Master Thesis Interaction Technology

Ons Berichten 2.0

Researching communication in elderly care, disabled care and mental health care for the proposal of a new messaging function within Ons

Kelly Marline van Tol

Department of Electrical Engineering, Mathematics and Computer Science

Supervisors University of Twente

Dr. Ir. R. Klaassen
Dr. M. Theune

Supervisor Nedap Healthcare

Ir. M. Huirne

February 2020

UNIVERSITY OF TWENTE.

nedap

Contents

Abstract (English)

The practice and delivery of care depends on effective and efficient communication. This communication happens between care professionals from multiple disciplines, as well as care professionals and their clients or the informal caregivers of those clients. Nedap Healthcare develops technology with the aim to improve the administration and communication in health care. They offer a software suite named Ons that enables care professionals to independently use all required tools for collaboration, connection, and the provision of information to support multidisciplinary working. This software suite includes a messaging function, Ons Berichten, providing the care professionals with a secured communication platform. However, during recent user research it was found that this tool does not match the needs of the users anymore.

The goal of this research is to redesign Ons Berichten for both mobile and desktop use to meet the current needs of its users. These users include care professionals in elderly care, disabled care and mental health care. The background research, context analysis and needs assessment that were performed during this research have provided insight into the needs of the current users and the context in which Ons Berichten is used. Based on these insights, a list of requirements for the new version of Ons Berichten is formulated. These requirements are translated into functions for the new messaging function, based on which an interactive, digital prototype is created. During a focus group, cognitive walkthrough and heuristic evaluation with in-house experts, feedback on the proposed functions and usability of the prototype is collected. Next, after an update of the prototype, user evaluations are performed. These evaluations consist of individual usability tests and interviews, during which actual users of the software were approached for their feedback on the new prototype. The overall opinion of the participating users about all newly proposed functions was very positive, and some interface elements with usability issues were identified and updated.

The final proposal resulting from this research consists of a mobile app as well as a desktop interface, integrated with other applications in the Ons software suite. This proposal can serve as a base for the redesign of Ons Berichten. Before implementation of the proposed functions is possible, further research to the integration with both applications within the Ons software suite and outside of the Ons software suite is necessary.

Abstract (Nederlands)

Zorgverlening hangt af van effectieve en efficiënte communicatie. Deze communicatie vindt plaats tussen zowel zorgprofessionals uit verschillende disciplines als zorgprofessionals en hun cliënten en/of de mantelzorgers van deze cliënten. Nedap Healthcare ontwikkelt technologie met het doel om de administratie en communicatie in de gezondheidszorg te verbeteren. Ze bieden een software pakket genaamd Ons waarmee zorgprofessionals onafhankelijk gebruik kunnen maken van alle nodige middelen voor multidisciplinaire samenwerking, verbinding en informatievoorziening. Dit pakket bevat een berichtenfunctie, Ons Berichten, die de zorgprofessionals voorziet van een beveiligd communicatieplatform. Uit recent gebruikersonderzoek is echter gebleken dat dit communicatieplatform niet meer aansluit op de behoeftes van de gebruikers.

Het doel van dit onderzoek is het zodanig herontwerpen van Ons Berichten dat het op de behoeftes van de gebruikers aansluit, voor zowel mobiel als desktop gebruik. Onder deze gebruikers vallen zorgprofessionals in de ouderenzorg, gehandicaptenzorg en geestelijke gezondheidszorg. Achtergrondonderzoek, een contextanalyse en een behoefteanalyse bieden inzicht in de behoeftes van de huidige gebruikers en de context waarin Ons Berichten gebruikt wordt. Een programma van eisen voor de nieuwe versie van Ons Berichten is opgesteld op basis van deze inzichten. Gebruikmakend van dit programma van eisen zijn de functies voor de nieuwe berichtenfunctie gedefinieerd, en is een interactief, digitaal prototype gecreëerd. Tijdens een focusgroep, cognitieve doorloop en heuristieke evaluatie met experts zijn verbeterpunten voor de functies en gebruiksvriendelijkheid van het prototype vastgesteld. Na het verbeteren van het prototype zijn er evaluaties gehouden met gebruikers. Deze evaluaties bestonden uit een individuele gebruiksvriendelijkheidstest en een interview waarbij Ons gebruikers om hun mening over het nieuwe prototype zijn gevraagd. De algemene mening van de gebruikers die meededen aan de evaluatie over de voorgestelde functies was erg positief, en enkele interface elementen met gebruiksvriendelijkheidsproblemen zijn naar aanleiding van de evaluatie verbeterd.

Het uiteindelijke voorstel dat resulteert uit dit onderzoek bestaat uit een mobiele applicatie en desktop interface die geïntegreerd is met andere applicaties binnen het Ons software pakket. Dit voorstel kan als basis dienen voor het herontwerp van Ons Berichten. Voordat de voorgestelde functies geïmplementeerd kunnen worden is er meer onderzoek nodig naar de integratie met zowel applicaties binnen het Ons software pakket als daarbuiten.

Acknowledgements

While writing this thesis, I received a wonderful amount of help and support.

Firstly, I want to thank my university supervisors, Randy Klaassen en Mariët Theune. Their feedback and experience has guided me through writing this thesis. The biweekly meetings with Randy were necessary to maintain the academic character of this research, and never failed at shaking up my brain and triggering new ideas or plans.

Then, I want to thank my Nedap supervisor, Marleen Huirne. She helped me shape this project and taught me a lot by sharing her insights and experiences. Moreover, she supported me when I was feeling stressed, encouraged me when I was feeling nervous, and always gave me the feeling that the work I was doing was really valuable and interesting. I could not have wished for better supervision!

Moreover, I am very grateful to many other colleagues at Nedap Healthcare. It amazed me how willing they were to plan some time with me and contribute to this research during interviews and several evaluation sessions. I also want to express my gratitude to all colleagues that made my months spent at Nedap full of fun and laughs, and (kind of) taught me how to play table football, indoor football, air hockey, do kangoo jumps, drink feuerzangbowle (in modest amounts), do pub quizes, climb in ropes, get over my presentation fear, cope with feedback, and many other things.

I also want to thank my sisters for reading through this massive object, providing their valuable feedback. And I should not forget to thank them for coping with me during stressful periods: that one goes out to all of my friends and family.

Lastly, I want to thank all the care professionals that contributed to this thesis by filling in the survey and participating in the usability tests. Without them, I could not have performed this research. Their enthusiasm encouraged and enlightened me!

1. Introduction

1.1. Problem Statement

The practice and delivery of healthcare depends on effective and efficient communication [1]. Since modern healthcare is delivered by teams rather than individuals [2], cooperation of and communication among care professionals from multiple disciplines is required [2, 3]. Effective communication among healthcare team members has been linked to increased patient satisfaction [4], shortened length of stay [5], decreased adverse events [6], improved treatment adherence and health outcomes [7], and is one of the hallmarks of safe and highly reliable client care [2]. On the contrary, ineffective communication may compromise patient safety and care, increase healthcare costs [8], delay treatment and cause staff distress, tension and inefficiency [9], misdiagnosis, medication errors, patient injury, or even death [10]. Moreover, failure in communication has been reported to cause two-third of adverse events in healthcare [10]. However, interdisciplinary communication between health professionals is still not properly supported by communication systems [2], even though improving the effectiveness of communication in healthcare is a global priority [11, 12].

The communication between care professionals and their clients or the families or friends (informal caregivers) of those clients leaves room for improvement as well: Dutch studies have reported lack of contact between informal and formal caregivers, and informal caregivers not feeling recognized as a full partner in the care [13, 14]. An extensive literature review to the needs of informal caregivers reports their need for better communication with care professionals, and better availability of support and information [13, 15].

1.2. Context

Nedap Healthcare is one of the seven business units that operate under Nedap N.V. The people at Nedap Healthcare develop technology with the aim to improve care by connecting people, knowledge, and technology. They offer several health-related software and hardware solutions for use in care context.

One of these solutions is Ons. Ons is a software suite for professionals in elderly care, mental healthcare and disabled care. Ons enables these professionals to independently use all required tools for collaboration, connection, and the provision of information to support multidisciplinary working. These tools include, for example, a multidisciplinary, digital file of a client (Ons Dossier) and a tool for scheduling appointments with colleagues and/or clients (Ons Planning). Moreover, the software suite includes a messaging function called Ons Berichten. This messaging function can be accessed from all desktop applications, and through the mobile application called Nedap Ons. More about the Ons software suite and current messaging function will be explained in subsection 3.3.

Ons Berichten provides a way for care workers to communicate one-on-one, with their team, their planners, or their team leader. During recent user research, Nedap found that the communication possibilities of this tool do not match the needs of the care professionals using Ons anymore. Furthermore, extending the communication tool to other parties involved in elderly care, disabled care and mental healthcare might improve communication for more people than just the care workers within a care organization. These other parties could be informal caregivers, general practitioners, or for example specialists outside of the organization.

1.3. Research Questions

The goal of this research is to make well-grounded recommendations for new versions, both desktop and mobile application, of Ons Berichten. The following research question will be answered:

> **Research Question:** How to redesign Ons Berichten to meet the current needs of its users?

To be able to answer this research question, some subquestions will be considered:

Subquestion 1: What are the needs of professionals in disabled care, mental healthcare and elderly care considering digital communication?

Subquestion 2: What are requirements for a messaging function within Ons meeting the needs of professionals in disabled care, mental healthcare and elderly care?

Subquestion 3: How can a design for a messaging function within Ons meet these requirements?

Subquestion 4: Which aspects of the proposed prototype could be improved considering its usability?

Subquestion 5: How do end users evaluate the new functions presented in the prototype?

1.4. Structure of the thesis

Firstly, the background research to interprofessional communication in healthcare presented in Chapter 2 will provide a good understanding of the current situation and its challenges. Research to the state of the art and related work will give insight into other available tools and present findings of research to similar applications to Ons Berichten.

Secondly, a context analysis will provide insight into the context in which Ons Berichten is used. A description of Nedap, the user sectors Nedap Healthcare is developing their software for, and the Ons software suite is presented in Chapter 3.

The third part of the research consists of a needs assessment, consisting of a document review, analysis of use data and survey research. Chapter 4 presents the methods and results of this needs assessment. Based on the lessons learned from the background research, context analysis and needs assessment, subquestion 1 will be answered.

From the background research on, every chapter concludes with the requirements that were elicited from that chapter. The full requirement list is presented in Section 5.1, answering subquestion 2. Those requirements will be translated to functions that will be mapped into a flowchart.

Based on this flowchart, interface designs for the prototype are sketched and subsequently translated into an interactive prototype, answering subquestion 3. These steps, as well as the proposed system design, are presented in Chapter 5. This prototype will be used for evaluations with both experts and Ons users. With the experts, a focus group, cognitive walkthrough and heuristic evaluation are performed. These are described in Chapter 6. These methods will help improve the prototype, preparing it for the usability tests with users. These usability tests are described in Chapter 7 and provide answers to research questions 4 and 5.

After those usability tests, a final proposal for the application, together with written recommendations, will conclude this research in Chapter 8. Finally, the results and overall research approach will be discussed. The structure of the research is visualized in Figure 1.1. The numbers in the diagram indicate the chapter in which the information is presented.

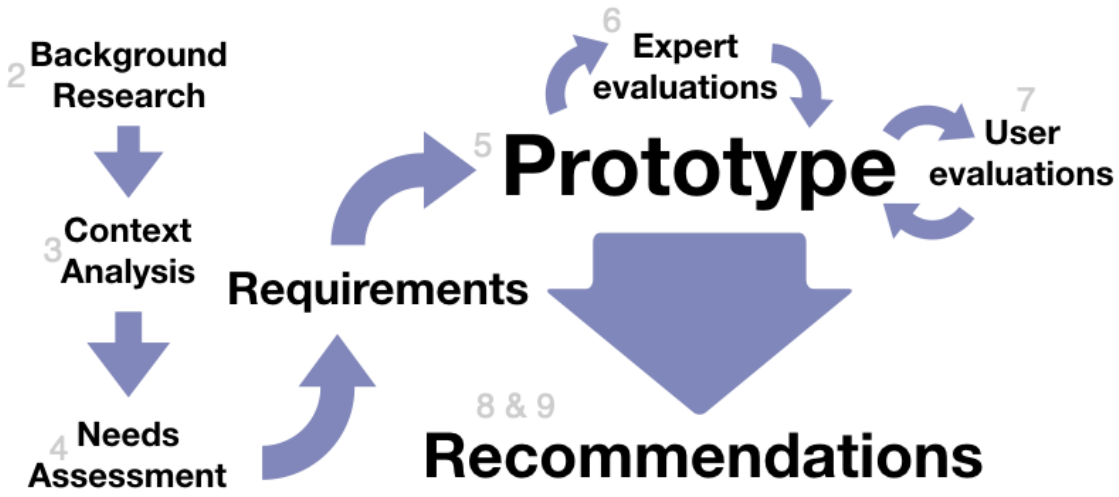


Figure 1.1: Diagram presenting the research structure

2. Background

2.1. Interprofessional communication

When professionals from a range of disciplines work together, it is called interprofessional collaboration [16]. In interprofessional collaboration, communication plays a key role [17]. Care for people with complex care demands is delivered by a range of care professionals from different disciplines [18]. In these cases, interprofessional communication becomes interdisciplinary communication as well. Communication in healthcare is complex due to the large amount of different actors involved in care, the large number of clients, the changing roles and tasks of professionals, and privacy concerns [19].

Interdisciplinary communication is often poor, caused by, for example, different education and professional habits within the disciplines. Take a nurse, being trained to be narrative and descriptive, or a physician, trained to be very action-oriented [20]. Especially for family caregivers, that have no specific knowledge of healthcare or medicine, healthcare professionals and their jargon can be hard to understand [21]. Moreover, the collaboration is perceived as rather complex because of the influence of many different factors like structure, organization, interaction, and context [22]. This causes lack of client-centredness, and poorly coordinated, fragmented and inefficient care [23].

To learn how to support interdisciplinary, client-centred and efficient communication, it is important to understand what content is shared among the different actors in this communication. Therefore, the next section will discuss the content of communication in care context.

2.2. Content of communication

Information about the care of the client, for example records of changes in health condition, has to be constantly updated, shared, and communicated about with everyone involved in the care process [21]. The specific content communicated between all different parties involved in the care of a client differs per client. However, some common practices or needs regarding the content of communication in care have been identified.

A large variety of content for the communication in care teams is described. This communication can consider care planning, care-related information exchange, team teaching, and decision making [24]. Voruganti et al. [25] described the potential topics of team communication more specifically as medical care management, reporting of symptoms, appointment coordination, prescription related queries, medication information or changes, administrative information, and overall updates. Zooming into the communication between physicians and nurses, we can add orders, clarification requests, and client concern to this list [26].

Apart from team communication, care professionals communicate often during face-to-face handovers. A handover is the transfer of professional responsibility and accountability for care for a client [11]. During handovers, care professionals communicate about a client's care, current condition, and recent or anticipated changes [27], content varying on the context of and reason for the handover [11]. Moreover, referral letters are used to communicate and often include specific information like the client's personal and contact information, case history and social situation, present state and results, past and ongoing treatment, professional network involved, the client's assessment, reason for referral, planned integrated care, specialist's role, and info about the client's involvement [28].

Considering the communication from care professionals to clients or informal caregivers, this often includes information about the client's clinical diagnosis and condition [29], but might also include content

concerning diagnostic tests, medical conditions, medications, the evolution of the disease, symptoms, prognosis, treatments, or services available [15]. In mental healthcare, supervisors communicate to their clients digitally to send them reminders, provide them with information, or send supportive messages [30]. The other way around, clients or informal caregivers often communicate to professionals about concerns, needs, and problems [15]. Silva et al. [15] also describe the informal caregivers' desired communication content, namely encouragement, reassurance, acknowledgement, social and emotional support, and information about the management of abnormal behaviour.

After learning what the content of the communication in care context encompasses, the next question is how this content is currently shared. The pros and cons of different communication channels and tools can teach us good and bad practices for the new version of Ons Berichten. Therefore, the next section will consider the different communication channels used in care context that are described in literature.

2.3. Communication channels

There is a large variation in data types, communication purposes, and channels to convey the messages over. This section describes the most frequently used communication channels in healthcare, considering their advantages and disadvantages.

Firstly, care professionals communicate using face-to-face communication: synchronous communication during, for example, team meetings, spontaneous conversations, or interdisciplinary rounds [31]. Face-to-face communication is fast, personal, and considered the most complete way of communicating because of the inclusion of body language, attitude, and tone [32]. Downsides of face-to-face communication are its potential inefficiency [33], bad documentation and information sharing with parties that are not present during the communication, and face-to-face communication often being unfeasible because of busy schedules and long distances between actors in the communication [19].

Despite all alternatives, phone calls remain an essential method of communication within healthcare as well, for its rapid and clear way of communicating [34, 35]. However, the problems of people having to be available at the same time and lack of documentation remains.

Written communication offers a solution to the aforementioned problems of face-to-face and verbal communication by enabling asynchronous communication between all parties involved, in digital means even accessible whenever and wherever one prefers. Other advantages of written communication are the potential use for future reference and option for easy and simultaneous distribution [28]. Written communication can include (physical) letters, memos, messages in health notebooks, faxing, whiteboard messages, email, or texting [5, 35]. Email or text conversations appeared to increase communication and communication efficiency between care team members during the research to smartphone use for communication between clinicians [36]. Smartphones have revolutionized the way healthcare providers, practitioners, clients and other stakeholders interact in a healthcare system [37], since smartphones support wireless, continuous and interactive communication from any location [37]. However, smartphones, email and text conversations also increase interruptions during the day, and can worsen interpersonal relationships between team members because of lack of face-to-face contact [36]. Another downside of smartphones for communication is related to data protection: A survey among 81 surgery residents in Canada found that texting was the most common method for client-related information sharing with staff physicians, with not all respondents using password protection on their smartphones [38].

Another channel for communication between care professionals is the medical record. The medical record is often used to share and update information with the care team, ideally within an electronic health record [24]. Not only could relevant data, on for example medications, be available to the client, it could also easily be shared with external agencies such as social services or home care services [24].

Additionally, insight into this record by informal caregivers could keep them aware of the clients' medical conditions and treatment [21]. An online medical record is often referred to as an Electronic Health Record (EHR) or Electronic Medical Record (EMR). EHRs/EMRs can provide safer, higher quality, and more cost-effective care when they efficiently support the work of the care providers [39]. However, some problems with EMRs have been described: Bardach et al. [40] found that, because of, among other things, complexity in entering or retrieving documentation and time-consuming sign-in processes, physicians were more likely to use multiple other communication channels. Improvements could be made by having the systems adapt to the practitioner preferences, more prominently displaying the information most utilized by a user, and a data trail to support collaboration by showing what is read or how and why decisions are made [40]. Jaatun et al. [41] argue that EHRs could be extended with features borrowed from social networks, enabling easier and more accessible communication for healthcare professionals, a more flexible and usable healthcare record, better information for clients, and closer collaboration between all participants within the client trajectory.

Sometimes, EHRs include a client portal. This portal can be used by clients and informal caregivers to look into the file, calendar, or send messages to formal caregivers. Though informal caregivers mention that this (specifically CarenZorgt[1], which is described in Section 3) saves time, brings peace, is practical, improves communication, and creates a firm network around the client, attention should be paid to privacy issues related to several people outside the organization being able to look into the data of the client [19].

Another channel for communication is social media. According to the Cambridge Dictionary[2], social media are "websites and computer programs that allow people to communicate and share information on the internet using a computer or mobile phone". Even in healthcare contexts, the use of social media is increasing [42]. Some of the uses are professional networking by, for example, forming online communities for information sharing and discussion [43, 44, 45], promoting health awareness by disseminating information by for example YouTube videos [45], searching for information about health conditions online [45], looking for emotional support in for example Facebook groups [45], and client care by for example using WhatsApp to communicate with clients [43, 44, 45]. Social media in communication within healthcare is used for both communication between care professionals and communication between care professionals and their clients [43, 44, 45]. Social media communication has been reported to contribute to continuous improvement in client outcomes [44], and positively impact the relationship between care professionals and clients, with more client empowerment and participation in decision-making due to increased knowledge and better communication [44]. However, the use of social media among physicians increases the potential of blurring the boundary between personal and professional life, potentially causing unprofessional behaviour. Moreover, content communicated on social media can include medical records, and messages considering appointments and prescriptions [46], which violates client confidentiality and privacy [47].

Many healthcare practitioners still use pagers [48]. A pager is "a small device that you carry or wear that moves or makes a noise to tell you that someone wants you to contact them"[3]. Its core function is ensuring that a clinician can receive an attention-diverting, easily read text message [48]. Pagers have several downsides: They do not indicate the urgency of a message, interrupt care workers frequently, and are inefficient in coordinating care across multiple disciplines and specialties [49]. Possibly, a pager function could be implemented in a smartphone-based application, as notification, as well, adding functions like forwarding or copying messages. This would even have several benefits: the user could stop carrying two devices, text conversation engagement would be easier, images could be shared and an easy tran-

[1] https://www.carenzorgt.nl
[2] https://dictionary.cambridge.org/dictionary/english/social-media
[3] https://dictionary.cambridge.org/dictionary/english/pager

sition from texting to phone call would be possible [48]. Yet, notifications are inherently disruptive and distractive [50]. For the users' benefit, a system should therefore present only important notifications, and enable users to easily manage notifications [51]. Different notifications can be coupled to different sources or message kinds, to indicate their urgency. However, during a study to the use of non-urgent and urgent messages between nurses and physicians, Quan et al. [51] found that physicians and nurses can have conflicting opinions regarding the clinical priority of a given problem.

All in all, many communication channels are used in healthcare, all having their advantages and disadvantages. We gained an understanding of the wide range of channels that support parties involved in the care or support of a client to communicate, and the motives to use them. This information helps to shape an understanding of the context in which the renewed application could be used, the needs of the users, and opportunities for the renewed communication tool. Next, to develop a broader understanding of e-communication in healthcare and available tools, specific tools used in elderly care, mental healthcare and disabled care are analysed.

2.4. State of the art

Sales managers and researchers at Nedap have listed Dutch communication tools that are used next to or instead of Ons berichten. These tools are described in this section, to learn about what the target group currently uses and what functions could therefore potentially be implemented in the Ons Berichten application. Commonly used electronic health records have been found to be similar to Ons, and to hardly provide information about their communication possibilities. Therefore, these tools are excluded from the analysis presented in this section. The tools included in the analysis are divided into three categories: Email, messengers and client portals.

2.4.1. Email

ZorgMail
A tool often used for communication within healthcare is ZorgMail[4]. Zorgmail offers a secured email service for care organisations to communication according to the requirements for communication in healthcare set by NEN7510[5] and the AVG[6]. Zorgmail is used for the communication of privacy-sensitive information or documents between care organisations. If the receiver uses an unsecured email service, the info can be opened using a secured weblink [52].

ZIVVER
ZIVVER[7] is a plugin, compatible with Outlook and Office, that enables the user to email securely. It enables users to work safely in the environment they are familiar with. ZIVVER checks outgoing emails on privacy sensitive information, makes sure only the receiver can access the information, and supports the safe sharing of large documents. ZIVVER is available on desktop and mobile phones.

[4] https://zorgmail.nl
[5] https://www.nen.nl/Alles-over-NEN-7510.htm
[6] https://autoriteitpersoonsgegevens.nl/nl/over-privacy/wetten/algemene-verordening-gegevensbescherming-avg
[7] https://www.zivver.eu/nl/

2.4.2. Messengers

Siilo
Siilo[8] Messenger is a free secure messaging app for healthcare. It enables users to coordinate care by creating direct messaging groups around clients, or discuss challenging cases with peers. It is appropriate for the healthcare sector because it is 100% confidential. All information is sent and stored fully encrypted. It supports threaded case conversations to be exported to an client's file. Connections can be instantly found in a chat list with all colleagues from the organization. Siilo allows connecting with people outside of the network as well via a verified use base. Siilo Messenger can be extended with Siilo connect. Siilo connect allows users to control their organisation's member directory, and enable remotely wiping the Siilo app, message broadcasting to critical care teams instantly, and integration of Siilo in existing software systems. Siilo is praised for being the safe alternative of WhatsApp (a popular messaging tool)[9]: easy to use, safe, and very appropriate for communication between healthcare professionals [53].

ZorgMessenger
KPN, a Dutch telecommunication and ICT-provider, offers ZorgMessenger[10]. Zorg Messenger is chat software that supports secure chatting and the sharing of privacy-sensitive client information by secured email. Zorg Messenger can be easily integrated with for example EHRs with the possibility of archiving conversations into external systems. Apart from chat and email, ZorgMessenger also offers the possibility to start a videochat in either one-on-one or group conversations for digital consult. ZorgMessenger can be used on personal computers, tablets, and smartphones.

2.4.3. Client portals

FamilieNet
FamilieNet[11] is a safe and reliable communication tool for care homes. It enables care workers to share messages, photos and videos about a client via a secure and personal page. In this way, the family of the client can stay up to date about important and beautiful moments in the life of their institutionalized family member. Apart from message sharing, FamilieNet includes a client calendar in which appointments, activities and tasks can be shared, and a lifebook describing the history of the client.

Apart from the tools that are commercially available and frequently used in the Dutch care, it could be interesting to learn from research done to tools with similar aims as Ons Berichten. Therefore, the next section describes the related work presented in literature.

2.5. Related Work

During a literature review to communication tools in healthcare, several interesting reviews of alternative tools have been discovered. Three different databases were searched (Scopus, PubMed, and ScienceDirect). Two different combinations of keywords were used. "Communication tool" AND "caregiver" AND "digital" gave a total of 54 hits, and "Communication tool" AND "Home care" gave 79 hits. Out of the 133 resulting papers (not considering duplicates), a selection was made with the inclusion criteria that they had to be 1) in Dutch or English, 2) from 2014 or later, and 3) considering a digital tool that was used for communication within healthcare. Subsequently, several tools were excluded, because they were about

[8] https://www.siilo.com/connect
[9] https://www.demedischspecialist.nl/nieuws/siilo-veilig-alternatief-voor-whatsapp
[10] https://www.kpn.com/zakelijk/branches/zorg/messenger.html
[11] https://www.familienet.nl/how-it-works.html

for example teaching, monitoring, or coaching/behaviour change, which is out of the scope of this review. The 17 works that result from this selection procedure are presented in this section. The implementation, research method and outcomes of these reviews can be valuable for the current research. Therefore, this section summarizes these publications. These publications consider tools for use within the care organisation (Congredi), for communication with client and/or informal caregivers (Compaan and MyGuardian) or both (Loop, WhatsApp Messenger and Skype).

2.5.1. Congredi

De Jong [19] studied the communication tool Congredi[12], which is intended for communication between different parties involved in care of home-dwelling elderly. It encompasses a care plan and a safe communication channel. Congredi has been evaluated with 39 general practitioners, 96 nurses, and 68 other care professionals in The Hague, the Netherlands, over a period of 10 months. The group of nurses consisted of district nurses, case managers for dementia, and nurse specialists. The group of specialists included elderly consultants, physiotherapists, gerontologists, and social workers. De Jong [**?**] found that in nearly half of the client records, multidisciplinary communication about care problems took place. The tool was used as intended: problems were assessed, actions were defined, observations were done, and actions were adapted. One new functionality that was implemented, namely inviting colleagues to link to a mutual client record, was used in over 90% of the client records. The possibility to share observations about clients took place on a large scale as well. The function to send emails within the care plan was used in only 31.4% of the client records, possibly explained by the use of other email channels. In conclusion, the study showed that a tool like Congredi was used actively, and linking colleagues and sharing observations, which could result in stronger networks and integrated care, appealed to the users of Congredi the most.

2.5.2. Compaan

The Compaan is a tablet with software providing the possibility to communicate in diverse ways with the elder user, and includes special care related functions like alarms, instructions, check-ins, a calendar and contact via a family portal [54]. Schuiteman et al. [54] assessed the way in which the Compaan could lead to support informal caregiving. Using the Compaan led to feelings of rest and control, improvement of communication, easier organisation of care, and feelings of happiness and satisfaction among informal caregivers. Reasons not to use the Compaan were absence of need, lack of time, motivation, or skills, and the system not working well. Additionally, they found a great diversity in network composition of the care networks of the clients, leading to different usage of the system. Therefore, flexibility and adaptability of such a system is very important. Additionally, it was found that such a system has to be very simple to support users without much technological knowledge.

2.5.3. MyGuardian

During a three-year research called "MyGuardian", ConnectedCare[13] and the University of Technology in Delft collaborated with the goal to facilitate the safe and the secure mobility for the seniors with mild cognitive impairments [55]. They designed a communication tool based on an extensive research to the caregiving situation in several Dutch care facilities. This research taught them that caregivers in these facilities mainly communicate by phone and email. They shared the latest information about the situation,

[12] https://www.webcitation.org/6imIS0lY0
[13] https://connectedcare.nl

and function as proxies to deliver this information to others involved in the care. However, a problem identified was that family caregivers only have access to a physical notebook which was inadequate in providing relevant and frequent information from the professional caregivers. Therefore, the designed tool was an easy to use communication tool for caregivers to instantly update seniors' conditions and inform other caregivers about the caregiving activities. It was found that both family and professional caregivers liked how they could easily fill in what they did for the senior, and in the same way be aware of others caregiving activities. The only downside was that people from outside the organisation, or people other than the main caregivers, could not use the tool for privacy reasons, since it would be challenging to customize information for different care parties.

2.5.4. Loop

Voruganti et al. [25] developed a web-based tool for clinical collaboration called Loop. Loop is a secure online communication tool for team-based clinical collaboration. The tool connects patient and care team to facilitate online asynchronous communication around care management. An online patient profile is created that can be viewed on a computer or mobile phone after secured login by patient, healthcare providers and caregivers. Voruganti et al. [25] conducted an open-label pilot cluster randomized controlled trial among patients with advanced cancer, their participating healthcare team and their caregivers. 10 palliative care physicians, 9 medical oncologists, and 48 patients participated in the trial. They found that coordination tasks improved for the teams using the tool. Furthermore, they state as conclusion the importance of the integration of dynamic components of care, namely communication and collaboration, with the static repositories of medical records.

2.5.5. WhatsApp Messenger

WhatsApp is a mobile app that enables users to make phone calls, send and receive text messages, and share video and voice messages and images over the Internet on a highly secure network platform[14]. It has a group text capability to support the user in sharing content with up to 256 people at once. Whatsapp is often used within healthcare because of the ease of use, low cost, secure communication, possibility for large groups, and quick feedback you receive on it [56]. A WhatsApp group chat can for example be used within the primary healthcare team to enable brief and rapid communication, give an overview of the team activities and monitor the flow of information [34]. Khanne et al. [57] reported that the introduction of WhatsApp as an interdepartmental communication tool increased awareness of client-related information, caused a more efficient handover process, and shortened the duration of morning handovers. Moreover, Mars et al. [58] found that WhatsApp in clinical setting is used for group chats and doctor-to-doctor communication. Ganaseran et al. [59] mention that WhatsApp was found particularly helpful for questions which require quick response. However, they list several downsides of Whatsapp use for medical information sharing as well, among which disparity on urgency, records being not easily printable, communications not being readily included in client's medical records, and a difficulty with identifying clients. Kaliyadan et al. [60] adds a limitation about lack of adequate follow-up in case discussions over WhatsApp. A last concern about the communication of medical information over WhatsApp is the risk of breaching client confidentiality and data protection requirements [60, 56], and a lack of understanding among users about the risks [58]. Risks would involve a smartphone being left unattended and unlocked, a smartphone being stolen and hacked or an error in recipient choice by the user.

[14] https://www.whatsapp.com/?lang=nl

2.5.6. Skype

Skype[15] is a free tool for video consults. It can be used for either one-on-one or group conversations via mobile, PC, Xbox or Alexa. It supports chatting and HD voice and video calling. In a study by Brecher [61], the use of Skype in a palliative care in-patient setting enhanced patient quality of life and connection to their loved ones. Battley et al. [62] report Skype as being helpful in facilitation communication between care providers, clients, and families as well. A review of Skype use on a tablet for elderly and their caregivers by Schuiteman et al. [54] found that the users had a problem with the complexity and user-friendliness of Skype. However, Skype will not ensure privacy of client data. Therefore, Skype should not be used to communicate privacy-sensitive information [63].

After learning about the tools that are used in healthcare from experts and internet research, it would be interesting to see to which extent and for which reasons the users of the Nedap healthcare software suite Ons use these tools. This information could be taken into the design process to be able to create a new and secure messaging function, integrated with the medical record and client portal, including functions that can make the use of other, unsecured tools unnecessary.

2.6. Conclusion

While caring for or supporting a client, information has to be constantly updated, shared, and communicated about with everyone involved in the care process.

This information can be practical, urgent or very sensitive. Though a communication tool should support these different kinds of communication, digital communication might not be appropriate for all content. It cannot fully replace face-to-face contact. On the other hand, it is very important to design a tool that can replace digital communication about clients that happens using WhatsApp or email.

For these different content types, different means of communication are used. Though face-to-face communication is fast, personal, and practical, it is not considered efficient, effective, well documented and shared, and achievable with large groups. Therefore, many (digital) alternatives are available. Digital messaging is popular, but should happen on a secure platform and could be integrated with a medical record. For the contact with clients or informal caregivers, client portals are often used, bringing rest, control, satisfaction to the client or informal caregiver while enabling better communication and organization of care. A special way of written communication happens using the medical record. Ideally, most of the care communication would happen on one platform, as can be done with digital medical records. Digital medical records can include planners, client portals and a message function, offering an integrated and complete tool for care-related documentation and communication.

For the design of the new messaging function, we learned in this section that the new applications should enable the user to communicate with all their colleagues, also from other disciplines. Moreover, communication with informal caregivers or clients should be facilitated. Between those parties, information about the care of the client is shared, which should happen in a secure way, and could be integrated with the medical record.

These lessons can be translated to the following requirements. Through this report, all requirements presented will be sorted on their relevance, divided into musts, shoulds, and coulds. More about the sorting method used is explained in Section 5.

[15] https://www.skype.com/en/

The application **must** enable the user to

- ☐ Compose a message
- ☐ Send and receive messages securely
- ☐ Send messages to and receive messages from all colleagues

The application **should** (enable the user to)

- ☐ Send messages to and receive messages from informal caregivers
- ☐ Send messages to and receive messages from clients
- ☐ Integrate with the medical record *(to be specified)*

The next chapter, context analysis, will teach us more about the variety of users and contexts in which the application will be used. This analysis considers the different user sectors, to learn who the colleagues, informal caregivers and clients who might or will use the new communication tool are. Moreover, the current software suite will be described, to learn about the technical context in which Ons Berichten would be developed and used, and potentially identify opportunities for integration.

3. Context analysis

The goal of the context analysis is to gain insight into the context in which the Ons Berichten app is or could be used. Firstly, a short description of Nedap and their vision and products is given. Next, the user sectors targeted by the software are described using information from web sources, supplemented with insights learned from Nedap experts. Then, the current Ons application is introduced using a description of its functions and a summary of previous use evaluations of the app. Lastly, Dutch standards and regulations in care communication that apply to Ons Berichten are described.

3.1. Nedap

Nedap is a technology company based in Groenlo, the Netherlands. Nedap aims at developing technology that helps people to be more productive and successful in their work. They create solutions for seven different markets: Light Controls, Livestock Management, Healthcare, Identification Systems, Retail, Security Management and Staffing Solutions. This research is performed within Nedap Healthcare. Nedap Healthcare has developed applications with different health-related aims, that are kept up-to-date by the Healthcare team, responding to the dynamic world of healthcare.

Within Nedap Healthcare, the user experience (UX) design team focuses on creating, improving and maintaining a good user experience through the software of Nedap Healthcare. The mission of the team is formulated as "improving the world by creating solutions for people with real problems in a way that seamlessly fits their needs". Especially when users cannot articulate their needs properly themselves, the UX design team will make sure their voice is heard, understood and shared. Moreover, simplicity, beauty, utility, ease of use and most importantly the human touch are the core of the daily work of the UX designers.

This research is performed within this UX design team, and therefore through the UX design vision. The application this research focuses on, Ons Berichten, is part of the main product of the Healthcare department 'Ons'. Ons Berichten functions as the messaging application within and across the Ons software suite. More about Ons will be explained in the Section "Ons software suite".

3.2. User Sectors

Nedap Healthcare offers software for three care sectors in the Netherlands: elderly care, disabled care, and mental health care. This section will be divided into these three sectors, describing the range of clients in the sector, and presenting information about the actors involved in and communication about their support or care. Every sector description starts with information retrieved from internet research, supplemented by the results of a short, 30-minute interview with the Nedap Sales manager for that particular sector. The in-house Sales managers are approached for this information, since they are in frequent contact with Ons users, know about their way of working, and often receive their feedback. The interview questions and summaries are presented in Appendix A. The information gained from Nedap sales managers considers the situation among Ons users, and might not be generalizable to the full sector.

3.2.1. Elderly care

Elderly care[16] is care offered to people that, because of their age, are not able to fully take care of themselves anymore. This could be caused by, for example, immobility or health problems causing them to need extra support. Elderly care is not only about caring for and helping the elderly, but includes stimulating them to have social contact and go out and do things to avoid social isolation as well. Elderly can either receive care at home, or move into a special home where they receive care.

Care at home There are two main ways for elderly to receive care while still living at home:

- Informal care: An informal caregiver takes care of the elder over a long period of time without being paid. This could for example be a spouse or child. Though this can be hard on the informal caregiver, it makes it possible for the elder to stay at home.
- Home care: When an elder receives home care, a care professional comes to their home to, for example, help the elder with taking medicine, cleaning the house or getting dressed.

Care at another location When staying at home is not possible anymore, the elder can stay at a facility:

- Care home: In a care home, care and home are offered to the residents. The elder receives help with personal care, meals, and going to bed. Most people stay at the home, others get day care and go back home in the evening.
- Nursing home: For intensive care or heavier medical treatment, the elder should go to a nursing home. This could for example be the case when someone suffers from dementia or a severe physical handicap. In a nursing home, full-time and intensive care and support are offered to the residents.

The care network of elderly living at home often consists of informal caregivers, formal caregivers, nurses, specialists, and volunteers. In the Netherlands, such a network averagely consists of 6.6 professionals and 3 informal caregivers. The more care an elder needs, the bigger the care network [64]. In extramural elderly care, one primary caregiver or district nurse organizes most of the care around the client by taking care of communication with the client, care planning, the care plan, and finances. Furthermore, nurses, caregivers, activity supervisors and volunteers are involved in the daily support of the elder.

In the case of, for example, dementia, a case manager might be involved. In other cases, the help of other specialists might be necessary. These specialists can work either within or outside the care organization. In the depiction of Figure 3.1, a large organization is depicted where those specialists are part of the organization. Considering intramural elderly care, a primary caregiver is most responsible for the client, functioning as care coordinator. Nurses, caregivers, and practitioners like the general practitioner, physiotherapists, occupational therapists and speech therapists are included in the care as well. When informal caregivers live with the elder, respite workers are sometimes involved to now and then release informal caregivers from the informal care. When the elder lives alone, domestic caregivers can come over to help with housekeeping, and home care can help with, for example, washing.

Within these care teams, information about the state and well-being of the client is exchanged on a daily basis. Among the caregivers, WhatsApp, email, and the digital record are used. Communication with the informal caregivers or the client happens through client portals, or alternatively calling, emailing, or using WhatsApp. Communication with people outside of the organization mostly happens using (secure) emails and calls. Though many digital applications are used in elderly care, research [65] has found that almost 20% of the care workers in elderly care could be considered digital illiterate, implying

[16] https://www.rijksoverheid.nl/onderwerpen/ouderenzorg

that a low affinity with digital tools among part of the users should be considered when designing software for elderly care.

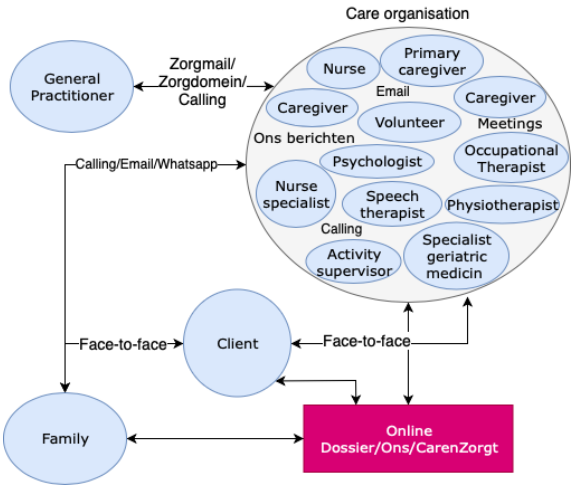


Figure 3.1: Actors and communication methods in elderly care

3.2.2. Disabled care

Disabled care is care for people with either a physical or mental disability. Physical disabilities include problems with moving, seeing, and hearing, where mental disabilities include limitations in intellectual or social development. The amount of care needed depends on the severity of the disability. This can range from help in household or supervision at school (extramural care) to intensive institutionalized care (intramural care). Different forms of disabled care are 1) personal care or nursing at home, 2) supervision at home, school, or in an institution, 3) treatment by general practitioner or medical specialist, and 4) the use of tools and/or facilities, such as means of transport.

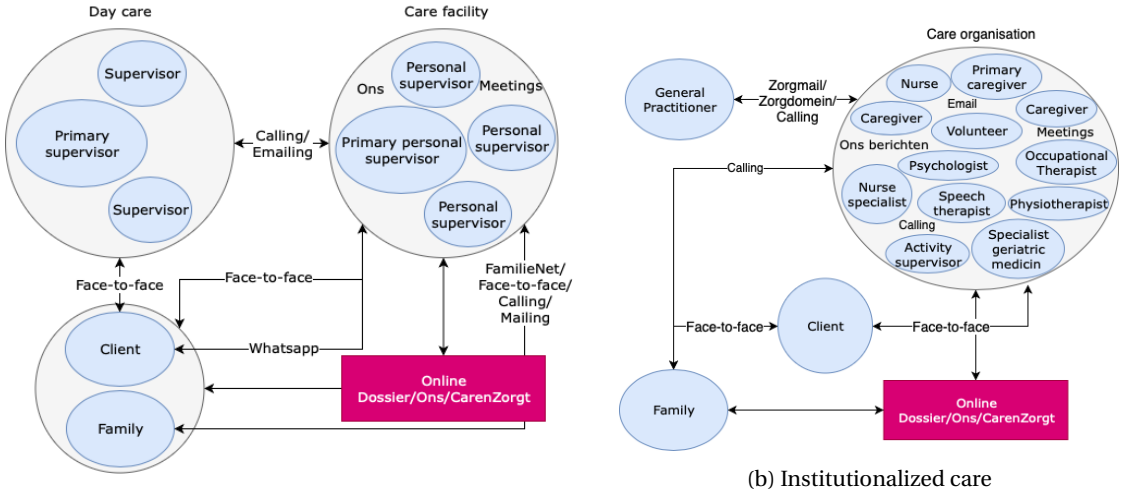
If someone, because of a disability, is unable to live (fully) independently, an adapted living space or institution might be suitable. For people with physical disabilities, adapted houses with potentially care and supervision are available. For people with mental disabilities, the options are housing assistance, staying in an institution, protected living, or a small-scale residential facility. If people with a disability are unable to do regular work or follow regular education, there are alternative options. Children can go to special education, and instead of regular working, people with a disability can work at a day activity centre or a social- or secure workplace [17]. The care network of someone with a disability is mostly large, since they often have multiple health and functional problems, and may see numerous sub-specialists and allied health professionals [66]. This often results in fragmented care.

To describe the people who are included in the care of someone with a disability, a distinction should be made between ambulant support and institutionalized care. Ambulant support is offered to clients who live with their parents or independently. Personal supervisors visit the client at home, offering them support with, for example, planning or administration. The relationships with those personal supervisors are mostly one on one and very personal. Therefore, the communications happens to a large extent using WhatsApp. They often meet each other in real life as well. A reintegration coach might help someone with

[17] From: https://www.government.nl/topics/nursing-homes-and-residential-care/care-for-people-with-disabilities

a disability to find a job or daily activity, since they are often unable to have a regular job and therefore go to some form of day care. Family of the client stays up-to-date using CarenZorgt or another client portal, shares documents using email and calls the supervisors in case of emergency. The personal supervisors communicate about progress using each other's digital files, short messages using Ons Berichten, and have regular meetings. A diagram of the various actors and their communication methods in ambulant support for people with a disability is presented in Figure 3.2a.

Institutionalized care is offered to those who are unable to live independently. They are in need of more care, and therefore have a larger team supporting them and caring for them. They often have a primary care psychologist, functioning as their general practitioner, a behavioural specialist, and a primary personal supervisor. Other specialists included in the care team are, for example, psychologists and physiotherapists. All these professionals communicate by calls, meetings, Ons Berichten, but expectedly by using Whatsapp as well. The client's family is mostly eager to know what is going on in the facility, and stays up-to-date using CarenZorgt, emailing, FamilieNet for pictures, and calls. If the client has work, this is mostly within the care facility. A diagram of the various actors and their communication methods in institutionalized care of people with a disability is presented in Figure 3.2b. This figure presents a generalized picture based on a large organization.



(a) Ambulant care

(b) Institutionalized care

Figure 3.2: Actors and communication methods in disabled care (SV = supervisor, PS = personal supervisor)

3.2.3. Mental health care

In mental health care, professionals are aiming to either avoid, treat or cure psychological disorders, or offer help to people suffering from severe confusion or addiction. Based on the amount and severity of care needed it is determined where someone will receive the care. The primary care is offered by a general practitioner, social worker, or primary care psychologist. The primary care is general, fast, and accessible. If a more specialized treatment is necessary, the general practitioner or a medical specialist will refer the client to secondary care: the specialized mental healthcare. This care is offered by mental health care institutions. In these institutions, the care team normally consists of a practitioner with the final responsibility over the client, co-practitioners, a general practitioner, care assistants, secretary, and family. Practitioners can be therapists, psychologists, psychiatrists, psychotherapists, and specialists in

particular disorders. Highly specialized care is intended for clients with complex, severe, and/or rare mental disorders for whom the specialized care diagnostics and/or treatment has not sufficed or is not expected to suffice.

Mental health care is offered in the form of ambulant treatment, part-time treatment, intensive care in admission, or acute admission. During ambulant treatment, the client still lives at home, but often has frequent meetings with a supervisor, potentially combined with medication and online support. During part-time treatment, the client gets treatment several (parts of) days a week. When this is not enough and a client needs more intensive care, the client will receive this care in admission. In cases where immediate action is necessary, for example when someone endangers him/herself or his/her surroundings, acute admission is necessary[18].

After a general practitioner has referred a client to a specialist or institution, the practitioners treating the client inform the general practitioner about the diagnosis and care plan. This communication usually happens via secured email or mail. The same information, but using less jargon and potentially more sensitivity, is shared with the client and primary informal caregiver. The client and primary informal caregiver officially have the right to view everything the practitioners document about the client. However, not all practitioners feel comfortable doing this, since they would phrase information differently for their fellow professionals than the client. This forms one of the reasons for practitioners to use WhatsApp and (secured) email for their professional communication. Moreover, the practitioners communicate verbally, and have interdisciplinary meetings to discuss the progress of the client. Currently, CarenZorgt is used in mental health care to easily and securely allow client or informal caregiver to communicate with the practitioners (and the other way around). Invitations, reports, contracts and care plans that need to be shared with the client or informal caregiver are regularly shared by mail. A diagram of the various actors and their communication methods is presented in Figure 3.3. Again, a large organization is considered.

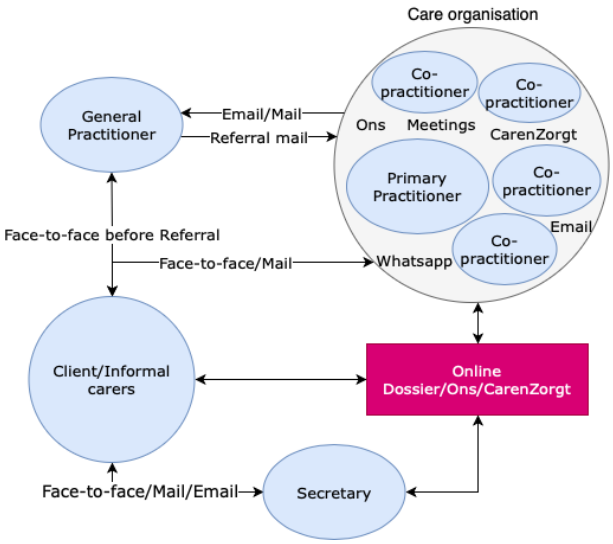


Figure 3.3: Actors and communication methods in Mental Health Care

Though many digital applications are used in mental health care, research [65] has found that almost 10% of the workers in mental health care could be considered digital illiterate.

[18] From: https://www.ggznederland.nl/pagina/ggz-sector

3.3. Ons software suite

The messaging tool that is redesigned during this research, Ons Berichten, is part of Ons. Ons is a software suite simplifying the administrative tasks of care professionals. The electronic health record is part of this software suite. Ons provides the care team and care organization with a complete tool set for care-related administration, communication, documentation and planning. Ons offers software for both desktop and smartphone.

This section will introduce Ons Berichten and its opportunity for integration with or connection to other functions within Ons. First, the desktop application is considered. Next, CarenZorgt, the web application for informal caregivers and clients, is described. Lastly, the mobile applications and their functions are explained.

3.3.1. Web applications

The Ons Software suite consists of a wide range of applications. Through these applications, the care worker can for example access client profiles, multidisciplinary electronic health records and his or her work planning. Moreover, a client's electronic health record can be linked to a client portal, namely CarenZorgt, which enables digital communication with clients or informal caregivers. Administration or coordination workers have a tool for planning within Ons, and even finances can be processed within the software suite.

When opening Ons in a web browser, it is accessed through Ons Medewerkersportaal. Two-factor authentication will make sure only authorized care workers can enter the online care environment. Ons Medewerkersportaal acts as a home screen for the care worker. After login, Ons Medewerkersportaal gives insight into the information relevant for that particular care worker: The content of the Medewerkersportaal is responsive to the user. It shows, for example, the work state of the care worker, their planning, and their messages. The messages are a fixed part of this page. This is where the main part of Ons Berichten for desktop is implemented. A screenshot of Ons Medewerkersportaal is presented in Figure 3.4.

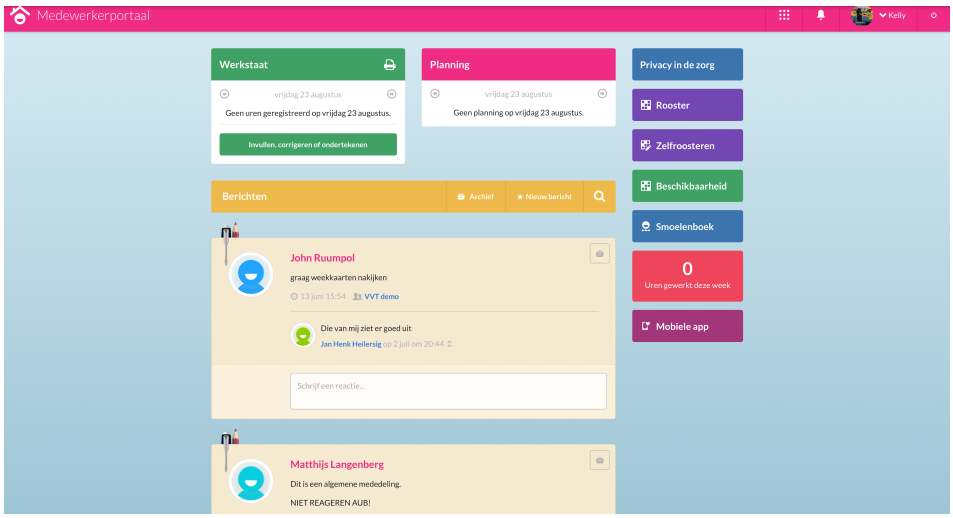


Figure 3.4: Ons Berichten in Ons Medewerkersportaal in the desktop application

When one of the other Ons desktop applications is used, Ons Berichten can still be accessed by using the message icon in the pink menu bar which is always available at the top of the screen. If this icon is clicked, the message function will slide in from the right side of the screen, presenting a small version of the Ons Berichten function, as shown in Figure 3.5.

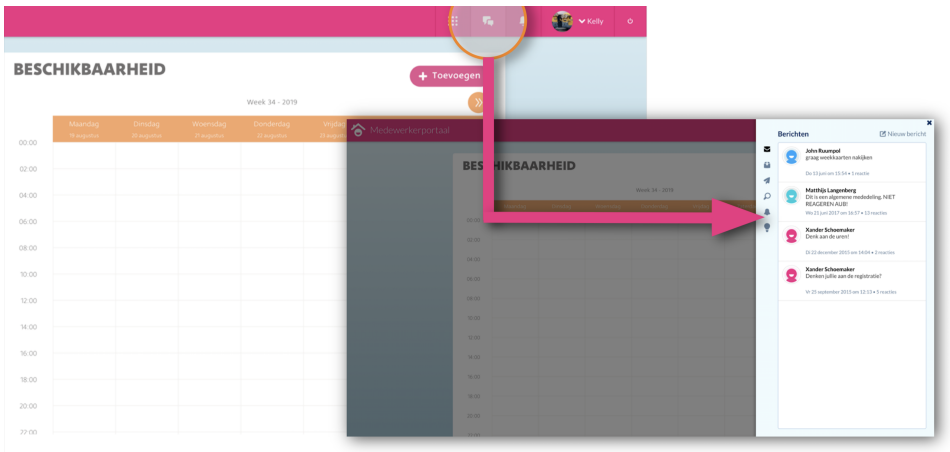


Figure 3.5: Ons Berichten access from other Nedap Ons tools in the desktop application

If this icon is not available, an alternative access method as shown in Figure 3.6 is available using a message-icon on the right side of the screen.

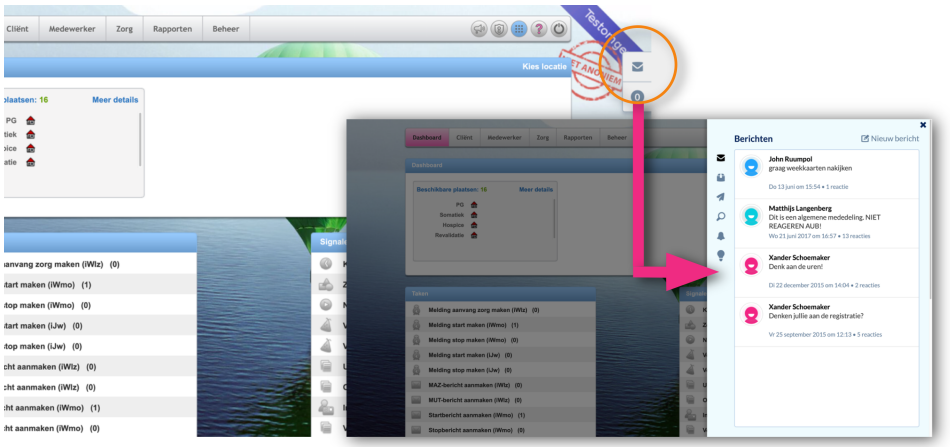


Figure 3.6: Ons Berichten access from other Nedap Ons tools in the desktop application

Since all information from other Ons applications is available within the same system, there is a lot of opportunity for integration. Clickable references to for example client profiles, items from the electronic health record, or calendar items, could make it easier and faster to discuss them. This reference could lead a reader straight to the relevant information in the proper context. It would be important to keep a layover of Ons Berichten accessible from all software to make the referencing practical.

3.3.2. CarenZorgt

CarenZorgt enables communication with client and informal caregivers from Ons. It provides a client with a personal health environment in which an informal care network can be built. It supports communication within this network, sharing messages, pictures, and calendars. A care facility can be included in this network, sharing care plans and reports to be viewed by the informal carers and the client.

Input for CarenZorgt from the care professionals is provided via Ons, so they do not have to use a separate CarenZorgt application. The CarenZorgt interface is kept very simple, since users are not necessarily familiar with digital applications. Currently, CarenZorgt provides a platform for informal carers and clients to connect to Ons. Formal carers can put information into Ons that can be accessed by informal carers via CarenZorgt. This information can be seen by the client and all informal caregivers. The other way around, informal caregivers can put information into CarenZorgt, which can be accessed by all formal caregivers. The communication between formal and informal caregivers/clients is visualized in Figure 3.7. This diagram presents a generalized situation in a large organization.

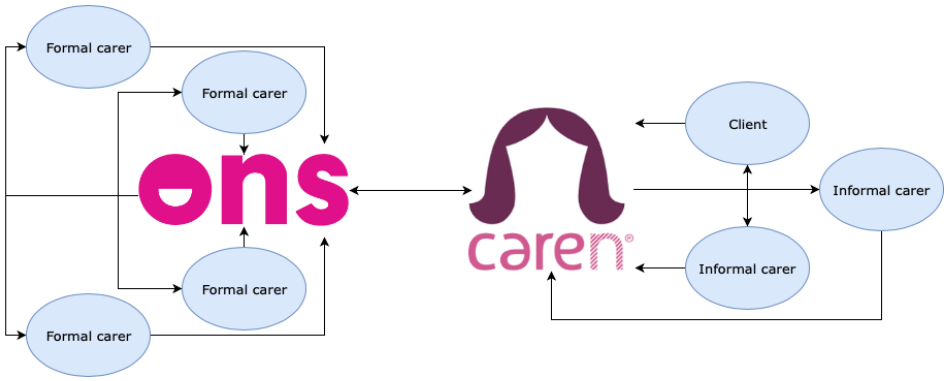


Figure 3.7: Communication between formal and informal caregivers using Ons and CarenZorgt

3.3.3. Mobile applications

Nedap Ons is the mobile application through which Ons Berichten can be accessed. The Nedap Ons app includes a secure messenger, originally designed for home care workers. It provides care workers with a way to communicate with the team while they are on the move. The current mobile app has a limited amount of functions: you can send messages (including pictures), visit client profiles, view your colleagues, and see your calendar. Figure 3.8 presents screen shots of the app and its functions. The planning will be removed from the app and included in another, so the Ons berichten app can focus on messaging. The app currently facilitates one-on-one messaging and messaging to predetermined groups. Only care professionals are included in the contacts. The app is connected to desktop applications, and enables access to them by opening the mobile web browser.

The other mobile applications Nedap offers are Ons Toegangscode, Ons Dossier, Ons Medicatiecontrole, Ons Vandaag (in development) and Ons Wondzorg (in development). Ons Toegangscode is an authorization application to be used by care workers on the go, allowing them to securely access the Nedap Ons applications using two factor verification. The Ons Dossier application gives the care workers access to the client record, wherever they are and at any time, even offline. In this way, they can access relevant information and report on their mobile device. The Ons Medicatiecontrole app helps care workers

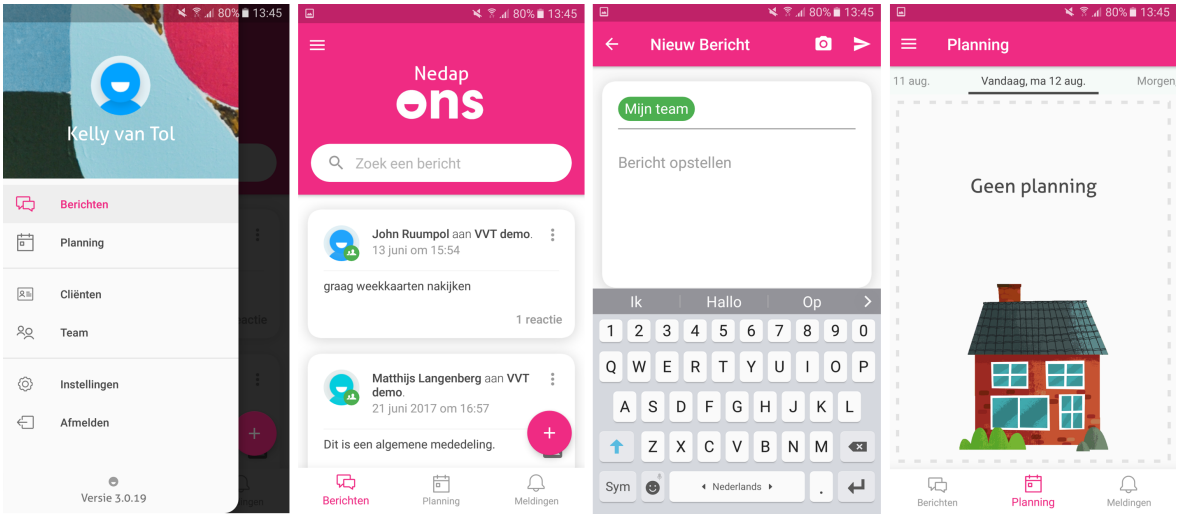


Figure 3.8: Ons App screenshots: menu, message overview, new message, and planning

administering medication to their clients. Human mistakes are prevented using the 'four eyes principle', meaning two persons check the administering plan before it is performed. This check can happen remotely. The Ons Vandaag application offers a care worker's planning, an hour registration tool and declaration tool within one app for daily, on-the-road use. Lastly, the Ons Wondzorg app offers a tool to monitor the progress of a wound. It includes a timeline on which pictures can be posted and added to the digital file, and automatic classification of the pictures.

This subsection taught us about what is currently available in Ons and specifically Ons Berichten. The new version of Ons Berichten could include the functions it has right now, which users are used to, and extend them with for example integration with the other applications.

3.3.4. The ideal application

Current or potential users of Ons often express their needs to the sales managers, account managers, support workers and user experience designers. One of the interviewed experts even uses Ons himself. While trying to design a new Ons Berichten, it is interesting to hear what the ideal communication tool should include in the opinion of these user experts. Therefore, their answers to the interview questions "What would the ideal communication tool be for mental health care/disabled care/elderly care?" and "What would its functions be?" are summarized in the following paragraph.

Firstly, all interviewed experts mention that the application should be accessible through a mobile app, integrated in current Ons software. It should allow for intuitive communication with client, informal caregivers, care professionals within and outside of the organisation, or a selection of those. Groups of those people can be created and deleted again when they are not relevant anymore. This does not mean all of those parties should have an Ons app as well, but integration with other communication platforms could allow Ons users to send all their messages from one place. Then, authorisation is mentioned several times as an important topic: When sending a message, especially to someone outside of the Ons environment, it is important to be made aware when privacy sensitive information is shared. Then, a user could double-check and choose whether he or she wants to allow the receiver to access this information. Moreover, the

app should be secure. It should support attachments in the form of images and documents, or links to client profiles or a digital client record, to be sent with the messages. Moreover, it should support conversation about any content available in the application, by enabling easy access to the relevant information by just clicking the link to the right place. In this way, communication can happen without barriers: Information is easily shared and accessed by all parties. This application would be the place where client information sharing is allowed. Finally, it was mentioned that it should be easy to add threads to a client record.

3.4. Standards and regulation in care communication

Considering care communication in the Netherlands, several standards, specifically NTA 7516, apply. Standards are voluntary agreements, not laws. They provide clarity about and trust in products, services or organisations[19]. Thus, meeting those standards is not mandatory, but can be beneficial. This subsection will describe items from called NTA 7516 that could be relevant for the design of a messaging application within the care context.

The NTA 7516 establishes functional specification for the secured exchange of personal health information between professionals and between professionals and individuals. Considering integrity, NTA 7516 states that a recipient must be able to visually determine which person or professional is the sender of a message. Moreover, it states that the organisation must guarantee that the sender of a message is authorized to send the message to the recipient. Considering user friendliness and usability, NTA 7516 states that a receiver of a message must be able to reply to or forward the message. Moreover, it states that the receiver must be able to save the message to a location within the software. Lastly, considering interoperability, two standards are stated. Firstly, it must be easy and safe to add messages to a professional's file. Moreover, multi-channel communication must be supported, meaning that users need the ability to send and receive messages to and from other communication service providers.

Considering regulation in care communication, care providers need to be compliant with the General Data Protection Regulation[20] (GDPR). As a controller in GDPR it is up to the care provider and in the end, the care professional to handle client data securely. However, the software used by the care professionals can facilitate their compliance with the GDPR. To achieve this facilitation, a high-security level among the Ons software is sustained.

The security of client data within Ons is ensured by using, for example, 2-factor authorisation to log in to the environment, and encryption of both data transport and storage. For Ons Berichten specifically, it is crucial to maintain the same high-security level among the message exchange and prevent the user from sending data to receivers that do not sustain a high-security level.

To conclude, for Ons Berichten to meet the standard NTA 7516, it should enable the user to see who sent a message, reply to the message, forward the message, and store the message. Storing the message in Ons could mean exporting it to a client's profile, or pinning it to look back to. Moreover, multi-channel communication should be supported. Lastly, while updating software, state of the art security can be applied to ensure the facilitation of the care providers' compliance with the GDPR.

[19] https://www.nen.nl/Standardization/What-is-standardization.htm
[20] https://gdpr-info.eu

3.5. Conclusion

Nedap Healthcare offers a software suite for care professionals, named Ons, including the electronic health record of the clients and tools for care-related administration, communication, documentation and planning. The software is used in elderly care, disabled care, and mental health care.

Though the reason for the need of care or support in these three sectors is different, similarities between the sectors and clients can be identified. In all sectors, both support at home and support at another location are available. While still living at home, care or support can be offered by someone regularly visiting the client, or the client can go somewhere for either a treatment or day care. Often, while someone still lives at home, informal caregivers offer most support or care.

In all sectors, communication within the care teams happens using WhatsApp, email, the electronic health record, Ons berichten, or (interdisciplinary) meetings. Communication with client or informal caregivers happens face-to-face or using a client portal, phone calls, (e)mail, FamilieNet or WhatsApp. Unsecured email or WhatsApp are used even though they are not fit for care-related communication when considering the privacy of the client. Although many digital tools are already used in all user sectors, people with a low affinity with technology have to work with the software as well. Therefore, the application should be usable for users with only fundamental computer skills.

Ons Berichten is aiming to be a secure and privacy compliant messaging application. It is a messaging function implemented within the Ons software suite. Evaluations of Ons Berichten (that will be presented in Chapter 4) and interviews revealed several limitations and opportunities for this communication tool. These limitations and opportunities can form the base for the redesign of Ons Berichten.

In this section, we learned about the three targeted user sectors of Ons, variations within the sectors, people involved in care and their use of digital tools. Moreover, we learned what is currently available within the Ons software suite, and what the functions of the current Ons Berichten are. These existing functions should be maintained, and the other applications within the software suite give opportunity for integration. The functions proposed by experts could be reviewed and eventually put on the requirement list. Lastly, aiming to meet the requirements of NTA 7516, the relevant items discussed should be translated into requirements as well. This leads to the following requirements:

The application **must** enable the user to

- ☐ Send and receive messages one-on-one
- ☐ Send messages to and receive messages in a group
- ☐ Access the software on a mobile device
- ☐ Access the software on a desktop

The application **should** enable the user to

- ☐ Take a picture
- ☐ Send and receive attachments

The system should support users

- ☐ In elderly care, disabled care and mental health care
- ☐ Working in intra- and extramural care
- ☐ With fundamental computer skills

Some functions recommended by experts should be proposed to Ons users, to potentially be added to the requirement list:

- ☐ A function for video-consult
- ☐ Sending messages to professionals outside of the organisation
- ☐ Reference to items in other Ons applications (for example a calendar item, client profile or electronic health record item)
- ☐ Authorisation checks
- ☐ Exporting messages to an electronic health record
- ☐ Create custom groups
- ☐ Adding people to existing conversations
- ☐ Send and receive messages labelled as urgent

After learning a lot from literature, specialists, and alternative tools, the next chapter will include the care professionals into the research. More information about the needs of these care workers is acquired through a needs assessment among the current users of Ons. This needs assessment and its findings are described in Chapter 4.

4. Needs Assessment

To learn about the needs of the users and revise, prioritize and add to the requirements formulated in the previous sections, a needs assessment was performed. A needs assessment is a systematic process providing justification for decisions [67]. During this research, a needs assessment was used as a tool to define requirements for the new application. Witkin and Altschuld [68] define a needs assessment as “a systematic set of procedures undertaken for the purpose of setting priorities and making decisions about program or organizational improvement and allocation of resources" with "priorities based on identified needs” [68, p.3]. Needs, in this context, can be described as the differences between current achievements and the desired accomplishments [67]. Considering Ons Berichten, these needs are the options the users desire to have that are not included in the current application yet. During this needs assessment, needs will include things the current application offers as well, to make sure the requirements list based on these needs will be a complete requirement list for the new application.

4.1. Selection of data collection tools

Several data collection tools and techniques for needs assessments are available. Watkins and Meiers [67] describe expert reviews, focus groups, interviews, surveys, and performance observations. They describe expert reviews as mostly effective for decision making, to have a fresh set of eyes that can provide new ideas and insights. Then, focus groups and interviews are used to have in-depth conversations or discussions, allowing for follow-up questions, stories and context about the use of an application. However, focus groups and interviews take a lot of time, limiting the research opportunity to a small scope and sample [67]. Furthermore, Watkins et al. [67] write that surveys are suitable for capturing the perspective of multiple groups on a variety of topics, using a variety of questions and formats. However, they mention that a downside of surveys is that no follow-up questions are possible. Lastly, Watkins et al. [67] describe the performance observations technique: a technique where the use of the application is observed to identify problems of the user experience.

To learn more about the behaviour and needs of Ons users, two of the techniques described by Watkins et al. [67] are used during this needs assessment: document reviews and a survey. The document review is performed because several studies among the users and about the use of the current application have already been performed, providing easy-to-obtain and useful information for this research. One of these studies (described in Section 4.2 and Appendix B.1) has already included a focus group and interviews. Therefore, and considering the wide variety of users and use context, the survey is chosen as supplement to existing research. Additionally, use data of the current application was analysed. Expert reviews are are performed to receive feedback on ideas in a later stadium of this research.

4.2. Document review

A document or data review is important since often similar research has been performed or data has been collected that can be relevant for the needs assessment. Existing sources can be documents, reports, data files, or other written artifacts, either from within or outside the organisation [67]. During this document review, the documentation of previous evaluations will be reviewed. The goal of this document review is to learn about the behaviour and needs of the users. Questions that are asked during this review are: "What do the users want to do in the communication app within Ons which is currently not possible?" and "What feedback about communication with care professions do informal caregivers and clients give on the current application?"

4.2.1. Methodology

The documentation of three previously conducted studies has been reviewed. These studies are selected based on their relevance to the research questions. During the first two of these studies, it was researched to which extent the current messaging application fits the way the Ons Berichten users work nowadays. The first study was performed by a User Experience designer of Nedap Healthcare. Methods used during this study were interviews, observation, focus groups, feedback from the system, and logged app use data. The second study was conducted by a developer of Nedap Healthcare. This second study was performed using an analysis of use data of the current application, as well as visits of users to talk about and observe the way they use Ons Berichten. More extended methods and/or results of these studies are presented in Appendix B.

The third study considered the application CarenZorgt. CarenZorgt offers a way for careworkers and informal caregivers to communicate by giving the informal caregivers access to the dossier of the client and allowing them to digitally respond to its items. The CarenZorgt team recently performed a study during which almost 50.000 respondents provided their feedback on the platform by filling in a mixed-method survey.

4.2.2. Findings

Results from the first study include specific feedback on the current messaging tool considering the clarity of the message page, and optimizing the functionality, layout and performance. It was found that users experience problems with searching through messages, notification preferences, and the consistency of the layout of the applications. Moreover, they would like to have some functions that are currently not available: users want to select multiple messages at a time, organise their inbox, forward or delete messages, add a subject line to a message, add colleagues to an existing conversation, send attachments with their messages, see when a message is read, and create groups. Moreover, a list was composed presenting the external care providers with whom the internal care providers would like to be able to communicate, and how they communicate with those people right now. An extended description of the results of this study is presented in appendix B.1.

The second user study resulted in a list of things current users would like to be able to do with the application, that are currently not possible. This list includes many elements that are mentioned in the results of the first study as well. Interesting additions to the results mentioned before are users wanting to be able to talk to anybody related to their client, refer to the client and easily talk about other Ons objects (shifts or reports), send messages to people that are currently working or working next, add reminders to messages in their inbox, and reach someone at home. The full list is presented in appendix B.2.

Considering the third study, key findings of this survey research about CarenZorgt for the current research are the following:

Responses from careworkers Careworkers barely respond to the comments of informal caregivers to the digital client record. Informal caregivers would like to get more response or at least see whether their message has been read by the care workers. The care workers need a clearer notification when a message from an informal carer is received.

The use of alternatives Because of the unsatisfying communication using CarenZorgt, email and phone calls are often still used by the informal caregivers to reach the care workers.

Edit/Delete Informal caregivers would like to be able to edit or delete their messages.

One-on-one communication Currently, one-on-one communication in CarenZorgt is not possible. In-

formal caregivers would like to for example send a message directly to the client's first caregiver, or to the care professionals without automatically sharing it with the other informal caregivers.

Include other professionals Currently, only caregivers of the client have access to the system. Informal caregivers would like to be able to read the input of and communicate with for example doctors or therapists as well.

Jargon Jargon is used in the documentation of the formal caregivers which makes it hard to understand for the informal caregivers.

4.2.3. Conclusion

Three previous user studies have been performed, presenting interesting information for the current research. While designing a new communication application, it is important to keep in mind what feedback was received on the previous version, making sure these aspects are considered and/or included. Therefore, the information gathered during these studies will be used as a base for the requirement list and questions in the user survey. To answer the question what users want to be able to do in the communication app, which is not possible in the current Ons Berichten, the results of these studies have been translated into requirements for the new messaging function. The needs of informal caregivers as identified during the survey research among CarenZorgt users have been taken along as well. This leads to the following requirements:

The application **must** enable the user to

- ☐ Become aware of an incoming message by a notification

The application **should** enable the user to

- ☐ Become aware of an incoming message from CarenZorgt by a notification
- ☐ Reference to items in other Ons applications (for example a calendar item, client profile or dossier item)
- ☐ Export a message to a dossier
- ☐ Make custom groups of colleagues, informal caregivers and/or clients
- ☐ Add contacts to an existing conversation
- ☐ Send and receive messages labelled as urgent
- ☐ Forward messages
- ☐ Organise the inbox by adding an "important" label to messages
- ☐ Create new folders in the inbox
- ☐ Organise the inbox by putting messages in folders
- ☐ Add a subject to a message
- ☐ Search through messages by name, date, or topic

The application **could** enable the user to

- ☐ Edit a message after sending
- ☐ Delete a message from their own inbox
- ☐ Send messages to and receive messages from professionals outside of the organisation
- ☐ Send messages to all people working at the same organisation
- ☐ See whether a colleague is currently working
- ☐ See if a message is read
- ☐ Select multiple messages in the inbox at a time
- ☐ Set an automatic out of office reply
- ☐ See if the inbox is up-to-date
- ☐ Receive a warning message before sending client information outside of the organisation

Considering **usability**, the application should

☐ Have a consistent layout ☐ Use clear symbols

4.3. Use data

Data from the current use of the software was collected through the existing use monitoring software at Nedap Healthcare, to get insight into who the users of the application are, and who are currently not using Ons Berichten despite its availability.

4.3.1. Methodology

From every user sector, use data from the four largest and three smaller organisations has been included in the sample for this data analysis. In this way, all sectors and different organisation sizes are represented in the sample, and the different sectors and sizes can be compared. This data includes information on the profession of the user, whether they have used Ons in the month of data collection, and whether they sent messages with Ons Berichten in this period. Based on an analysis of the professions that are entered into Ons and consultation with sector-experts within Nedap, the professions have been categorized.

4.3.2. Findings

The ten defined profession categories and some examples of what is included in these categories are presented in Table 4.1.

Table 4.1: Categorized professions with examples

Category	**Examples of professions included**
Caregivers	Care assistants, primary caregivers or community caregivers
Nurses	District nurses, nurse specialists, or social psychiatric nurses
Practitioners	Doctors, psychiatrists, or general practitioners
Supervisors	Personal supervisors, work supervisors, or daycare supervisors
Coordinators	Professions that focus on small-scale coordination, like coordination of client care around one client, or communication with families
Management	Professions that focus on large-scale coordination, like district managers or manager in care services
Administration	Secretary or service desk workers
Other help	Domestic caregivers, home help or food service
Therapists	Physiotherapists, speech therapists, or occupational therapists
Specialists	Geriatric specialists, specialist team, or nurse specialist

An overview of the Ons Berichten use compared to the overall Ons use from the sample, divided into the three sectors, is presented in Table 4.2, and visualized in Figure 4.1.

Table 4.2: Overview of Ons Berichten users per sector

Sector	**Ons Berichten use per Ons user**
Elderly care	0.46
Disabled care	0.25
Mental health care	0.02

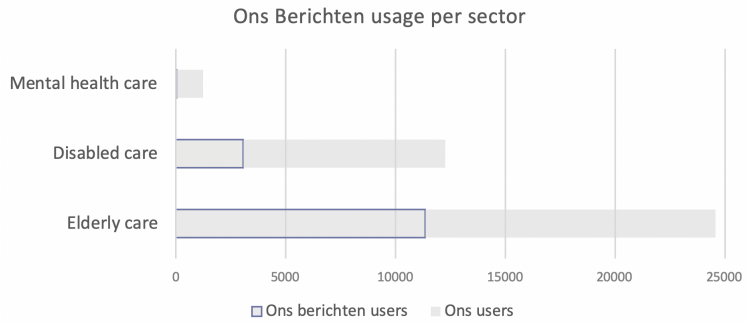


Figure 4.1: Ons Berichten users per Ons user per sector

Figure 4.2 presents the percentages of users from the sample taken that use Ons Berichten, divided into the newly defined profession categories.

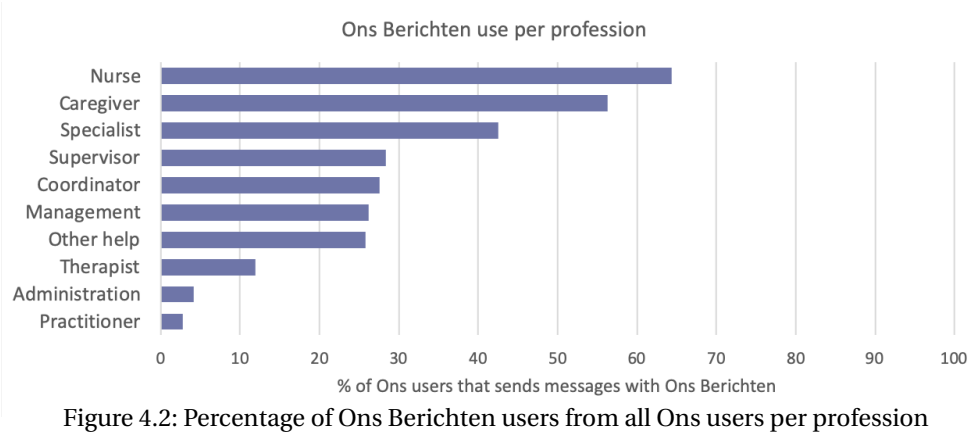


Figure 4.2: Percentage of Ons Berichten users from all Ons users per profession

Lastly, Figure 4.3 presents a scatter plot, showing the size of an organisation plotted against the percentage of Ons users that uses Ons Berichten.

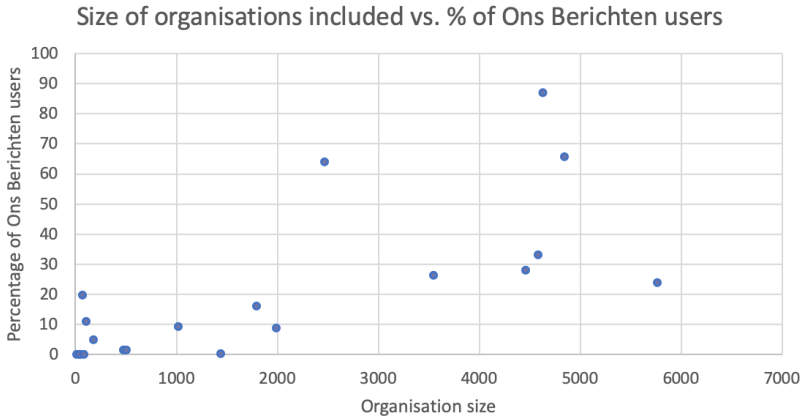


Figure 4.3: Ons Berichten users compared to the total number of Ons users per sector in elderly care

4.3.3. Discussion & Conclusion

From the use data, we can conclude a few things. Firstly, for this research, the professions of people working in elderly care, mental health care and disabled care are divided into the following categories: caregivers, nurses, practitioners, supervisors, coordinators, management, administration, other help, therapists, and specialists. Considering those categories, Ons Berichten is used by most nurses, caregivers, and specialists (over 40%). On the other hand, few (less than 15%) therapists, administration workers and practitioners use Ons Berichten. Though this implies that nurses and caregivers could give the best feedback about the current messaging function, it is also important to create a new function of Ons Berichten that is suitable for workers that currently do not use Ons Berichten.

Considering the sectors, Ons Berichten is used most in elderly care, though still less than 50% of the Ons users in elderly care uses the messaging function. Remarkably, only 2% of the Ons users in mental health care from this sample use Ons Berichten. The current version of Ons Berichten is based mostly on the needs of workers in elderly care, since mental health care is a new sector for Ons. It is important that the next version is suitable for disabled care and mental health care as well.

Lastly, the difference between the Ons Berichten use between small en larger organisations is remarkable. Small organisations seem to generally use Ons Berichten less than large organisations. Though digital communication in general might be required more in larger organisations, it would be interesting to learn why smaller organisations often do not use Ons Berichten. In further research, both large and small organisations should be included.

4.4. Survey

Check and Schutt [69] define survey research as "the collection of information from a sample of individuals through their responses to questions" [p.160]. Surveys are easy to distribute, and the output data is easily transformed to useful information [67]. While designing a survey, easy or engaging questions should be put first. Furthermore, common understanding should be ensured. Leading questions and unnecessary questions should be avoided, the survey should be kept short, and questions should be put into a logical order [67]. Questions can be open-ended, close-ended, multiple choice, or based on a Likert scale. Open-ended questions allow for the respondent to give input consisting of more than just one or two words. Close-ended questions are specific questions that prompt yes or no answers. Multiple choice questions let the respondent choose between a few options. Lastly, the Likert scale is used to let the respondent rate items on a response scale [67].

A web-based survey was distributed among the users of Ons to collect information considering their communication at work.

4.4.1. Methodology

The survey was distributed using an announcement at the banner of the Medewerkersportaal of all Ons users, which acts as a home screen of the Ons desktop applications for the care worker. This announcement was deleted after 24 hours. The first two survey questions were aimed at learning who the users of Ons are, to know who the new application is designed for. Additionally, these questions will help categorize the users into different sectors and professions for data analysis. Then, the other questions were designed to learn whether findings of the literature review and context analysis apply to the Ons users, and lastly, the survey was used to determine and prioritize the needs of the users, and receive new suggestions for a communication tool within Ons. The survey included quantitative (using numerically rated

items or multiple choice questions) as well as qualitative research strategies (using open-ended questions). Apart from their profession and work sector, no demographic information about the respondents was collected. Other information collected included answers to multiple choice questions asking who the respondent communicates with, about which topics the respondent communicates, which channels are used for this communication, and what the respondent communicates with for example caregiver or client. Furthermore, a Likert scale question was used to receive feedback about proposed functions for the messaging tool. Moreover, some open questions were asked. Firstly, triggered by the answers to the multiple choice question about communication tools, it was asked why these tools are used. Then, if one had rated interest in urgent notifications, it was asked what characteristics those notifications should have. At the end of the questionnaire, open questions were used to learn about the most important functions of a communication tool within Ons, and additional feedback about the current Ons Berichten. The full survey is presented in Appendix C.1.

The data collected with the open survey questions was analyzed using the thematic analysis method [70]. During the thematic analysis, the focus was on meaning across the data set, to see and make sense of collective or shared meanings and experiences mentioned in the open answers. It starts with a familiarization phase, followed by the definition of initial codes, and the creation of themes and subthemes which divide the data into meaningful categories. Thematic analysis does not identify unique meanings and experiences found only within a single data item.

4.4.2. Results

5858 care professionals filled in the online survey. Incomplete or confusing responses were removed, leaving 3357 complete and clear responses. Confusing responses, in this context, included responses that seemed only completed to be able to answer the last open question to give specific feedback after "clicking through" the rest survey, or responses that included answers to the open questions that did not fit the question. In this way, part of the respondents that misused or misunderstood the survey were excluded.

Sectors

3014 respondents work in elderly care, 292 work in disabled care and 224 in mental health care. Adding these amounts makes 3629 instead of 3357, because some respondents indicated to work in several sectors. Figure 4.4 visualizes the distribution of the respondents among the work sectors.

Figure 4.4: Distribution of the respondents among the work sectors

Figure 4.5 provides, for comparison, a visualisation of an estimation of the distribution of all Ons users among the work sectors based on the sample used during the use data review.

Figure 4.5: Distribution of the respondents among the work sectors

Most respondents selected elderly care as the sector they work in. It is important to recognize the opinion of the respondents working in disabled care and mental health care as well. Therefore, data is analysed for the sectors separately. No notable differences in the average sector responses have been found.

Profession
1531 respondents indicated to be caregivers, 686 were nurses, 513 worked in "other help", 332 as supervisors, 96 worked in administration, 65 as coordinators, 65 in management, 43 as therapist, 17 as specialist, and 9 as doctors. Figure 4.6 visualizes the distribution of the respondents among the professions.

Figure 4.6: Distribution of the respondents among the professions

Figure 4.7 provides, for comparison, a visualisation of an estimation of the distribution of all Ons users among the professions based on the sample used during the use data review. Since notable differences between professions have been found, some data is presented and considered for the separate professions.

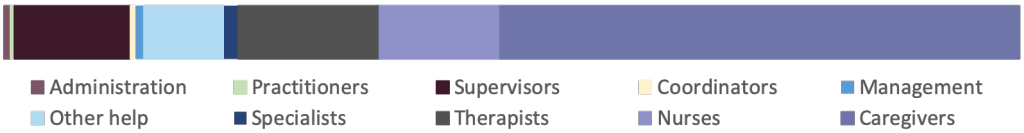


Figure 4.7: Distribution of Ons users among the professions

Communication with clients and informal caregivers
81% of the respondents indicated to communicate with the client or informal caregiver. Of these 2719 respondents, 55% responded they communicate with both, 34% communicates with only the client, and 11% communicates with only informal caregivers. The most frequently chosen topics of communication with clients are emotional support, acknowledgement, and encouragement. The most frequently chosen topics of communication with informal caregivers are information about the diagnosis or state of the client, social support, and emotional support. A full overview of the topics of this communication is provided in Figure 4.8.

The multiple choice question about communication topics with clients and informal caregivers also provided the option to fill in one or several "Other, namely..." fields. The top 10 of most frequently filled in topics in these fields were: planning of the care (N=17), the care or treatment plan (N=12), contentment/evaluation (N=9) practical issues (N=8), personal experiences (N=7), information about progress (N=6) or medication (N=4), alerts (N=3), questions (N=3), and activities (N=3).

Communication topics
The proposed communication topics among care professionals are ranked based on the percentage of respondents that indicated that they communicate about the topic at work. Since this question was a multiple choice question, the communication topics mentioned were given. The topics that were chosen by at least 50% of the respondents are presented in Table 4.3.

Table 4.3: Most chosen communication topics total

Topic	Problems	Care planning	Care plan	Urgent info	Worries	State of client	Needs	Progress
%	75	75	71	63	61	59	55	51

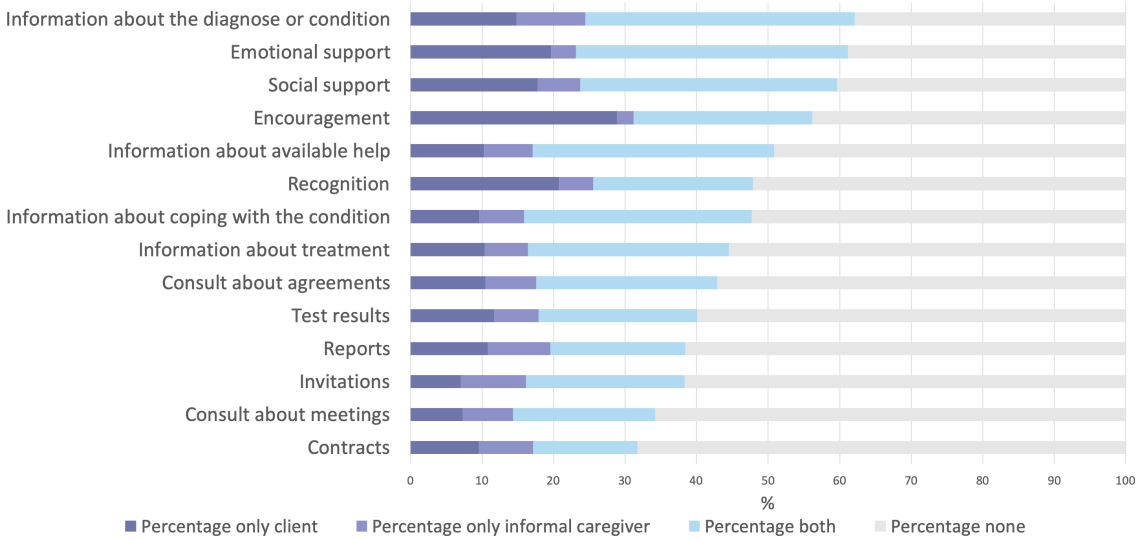


Figure 4.8: Distribution of the respondents among the professions

The results of the three different sectors considering the topics are very similar. Among the different professions, the results differ. Therefore, the top three communication topics per profession is presented in Table 4.4.

Table 4.4: Top 3 most chosen communication topics per profession (a and b)

Profession	**Administration**	**Doctor**	**Supervisor**	**Coordinator**	**Management**
Topic 1	Administration	Urgent info	Problems	Problems	Care planning
Topic 2	Care planning	State of client	Care plan	Care plan	Urgent info
Topic 3	Urgent info	Medication	Progress	Urgent info	Administration

Profession	**Other help**	**Specialists**	**Therapists**	**Caregivers**	**Nurses**
Topic 1	Care planning	Care planning	Problems	Care planning	Care planning
Topic 2	Problems	Problems	Needs	Problems	Problems
Topic 3	Urgent info	Urgent info	Dossier info	Care plan	Care plan

Communication channels

The survey included a multiple choice question considering the channels that the care professionals use for their work-related communication. Similar to the communication topics, the channels of this multiple choice question are ranked based on the percentage of respondents that indicated they used the channel for work. The channels that were chosen by at least 20% of the respondents have been presented in Table 4.5.

Table 4.5: Most chosen communication channels total

Channel	Phone call	Face-to-face conversations	Team meetings	Normal email	CarenZorgt	WhatsApp	Paper notes	ZorgMail
%	71	60	56	48	36	36	25	24

In this multiple choice question, nine options were provided that triggered an open follow-up question about the reason for the use, namely normal email, WhatsApp, SMS, pagers, ZorgMail, ZorgMessenger, Siilo, ZIVVER, and client portals. The follow-up question is triggered for these options because they are not privacy compliant, because they are a secured digital communication channel similar to Ons Berichten from which lessons could be learned while designing the new version of Ons Berichten, and/or because they are potentially replacable by Ons Berichten. The thematic analysis on the answers to these open questions resulted in the categories presented in Table 4.6. The amount of responses divided over the categories are presented in Figure 4.9. Moreover, the channels about which these responses were given are presented.

Table 4.6: Reasons to use digital channels (other than Ons Berichten): Categories

Category	**Description**
Contact with colleagues	For example questions are asked, meetings are planned, announcements are shared, or consults take place
External contact	Communication with people outside of the organisation, for example with the general practitioner or to order medication
Contact with client/informal caregiver	For example questions are asked, meetings are planned, or reminders are send. There is often no safe alternative available
Communication about shifts	For example to find replacement or switch shifts
Practical reasons	Because people are used to the channel, everyone uses it, it is fast, or the inbox can be organised
Long messages	Because it is easier to write using a computer keyboard, people need to take some time to look at them, or the message has a special format
Contact without rush	When there is no fast response necessary, or someone should take their time for the message
Attachments	For example a picture of a wound or the minutes of a meeting
Privacy	People mention privacy and secured messaging as reasons for the use
Group communication	To communicate with a group, for example by sending a message to several receivers
Emergencies	For example a group conversation for emergencies, or last-minute requests for empty shifts
Other	Communication about things that are not related to work, for example for sharing interesting articles or personal things

The presented top 8 of communication channels in figure 4.5 includes three channels that triggered such a question: Normal email, WhatsApp, and ZorgMail. Though the same categories are used for all channels, a variation can be found in the responses fitting in those categories. For example practical reasons for the use of WhatsApp include fast responses, and seeing whether someone has read a message. Practical reasons for email, on the other hand, are being able to organize your inbox and easily find old messages back. Alternatively, ZorgMail is not often used for practical reasons: For this tool, the ability to send privacy-sensitive information without problems is one of the main reasons for the use.

Proposed functions

The survey included one statement question. Respondents were requested to rate nine different statements considering them as potential new functions for Ons Berichten. They could rate these statements using a Likert scale, ranging from strongly disagreeing to strongly agreeing to being interested in the function. The results of this question proposing new functions as presented in Table 4.7 show that three statements score between 3 and 3,5, while the other four statements score between 3,5 and 4. However, taking

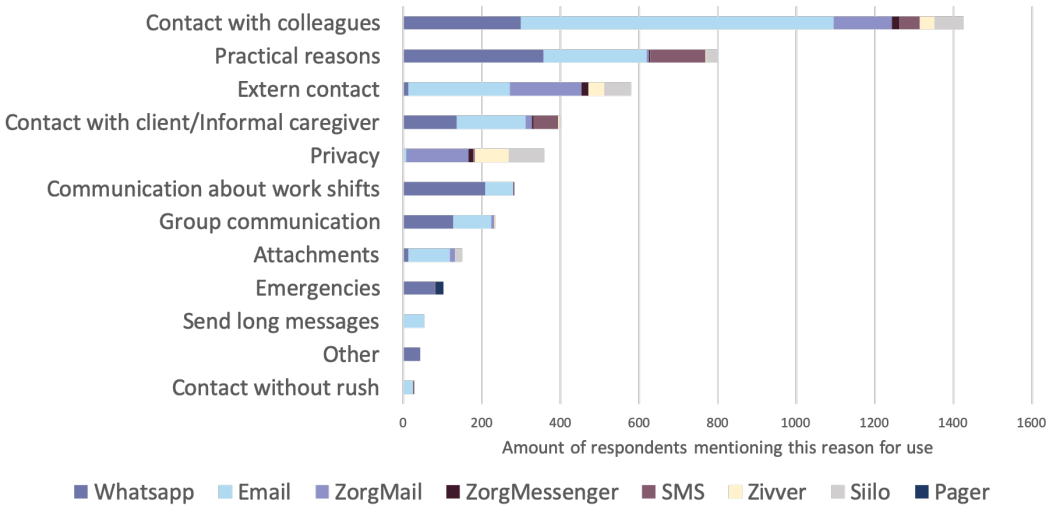


Figure 4.9: Distribution of the respondents among the professions

the average from amount of agreement is not possible: Therefore, it will be taken into consideration which option got the most votes. The highest numbers of votes per statement in Table 4.7 is **bold**. 7 out of 9 have a majority of votes on "Agree". Only the statements "I am interested in a function within Ons for video-consult" and "I am interested in making custom groups" have a majority of votes for "Neutral".

Table 4.7: Likert scale on statements: I am interested in..

Statement	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Average	Median	Std
A warning message before I send a message with client information outside of the organisation	119	279	996	**1317**	672	3,6	4	1,00
A function within Ons for video-consult	242	656	**1503**	758	224	3,0	3	0,98
Sending messages from Ons to professionals outside of the organisation	137	407	1163	**1200**	476	3,4	3	1,01
Smart referencing to for example client profiles, calendar items or dossier items	49	100	947	**1654**	633	3,8	4	0,82
Making custom groups	102	338	**1369**	1169	405	3,4	3	0,93
Adding coworkers to existing conversations	57	151	1049	**1601**	525	3,7	4	0,88
Exporting messages to a dossier	72	180	936	**1626**	569	3,7	4	0,84
Sending messages with the tag "urgent"	51	143	936	**1679**	796	3,9	4	0,86
Receiving messages with the tag "urgent"	52	143	1049	**1668**	800	3,9	4	0,86

However, when regarding the separate results for the different professions, the results vary. Figure 4.10 presents the responses of management workers on the two previously mentioned statements. Management workers as well as supervisors, coordinators, therapists and nurses, do seem interested in those two functions, since their majority votes "Agree" on the two statements.

Related to the last two statements, "I am interested in sending messages with the tag "urgent"" and "I am interested in receiving messages with the tag "urgent"", respondents were asked how they would want to be notified of such an urgent message. The most frequently suggested options were: receiving an email, receiving a pop-up in Ons, giving the message a special colour, symbol, tag, or sound notification, receiving a push-notification, receiving a repeating notification, and the message remaining at the top of the inbox.

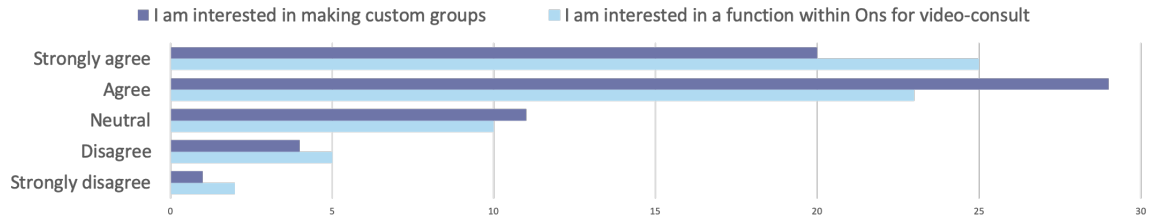


Figure 4.10: Distribution of the respondents among the professions

Important functions

The last open question of the survey is about the most important functions in a messaging application within Ons for the respondent. 16 functions were mentioned by at least 10 respondents. Figure 4.11 presents these most frequently mentioned functions. The bars marked in purple represent functions that match the evaluated statements of the previous question.

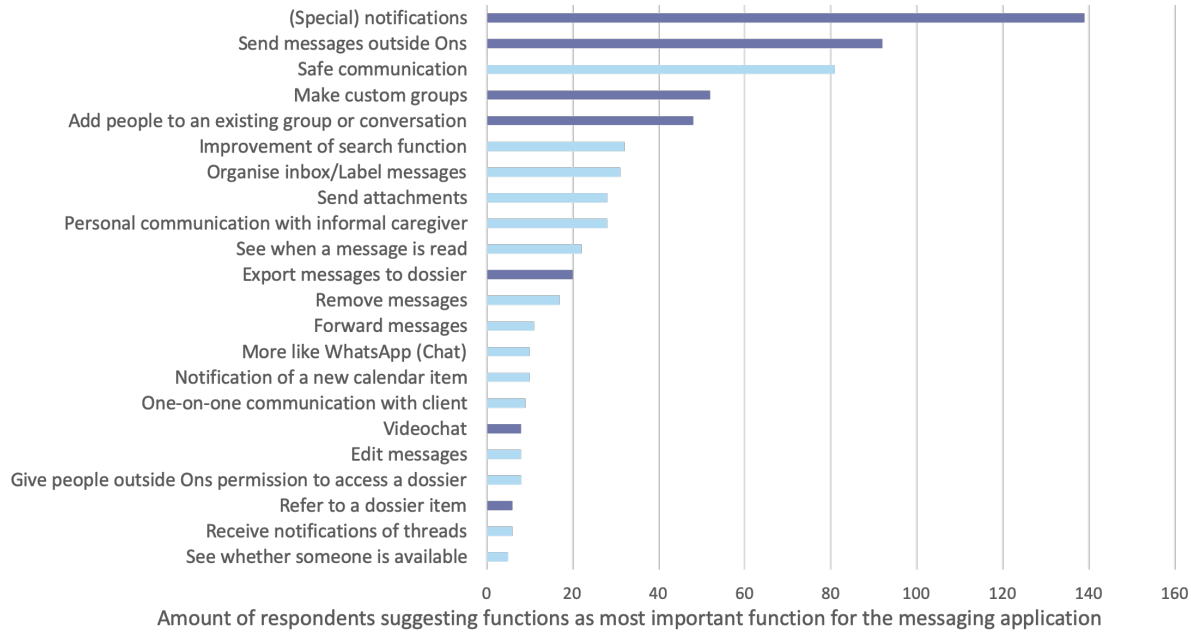


Figure 4.11: Most important functions for a message function within Ons

A more extended summary of the survey results is presented in Appendix C.2.

4.4.3. Conclusion

Several things can be learned from the survey data considering the communication with the client and informal caregiver. Firstly, it is important to allow for communication with either one or the other party,

because many respondents indicate to want to share certain information with either client or informal caregiver, and not both. Then, both practical communication, like information about the diagnosis or available help, and more personal communication, like emotional/social support or encouragement, are often topic of communication.

The question regarding communication topics is one of the questions that shows differences among the answers of the different professions. Administration workers communicate mostly about administration and planning. Practitioners, on the other hand, communicate most about clients and medical information. Likewise, supervisors communicate about the well-being and progress of the clients. Coordinators communicate most about the client process as well as planning and administration. Then, both therapists and specialists indicate to communicate mostly about the progress of the clients. Lastly, the caregivers, nurses and other help communicate about a wide variety of things around and about the client care and well-being.

The topic which is communicated most about is problems, and urgent info is high in the ranking as well. This means that it is important for this communication that someone gets a clear notification when receiving a messages, and is able to respond quickly. Then, care planning is discussed a lot. For this topic, integration with one's own and others calendars could be practical. Thirdly, the care plan, followed by worries, the state of the client, needs and progress are discussed a lot. All of these topics include client information and would preferably be communicated, if digitally, using a secured platform. Additionally, connection to for example client profiles or client record items could be beneficial for communication about these topics.

Most communication channels for which the reason for use is asked in the survey are most frequently used for contact with colleagues. Therefore, supporting this contact with an application is very important: being able to reach all your colleagues within the application, being able to make appointments with them, share information with them, and have consults. Then, practical reasons are often mentioned for the use of communication channels. Combining a well-designed user experience with application elements that people already know might make the application fast and easy to use for them. Moreover, inspiration can be gained from WhatsApp's quick chat interface as well as the more easily organiseable email interface.

From the statement question, we can conclude that all proposed functions can be transferred to the requirement list, in the order of their average score on this question. More potential (new) functions have risen during the last question where the respondents could give their own formulated input about important functions for a messaging tool within the Ons software suite. The functions mentioned by at least 10 respondents are put onto the requirement list, in the order of amount of respondents mentioning them. Therefore, the following requirements will finalize the list:

The application **should** enable the user to

- ☐ Export a message to a dossier
- ☐ Send and receive messages labelled as urgent
- ☐ Reference to items in other Ons applications (for example a calendar item, client profile or dossier item)

The application **could** enable the user to

- ☐ Send messages to and receive messages from professionals outside of the organisation
- ☐ Receive a warning message before sending client information outside of the organisation
- ☐ Have video-consults with contacts
- ☐ Set notification preferences
- ☐ Receive a notification of a new calendar item

☐ Add a new contact using a secure email ad- dress

Considering **usability**, the system should

☐ Include functions and interface elements that users already know, from for example WhatsApp or email

☐ Have a consistent layout

☐ Use clear symbols

4.4.4. Discussion

The distribution of the sectors among the respondents of the survey corresponds with the distribution of the sectors among the users of Ons. Most work in elderly care, some in disabled care, and least in mental health care. A similar situation exists for the professions of the respondents. However, relatively few therapists responded to the survey. This could be because therapists do not use Ons much, or have a very tight schedule and did therefore not fill in the survey. Another thing that could cause the difference between the division of the categories among the respondents and users is the categorisation: Possibly, some respondents either fit in several categories or would place themselves in another category than was intended in this research. The opinions and needs of people from the different professions are important. The needs of doctors for example, which are represented by only 9 respondents, would barely affect the total average when only considering their data together with the data of the other thousands of respondents. Therefore, their data is analysed separately.

Clients and informal caregivers, though their opinion is relevant for this research as well, are not included in the respondents of this survey since they do not use the Ons application. To still be able to consider the functions that would be relevant for them, the care professionals are asked about their communication with clients and informal caregivers. The information collected from these questions, together with the previously mentioned document review of CarenZorgt research with the informal caregivers, will represent the needs of the informal caregivers and clients.

Looking at the communication channels, from the options given we can already select some that are necessary and not replaceable by a digital application. Take for example impromptu conversations or team meetings, including important face-to-face contact. Another important communication channel is a phone call: quick, practical, and low-risk when considering data and privacy. Normal email and WhatsApp, on the other hand, should not be used for privacy-sensitive data. Though ZorgMail, another channel included in the top 8 of communication channels, is a secure option, its functions could possibly be included in the Ons software suite as well.

To be able to provide an alternative for WhatsApp, normal email and perhaps Zorgmail, and other tools used by less than 20% of the respondents, the reasons why these apps are used should be considered. Since the reasons of use are grouped using thematic analysis over the data of all channels put together, some variation can be found in the meaning of the categories per channel.

In the last question, following the question proposing new functions, the respondents could give their own free text input about important functions for a messaging tool within the Ons software suite. Many of the proposed functions in the question proposing new functions were mentioned: This question might have limited the creativity of the respondents by already putting some ideas in their minds. Switching the order of these two questions could have avoided this. However, still many new functions were proposed.

5. System Design

Through most sections of this research, requirements were stated and prioritized with the MoSCoW method. These requirements are jointly listed in the first section of this chapter. To translate the requirements into a system design, they are firstly translated into functions. Then, these functions are translated into flows by creating a flow chart. Based on this flowchart, designs are sketched and digitized to create the digital prototype as presented at the end of this chapter.

5.1. Requirements

The first requirements for the messaging function were already found during the background research at the beginning of this research. Subsequently, the context analysis added requirements that were elicited from the lessons learned about the user sectors, current version of the application, and other applications within the software suite. During the needs assessment, even more requirements were elicited during both the document review and survey research. Moreover, suggestions for requirements from the experts as described in the context analysis were fine-tuned and/or accepted.

All of these requirements were prioritized using the MoSCoW method [71]. MoSCoW, in this context, stands for "Must haves, Should haves, Could haves and Won't haves". With this technique, requirements are prioritized in these four categories: "Must haves" are features that must be included before the product can be launched. These are minimal requirements for the software to be functional. When a requirement is considered essential for the system to use, it is included in this category. An example is the possibility to send and receive messages: This is an essential part for Ons Berichten, because without it, the application could not be used as it is intended.

"Should haves" are features that are not critical, but considered important. An example in this research is the possibility to communicate with informal caregivers. Without this function, professionals can still use the messaging function to communicate with each other about the care of the client. However, many professionals and informal caregivers have indicated that this would be a very desired option. Therefore, this option is a "should have".

"Could haves" are features that are nice to have, but potentially not included considering time, effort or cost. An example is editing a message after sending. Though users indicated this is a function they would like to have, it is not an essential function and might, because of its implementation costs, not be implemented. Lastly, "won't haves" are features that were requested but are explicitly excluded from the scope for the planned duration. During this research, "won't haves" will in first instance not be defined. However, items from the "could haves" list could end up not being implemented.

Altogether, this has led to the list of requirements. The "Must haves", things the application **must** enable the user to do, are

1. Compose a message (Chapter 2)
2. Send and receive messages securely (Chapter 2)
3. Send messages to and receive messages from all colleagues (Chapter 2)
4. Send and receive messages one-on-one (Chapter 3)
5. Send messages to and receive messages in a group (Chapter 3)
6. Access the software on a mobile device (Chapter 3)
7. Access the software on a desktop (Chapter 3)

8. Become aware of an incoming message by a notification (Section 4.2)

The full requirement list is presented in Appendix D. To refer to these requirements, their numbering in the Appendix will be used. These requirements serve as a base for the system design as presented later in this section.

5.2. Requirements to functions

Using all the knowledge gained during the research and the requirement list as a base, new functions are defined. These functions are described in this section. They are divided into secured chat, secured mail, create groups and notification preferences.

Contacts and settings are standard functions to have in a messaging application. Including both chat and mail, however, is not standard. Whether having both of these functions is necessary and not confusing will be learned during the user tests. For this first prototype, the choice was made to include both, because it was found during the needs assessment that users have a need for several elements that can be found in either chat or mail. What these elements are is explained in the following category descriptions. Every category description firstly states which requirements are met with the functions using the requirement numbering as used in Appendix D, and then explains what the function includes.

5.2.1. Secured chat

Requirements: 1, 2, 3, 4, 5, 9, 10, 11, 24, 12, 13, 14, 16, 17, 23, 25, 26, 28, 30, 31
New functions: Communicate with clients and informal caregivers, send attachments, refer to other items in Ons, forward a message, export a message to a client record and mark messages as important.

With the secured chat, users can send and receive messages securely. A new message can be composed and sent to colleagues, clients, and/or informal caregivers, either one-on-one or in a group chat. The chat is designed to enable quick and accessible communication. If conversations are not deleted, they keep existing and can be accessed again to continue the conversation or start talking about something new. There is no need for creating a new thread and choosing receivers for every message. The unread and most recent conversations will always be presented at top of the list in the chat overview. Users can send attachments using the chat, refer to clients, client record items, or calendar items, and mark a message as important before sending. Moreover, messages can be forwarded to other contacts and exported to a client record. Apart from sending images and forwarding messages, these are all functions that were not available in Ons Berichten before.

The purpose of the secured chat is to fulfil the needs of the users to send short and quick messages with clear notifications, either in groups or one-on-one. These messages are currently often sent using WhatsApp. Therefore, metaphors from WhatsApp are used in the application design. In this way, functions that are new in Ons Berichten can still feel familiar to the user.

5.2.2. Secured mail

Requirements: 1, 2, 3, 4, 5, 8, 9, 10, 11, 12, 13, 14, 16, 18, 19, 20, 21, 22, 23, 24, 26, 27, 28, 31 and 32
New functions: Communicate with clients, informal caregivers and external parties, send attachments, refer to other items in Ons, export a message to a client record, forward messages, organise the inbox using folders, add a subject to a message, search through messages, delete messages, and select multiple messages

at a time.

With the secured mail, users can send messages as they are used to with email. They can send and receive messages to and from colleagues, clients, informal caregivers, but also external parties like the pharmacy or general practitioner. A mail message has a subject, and can include references and attachments. The mail inbox can be organised using folders. Several messages can be selected at a time, to be moved into folders, marked as important or unread, or deleted. Moreover, a message can be exported to a client record or forwarded to other contacts. Date, receiver and subject can be used to search through the inbox.

The purpose of the mail function is to fulfil the needs of the users to organise their inbox, easily find their messages back, and communicate in a formal way with especially external parties.

5.2.3. Create groups

Requirements: 15, 17, 27, 38
New functions: Custom groups, dynamic groups, send messages to the full organisation

Instead of only having groups created by, for example, application managers, the new application would give all users the freedom to create their own groups. These groups can be used to chat with or send mails to. Everyone can add contacts to these groups, or leave the groups. While creating the group, one can search on, for example, profession or client, and filter contacts on people having this profession or being connected to this particular client.

5.2.4. Notification preferences

Requirements: 8, 13, 31 and 37
New functions: Clear notifications, notifications from informal caregivers, reach people not working, set notification preferences

In the settings overview, an option to set notification preferences is available. This enables users to create a special notification profile to use when they are not working. It is also possible for the user to choose what the difference would be between a normal and an important notification. Moreover, group chats can be muted separately.

5.2.5. Communicate with external parties

Requirement 25 and 37
New functions: Communicate with professionals outside of the organisation, add contacts

To make it possible to communicate with external parties, they first have to be added to the contacts, since the contacts that are already available in Ons do not include them yet. Such contacts could be added using a secured mail address, integrating with other secured mail services. Before sending a mail message to one of the external parties, a notification will inform the user that information is being sent outside of the organisation.

5.3. Functions to flows

After defining the the functions for the new application, they can be mapped into a flowchart which will present the flow as intended for the application. This flowchart is created for the mobile app version of the new Ons Berichten, and presented in Figure 5.1.

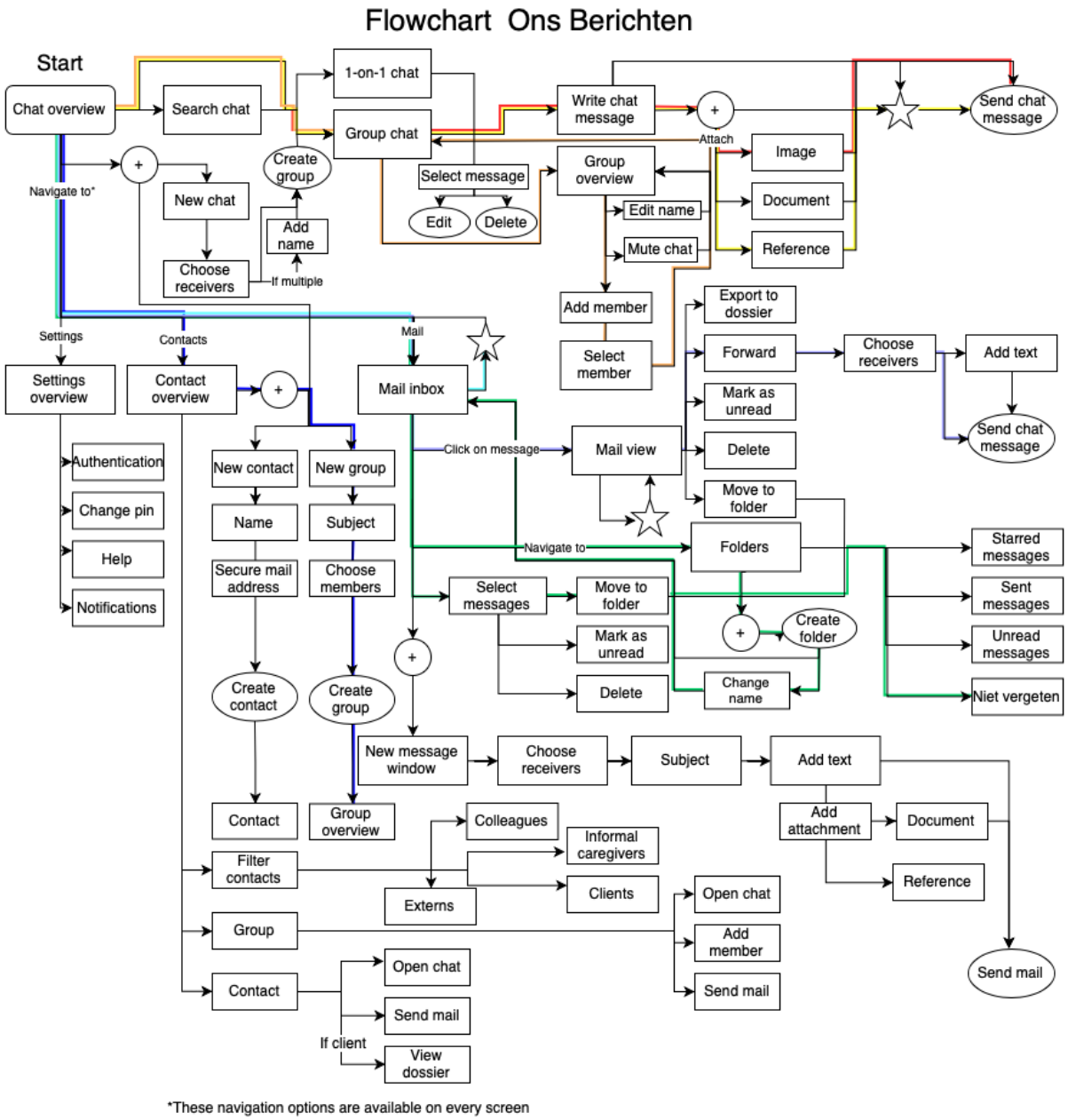


Figure 5.1: Flow chart Ons Berichten Mobile version

Based on this flowchart, the mobile app design can be created. As recommended by the "Mobile first" method [72], the desktop designs are built from those mobile designs. This method is promoted because larger user interfaces are easier to implement afterwards than smaller ones [73]. Therefore, the flows for the desktop version would very similar to the flows for the mobile app.

The main difference between the desktop and mobile flows can be found in the main menu. On desktop, you start in the Medewerkersportaal, an overview page, instead of in the chat overview. From this overview, you can navigate to all functions, and from these function overviews (Chat overview, Contact overview, Mail inbox), the flows are the same as in the mobile prototype. Moreover, settings will be presented in the main settings overview for desktop applications.

To make the chat very easily and quickly accessible on the mobile version of the application, opening the application will bring the user to the chat overview. However, mail, contacts and settings must always be available as well, because this is what the users are used to, and these are the main functions that should be easily accessed with only one click. Therefore, from this chat overview and every other screen in the application, a menu including settings, contacts, and mail inbox will be present. From these four places as starting points, the flows to perform the actions related to the described app functions are created. The colored lines in the flowchart represent the different flows selected for the evaluations that are described in the next two chapters.

5.4. Flows to designs

Before creating the digital prototype, design decisions had to be made. Using sketches, the design options were explored. The two main design challenges found were 1) the navigation/menu design and 2) the chat interface on desktop. Following the vision of the UX design team, the design is focused on simplicity, utility, and ease of use. The aim and challenge is to minimize the amount of clicks necessary to perform the necessary actions with the application while presenting only the necessary information

As described earlier, the four functions (chat, inbox, contacts and settings) should be accessible from every screen. There are several mobile menu design options, as sketched in Figure 5.2. The first option, presented in Figure 5.2a, shows a hamburger drop-down menu as used in the Gmail mobile application. The second option, as shown in Figure 5.2b, is used in the current Ons Berichten, and shows a fixed menu at the bottom of the screen. Similarly, this menu could be placed at the top of the screen, as sketched in Figure 5.2c. Lastly, a full-screen navigation page with the four main functions as destinations, as presented in Figure 5.2d, could be used.

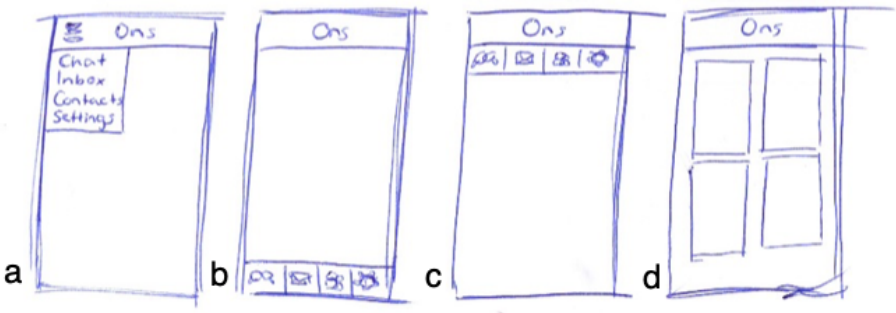


Figure 5.2: Four mobile menu design options

The second option (Figure 5.2b) was chosen to be used in this prototype, since it was what users were used to in the current application and WhatsApp, it is always available without using much space in the screen, and enables users to navigate from one function to another with only one click.

On desktop, navigation works differently. Generally, the menu bar at the top of the screen often functions as navigation bar. Moreover, the page through which one enters the software can offer full screen navigation options. Buttons or hyperlinks are often used to navigate to different places within the software or website as well. This is also the case in the Ons software: all of these navigation options have been applied in the current software. These navigation options will be used for Ons Berichten as well, integrating with the existing options.

Special navigation was chosen for the chat: Different options were explored, as sketched in Figure 5.3. One of the navigation options for chat is opening it through an dropdown preview accessible from the menu bar, as is used in for example Facebook [21]. This option is sketched in Figure 5.3a and b, and often used when the chat is not the main function of the software, so it can be accessed from very page without leaving the page. This option is available on most of the pages of the current Ons software as well. Alternatively, chat can be accessed using an icon at the side of the screen, which can slide in the chats from the side. This option is sketched in Figure 5.3c and d. As a third option, the chat could be full-screen, as sketched in Figure 5.3e and f. The previous explained options could also be combined with this full-screen chat by accessing the preview of the chat through the drop-down menu or slide-in, but enabling further navigation to the full-screen chat.

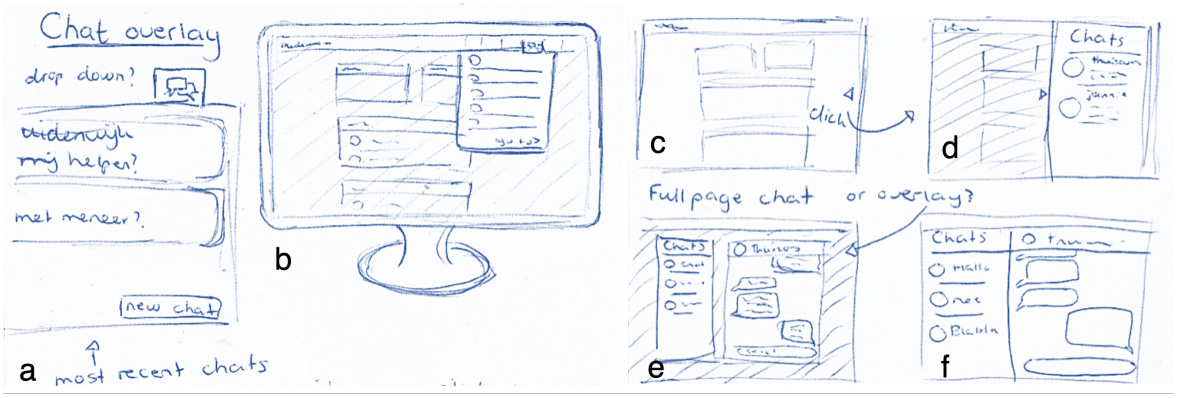


Figure 5.3: Sketches different chat overlay options: a,b = drop-down, c,d = slide-in from side, e,f = full-screen

The final design combines a layover (Figure 5.3b) and the interface as people might recognize from Web WhatsApp (Figure 5.3f), to keep both familiarity and the options to easily navigate (back) to the location from which the chat was opened. Again, the evaluation can teach us whether this interface is easily usable for the Ons users.

Using design elements from the other Ons applications for consistency, and the current Ons Berichten application, WhatsApp, and popular email services for familiarity, a design for the new Ons Berichten was created. The chat functions mobile interface and interaction design is inspired by WhatsApp, and the mail function has more similarities to the Gmail app. In this way, people that already know these mobile applications will know where to find the functions and how to interact with the application, while having a familiar experience while using it. The branding and feel of the application are based on other Nedap

[21] www.facebook.com

applications as well as the current version of Ons Berichten, to keep familiarity and consistency for the users. Then, the menu bar, contacts and settings are kept similar to the current version of Ons Berichten, since this is what the users know, and not many changes were necessary on these parts of the application. Screenshots of Ons Dossier, Ons Berichten, WhatsApp and Gmail are presented in figure 5.4 for mobile devices and 5.6 for desktop use.

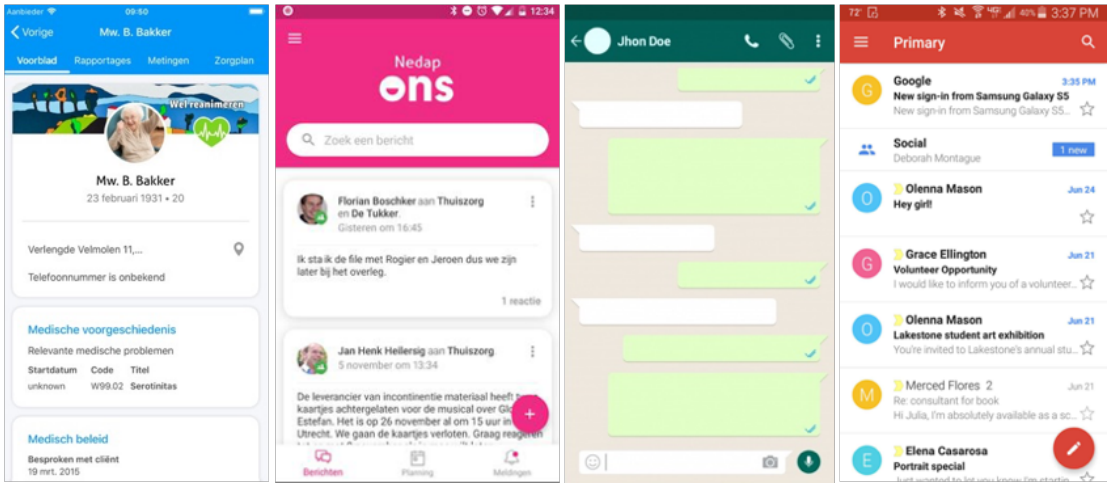


Figure 5.4: Mobile screenshot of Ons Dossier[22] (a), the current Ons Berichten (b), WhatsApp[23] (c), and Gmail[24] (d)

The final design sketches for the main pages of the four main functions on the mobile application are presented in Figure 5.5. Following upon this sketching phase, a digital prototype was created.

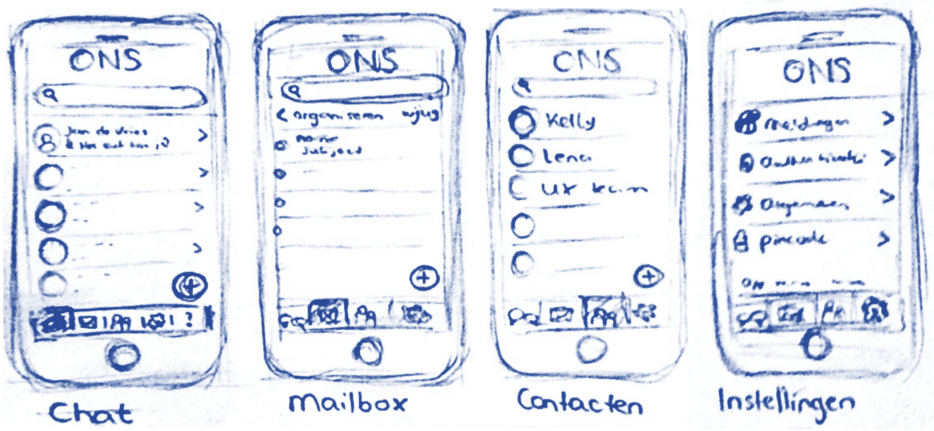


Figure 5.5: Sketches different menu design options

[22] https://nedap-healthcare.com/oplossingen/ons/dossier/
[23] https://www.whatsapp.com
[24] https://www.gmail.com
[25] https://outlook.live.com/

Similar to the mobile version, the desktop interface is inspired by other Ons desktop applications (Figure 5.6a), the current Ons Berichten on desktop (Figure 5.6b), Web WhatsApp (Figure 5.6c), and the Outlook desktop application (Figure 5.6d).

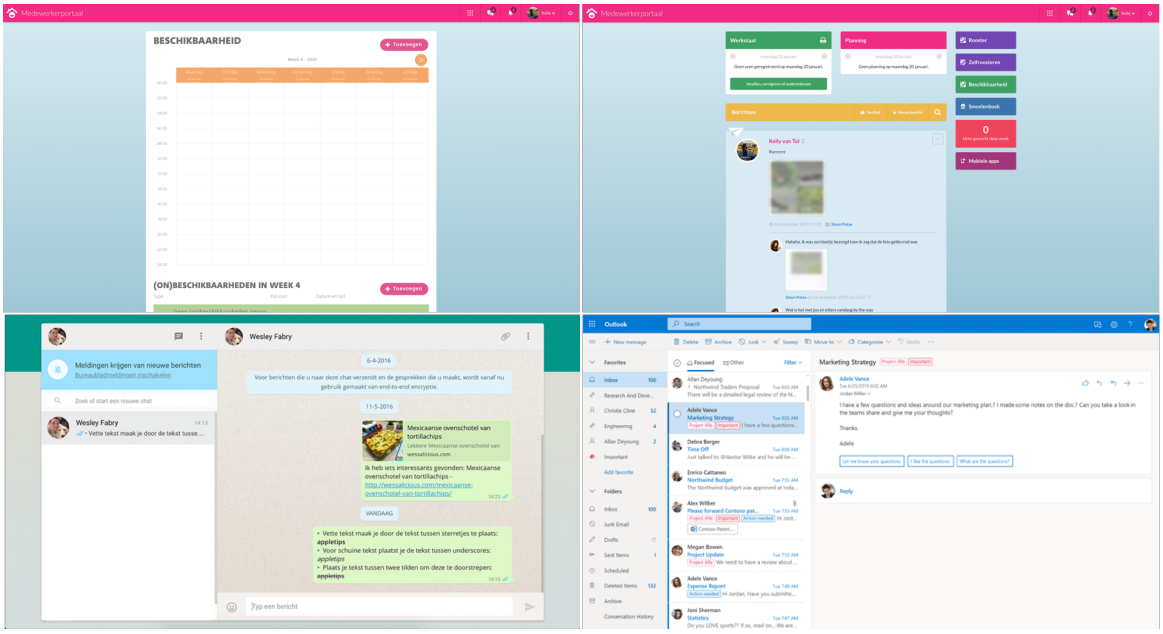


Figure 5.6: Desktop screenshot of Ons Dossier (a), the current Ons Berichten (b), WhatsApp (c), and Outlook[25]

5.5. Digital prototype

After making the design decisions, the first digital prototype was created. The design of this prototype aims to be simple and familiar to the users. The digital prototype is created using the design and prototyping tool Figma[26]. Figma has some limitations considering the possible interaction in a prototype. It does not include functions for for example typing, dragging, and holding. However, Figma is the standard used at Nedap Healthcare and therefore includes assets from other Ons applications that can be used to keep consistency among the software. This advantage led to the decision to use Figma despite its limitations.

The digital prototype is created based on the flows for the evaluation. These flows were selected to 1) represent a large part of the application in just a few flows, 2) include the interfaces that are new to see whether they are understood by the users, and 3) include the functions that are frequently requested and are therefore expected to be frequently used.

Screenshots of the digital prototype on both mobile and desktop are presented in Appendix E. For every flow, the color in which the flow is marked in the flow chart is mentioned and the task to be completed by the users in the upcoming user evaluation and the functions that are evaluated through these tasks are described. As a preview, some screenshots of the mobile prototype for flow 1 are shown in figure 5.7.

[26] www.figma.com

Flow 1 (Yellow): Send a chat message to the chat group Thuiszorg Kruidenwijk with the text “Het gaat niet zo goed met meneer” (in English: "Sir is not feeling so well"). Refer to client A. de Vries in this message, and mark it as important before sending it. (Functions: Secured chat, reference to client, mark message as important)

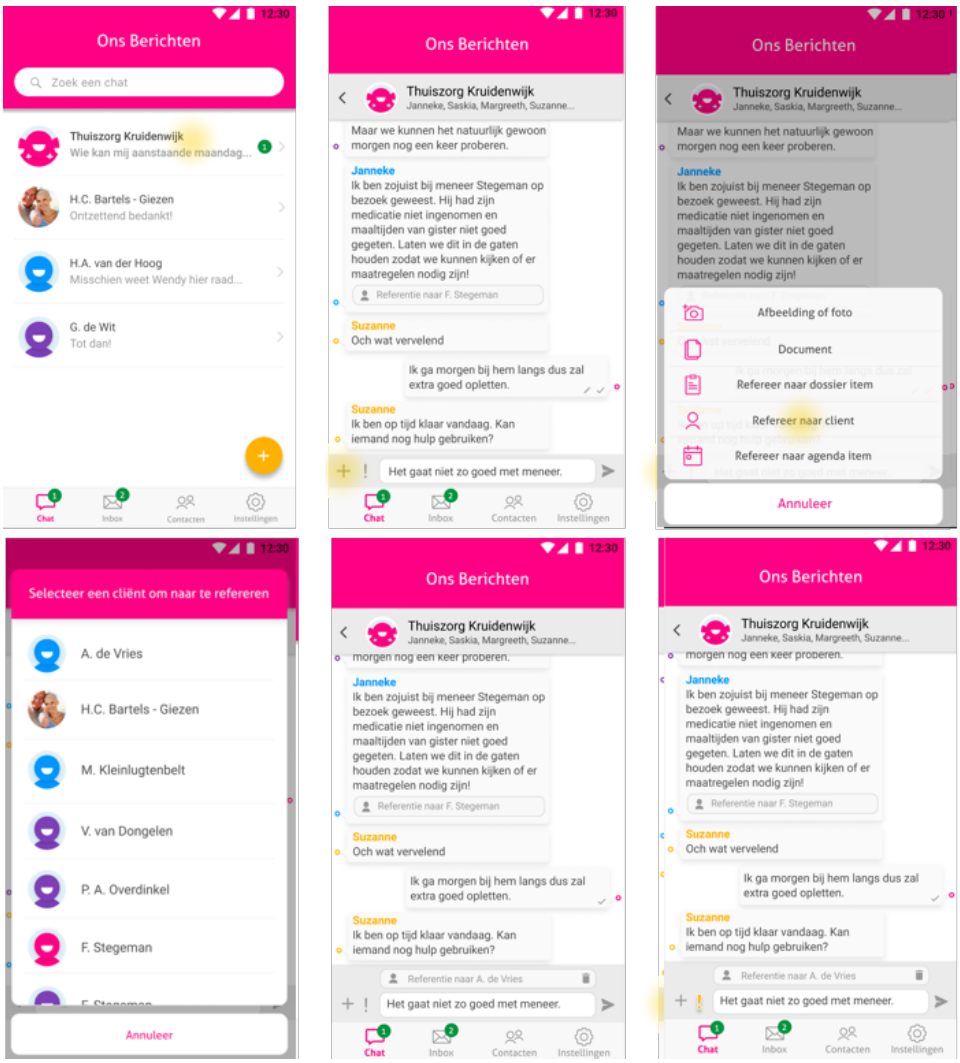


Figure 5.7: Flow 1 mobile: Important chat message with reference

Flow 2 (Orange): Add Caren van der Heijden to the chat group Thuiszorg Kruidenwijk. (Functions: Add someone to an existing chat)

Flow 3 (Red): Send your most recently made picture to the chatgroup Thuiszorg Kruidenwijk. (Functions: Send attachments in chat)

Flow 4 (Purple): Forward the message “Onderzoeksresultaten Gerrit van Vliet” (in English: "Research results Gerrit van Vliet") to all people in the group “Groeneweerd”. (Functions: Forward messages, communication external parties)

Flow 5 (Light blue): Mark the message “Onderzoeksresultaten Gerrit van Vliet” as important. (Functions: Organise inbox option 1)

Flow 6 (Dark blue): Create a group with the name “Zorgteam Bartels”. Add all contacts with a connection to lady H.C. Bartels – Giezen to this group. (Functions: Create (client-centered) group)

Flow 7 (Green): Create a folder in your inbox named “Niet vergeten” (in English: "Do not forget"). Move the message “medicatielevering verlaat” (in English: "medication delivery delayed") from the pharmacy to this folder. (Functions: Organise inbox option 2, communication external parties)

5.6. Discussion

Some problems occurred during the creation of the digital prototype as presented in this section. Firstly, there are some limitations to prototypes in Figma. It is for example not possible to type in the prototype. Therefore, clicking on the right place will make the text that is supposed to be typed appear. Some other functions like holding, dragging, and in-line suggestions are not available in Figma either. Therefore, these interactions cannot be used in the prototype and therefore not be tested. Alternative options are made available to still allow for the flows to be performed.

Then, there are some points to discuss considering the flow chart and functions that will be evaluated. The flow chart does not include the full application flow. For example the settings are not worked out in detail. These were considered out of the scope of the prototype, since they are not about the actual messaging and probably not used as often as the other functions. Moreover, some loops and options to go back have not been visualized in the flow chart. This would have made the flow chart more complicated without adding much information. Still, in the application designs, ways to go back to previous screens are always provided.

Then, considering the content of the presented prototype compared to the requirement list, some requirements have not been met. These requirements only include "Could" requirements, which were defined as "features that are nice to have and could potentially be included without incurring too much effort or cost". This regards the items "See whether a colleague is currently working", "Set an automatic out of office reply", "See if the inbox is up-to-date", and "Have video-consults with contacts". These requirements were all elicited from the document review, because during previous user research it was found that some users had these needs. However, the severity of these needs was not documented. Considering seeing whether a colleague is currently working or seeing whether the inbox is up-to-date, presenting this visual information could go at expense of the simplicity of the interface. Adding a new functionality with specific settings like the automatic out-of-office reply could go at expense of simplicity as well, and would cause effort and cost for implementation which might not be outweighed by the benefit it offers the users. Especially since, during the survey research, these functions were not or infrequently mentioned as functions that respondents considered as important, these three requirements were not considered a priority in the current system design. Considering the ability to have video-consults with contacts, this would mean enabling video streaming. Enabling video streaming would cause high implementation effort and costs. Since during the survey research the function to have video-consults was proposed and rated with an average of 3 (Neutral), this function is considered not worth this implementation effort and costs for now.

Though these items have not been considered a priority in the current system design, they could still be implemented in future prototypes.

6. Expert evaluation

This chapter describes three evaluation sessions which are used to collect feedback on the prototype from a variety of Nedap experts.

6.1. Method selection

A wide variety of interface evaluation methods is available. These methods include both expert-based tests and user-based tests. Expert-based tests are structured inspections by interface experts, often used in conjunction with user-based tests, but always coming first [74]. Therefore, a variety of in-house experts is approached for an expert-based review iteration on the functions and design of the proposal before the evaluation with Ons users is performed.

The first method used for the expert evaluation is a focus group. Mazza et al. [75, p.75] define a focus group as "a powerful social interviewing technique that allows researchers to elicit several viewpoints from users at the same time". This method is chosen for the expert evaluations because it offers a suitable format to stimulate discussion considering the functions proposed in the new prototype. The second and third method are the most widely adopted methods for expert evaluations, namely the heuristic evaluation and cognitive walkthrough. These methods are chosen because they are known for being efficient usability evaluation methods, appropriate for this stage of the research [74].

6.2. Methods

Experts with knowledge of the different users and their needs were invited to represent the users during a focus group. Moreover, two expert-based tests are performed with user experience designers: the heuristic evaluation and the cognitive walkthrough.

6.2.1. Focus group

During the focus group, six experts, selected to represent the different Ons user groups, were gathered for a group discussion considering the newly proposed functions for Ons Berichten. The group of experts consisted of a sales manager for disabled care, a sales manager for mental health care, a geriatric specialist representing elderly care, a developer of CarenZorgt (the Nedap application for informal caregivers), and a developer and a designer that have performed the previous user research among Ons Berichten users (see Section 4.2). The participants were invited into one of the meeting rooms within the office building for a 1,5 hour focus group session.

The goal of the focus group was to learn whether the proposed functions would fit the needs of the different user groups. The experts could suggest improvements to be implemented before the user-based tests.

The structure of the focus group was as follows: Firstly, the goal and structure of the entire research was explained. Then, the goal of the focus group was specified. Next, one by one, the newly proposed functions were presented. These functions were all visualized using screenshots from both desktop and mobile prototypes. For every function, the experts were asked whether they thought this function would fit the needs of the users. The discussion of every function was ended with a conclusion by the moderator and the question whether the participants agreed with this conclusion. Lastly, the experts were asked whether they had any recommendations, or thought that any important functions were forgotten.

During the focus group, the moderator took notes, including interesting use scenarios and reasoning mentioned, and a note on whether or not a function would be interesting for elderly care, mental health care, and disabled care according to the participants. Moreover, the conclusions for all functions are written down. During the content analysis, these notes were summarized with the research goal in mind.

6.2.2. Cognitive walkthrough

During a cognitive walkthrough, interface experts simulate users walking through a series of tasks. The experts need to have a good understanding of who the users are and what tasks they are expected to perform. A cognitive walkthrough can give understanding of how users might interact with an interface the first time they attempt to use it [76].

During this research, the interface experts at Nedap Healthcare, namely the six members of the user experience design team, were invited to participate in a cognitive walkthrough. Three of the user experience designers participated in the cognitive walkthrough and were invited to sit together for a 1.5 hour session in a meeting room within the office building. As content of the cognitive walkthrough, the tasks prepared for the usability testing were reviewed. The goal of the cognitive walkthrough was to identify problems with the interface and/or proposed tasks, and find ways to improve those before starting the user-based tests. For both the mobile and desktop prototype, the experts tried to collectively perform the tasks presented. For every step they took through the application, three questions were asked:

1. Will the users know what to do?
2. Will the users understand how to do this?
3. Will the users understand from the feedback that this went well?

The experts discussed these questions together. When the answer to one of these questions was not "yes", they were asked to explain how they would have designed the interface differently. During the cognitive walkthrough, notes were made including the identified problems and proposed alternatives.

6.2.3. Heuristic evaluation

During a heuristic evaluation, a group of usability experts evaluate the usability of an user interface using a set of guidelines, noting the severity of each usability problem [76]. These guidelines are called the heuristics, and, in their most common form, include the usability principles as described by Nielsen [77]:

1. Use simple and natural dialogue
2. Speak the user's language
3. Minimize memory load
4. Be consistent
5. Provide feedback
6. Provide clearly marked exits
7. Provide shortcuts
8. Provide good error messages
9. Prevent errors
10. Provide help and documentation

During the heuristic evaluation, the two members of the Nedap Healthcare user experience design team that had not seen the interface before performed the tasks prepared for the usability test. After every task, they walked through all ten heuristics, evaluating on what they saw during the task through the lens of the heuristics. For every heuristic, notes were made about the comments of the experts considering the heuristic. The outcomes of this evaluation were used to improve the usability of the prototype before the user-based tests.

6.3. Results

This section presents the results of the three expert evaluations, separated into the three evaluation methods.

6.3.1. Focus group

The first function discussed was secure chat. The experts agreed that within the organisations, but also for digital contact with clients, chat is currently often used. Privacy-sensitive chat is used, because chats meeting the privacy standards are often expensive. The experts agreed that chat is used because it is fast and accessible. After some discussion regarding transparency and the digital contact between clients or informal caregivers and care professionals it was concluded that it would be important to still enable comments within the client record, as is currently possible through CarenZorgt.

Secondly, secured emailing was proposed. The experts mentioned that Ons users absolutely have a need for secured emailing. Currently, sending emails primary happens for but is not excluded to contact with external parties. Clients often request the option to send email from Ons. Implementing email in Ons would be a big step, and it should be considered whether the benefits will outweigh the effort. If the email function is supposed to replace for example Outlook, users should be able to do everything they currently do in Outlook in Ons Berichten as well. On the other hand, the application should be kept as simple as possible, and functions that users do not need should not be implemented. Lastly, it was mentioned that clear contrast between the interface for chat and email is important.

Considering sending important messages, it was discussed that these could be helpful when people are at home. Currently, many people do not install Ons Berichten on their personal phone because they do not want to be bothered by all the notifications when they are not working. This also means that they sometimes cannot be reached in case of emergency. If only important messages would trigger a notification on their persona phone, people might consider having the application on their personal phone for emergencies after all. Discussion among the experts arose about what scenarios would be for important messages that could not be solved by a phone call. It was explained that it could be semi-urgent messages, that need special attention or some careful consideration. Moreover, this they could be sent to a group. This is not possible with a phone call.

Next, referencing was discussed. All experts thought it would be a very useful function. They discussed whether the name of the person to whom is referred should be blurred. It was concluded that the name itself can be shown to all people in the group, but the file that is referred to should only be accessible for people that already have the right to access it. It would be good to make the function like "tagging" in WhatsApp and Facebook: When you type "@", a list of suggestions is presented.

The experts were very happy about the function to create new groups. This function is requested by the users very frequently. They mentioned groups for planning, but also client-focused chats. Being able to include informal caregivers in the chats would be practical. They discussed that everyone should be able to create these groups. Some basic groups could be created by a coordinator or district nurse with good overview of which groups are needed. It is important that when someone new is added to a group or chat, this person cannot access all previous communication.

Considering communication with external parties, the experts commented that this function already exists in "Ketencommunicatie", which enables integration between ZorgMail and Ons. An integration could be considered. It is important to be able to confirm that your receiver is a medical professional. Moreover, it would be interesting to have access to a database with medical professionals and their secure contacting options.

Then, sending attachments was discussed. The experts agreed that Ons users would send letters, referrals and treatment requests using email. Pictures or videos would be shared with the chat functin. Then, both channels could be used for formats like docx, PDF, or excel.

The experts representing elderly care agreed that the users would absolutely like to organise their inbox with stars, folders, an archive, and the ability to mark a message as unread. For disabled- and mental health care, the experts were unsure whether those functions would be necessary.

The last function discussed was exporting messages to the client record, and sending a message from and about a client record item. The experts agreed on the usefulness of this function.

When asking the experts which functions might be interesting to consider that were not yet included in this overview, they mentioned video calls were used in disabled care.

During the focus group, some questions arose that were left unanswered. It was for example unclear which communication would happen using chat, in contrast to the communication using email. Maybe one of the two functions would be enough. Moreover, the importance of organising the inbox was unclear.

6.3.2. Cognitive walkthrough

The results of the cognitive walkthrough are presented divided into the seven tasks that were evaluated.

For sending a chat message, the experts' advice was to enable going to the group through the "+"-icon, because they expected people to try to create a new chat for this task as they are used to in the current application. When they try to create a new group, a pop-up saying this group already exists could lead them back to the existing group.

For adding a reference, the experts would like to see a reference suggestion appear while typing.

While marking the message as important, they suggested using a star instead of the exclamation mark, since this matches with the icon used for important marking in Ons dossier. Moreover, a tooltip was used in the presented prototype which is not possible in a mobile application. It was suggested to explain what the option does when it is already selected. So when someone presses/clicks the star, a pop-up could inform the user that the message is marked as important.

The experts agreed that, while adding a new member to the group chat, the selection step could be skipped. Moreover, a notification should show all members of the group that someone was added. Moreover, the title "Select a contact to add to the group" could be combined with the placeholder in the search bar. The same applies to the titles on other pop-up screens with search bar, for example while adding a reference to a message.

In the presented prototype, there were two options available for forwarding an email: a fixed button with text at the bottom of the screen, and an icon to the right of the receivers. The experts agreed that only one option was necessary.

Then, adding a receiver to the email in the presented prototype did not feel natural to the experts. They wanted to be able to type and get suggestions like they are used to in email, instead of clicking and choosing the recipient as in the chat. This would make the email-feel more consistent. Moreover, a confirmation for the message being sent is missing.

Lastly, it would be practical to be able to move an email to a folder from the email-view, instead of only from within the inbox or folder.

The results of the heuristic evaluation are presented divided into the ten heuristics.

Visibility of system status - The visibility of the system status is clear: It is always visible what your location within the system is.

Not only would it be good to see when someone is added to a conversation, it would also be useful information to know who this person is. It does not have to be literally stated, but for example a colour could indicate whether someone is a colleague, client, or informal caregiver. This could be used for group chats as well: Instead of using a group image for a colleague chat, a certain icon indicating that it is a chat with only professionals could be used. Moreover, it would be good to get a profile preview when clicking on someones name, showing who they are: maybe profession, part of which team they are, and mutual clients.

While marking a message as “important”, the indication of the message being marked could be even clearer, for example with a bigger icon or larger contrast. This could also avoid someone accidentally sending a message marked as important. Instead of the hover (which does not work in a mobile application anyway), a temporary notification saying “This message is marked as important” could be used.

Match between system and the real world - What mostly makes this system very recognizable are the similarities with WhatsApp and email. This is good: Most users will know WhatsApp and email and this will make the interface familiar to them. A while-holding function could be implemented to increase the familiarity even more. In this way, some icons could be removed as well, because their functions would become available when holding a message. Moreover, sometimes the application does not feel “natural”. While, for example, sending a picture, a modal (a separate window in front of the previous focusing on one specific action) is opened after selecting "Image or picture". Experts question whether this has to be a modal with a separate button for sending, and whether the “cancel” option in the upper right corner is placed where a user would expect it. A more recognizable redesign might be necessary. Lastly, one of the experts notes that the button leading to the folders in the inbox-view feels like a back-button.

User control and freedom - User control and freedom is a complicated heuristic when designing an application to be used in care context. In this case, it is more of a question whether the users do not get too much control and freedom: Considering privacy laws, rules and standards in care, it is important to sometimes limit the users’ freedom to prevent errors.

Consistency and standards - Where to cancel (on a button, middle down, right down, or just with text in the upper right corner) is not consistent. But sometimes consistency is not necessary, if you can ground why it is different.

Error prevention - One of the experts noted that it is not desired to enable a user to add a client to a chat with only colleagues. Also, to avoid “accidentally” adding a client to a chat, the add-options for clients, informal caregivers and colleagues should be separated.

Recognition rather than recall - Considering the references, one of the experts mentioned that the user should be able to, from for example a client record, select an item and export it to a message. In this way, the user could not just add references to a message, but also start the messages from the item that becomes the reference.

Aesthetic and minimalist design - One of the experts asked whether it was necessary to have the standard menu at the bottom all the time. It takes a lot of space and presents extra information that is not always necessary to have directly available. Using the hold-function can minimize the design even more because some icons will be made unnecessary.

Help users recognize, diagnose, and recover from errors - When a message has been sent, the user

should be able to edit or delete it within a certain time span (5 minutes). In this way, for example a reference could be added to the message after sending without having to send a new message. This time limit is necessary because this should not be possible in other scenarios (like deleting "proof").

Help and documentation - The experts did not see documentation or help anywhere in the prototype but also did not think it was necessary. The system is not complicated, and very recognizable. If people have questions, they can look up the overall documentation, because this will probably rarely happen.

6.4. Conclusion

The goal of the expert evaluations was to improve the functions and usability of the prototype before testing with actual users.

6.4.1. Requirements

The focus group gave most interesting insights considering the functions. Based on the outcomes of the evaluations, the following requirements regarding notifications, attachments and references can be added or extended:

11. Send and receive messages with attachments (Images, documents, spreadsheets or videos)
25. Organise the inbox by marking a message as unread
26. Edit a message after sending within a time span of 5 minutes after sending
28. Delete a message for all receivers within a time span of 5 minutes after sending
39. Set notification preferences for a silent mode outside of work hours

The numbering of these requirements refers to the full requirement list in Appendix D. These modifications are described in that requirement list, colored in blue to indicate they were updated based on the outcomes of the expert evaluations.

6.4.2. Changes to the prototype

As a result of the cognitive walkthrough and heuristic evaluation, several changes to the prototype were made.

Firstly, to mark something as important, the exclamation mark was changed to a star. Moreover, the size of the icon has been increased, the hover-state has been removed, and an explanation after clicking the star was added. A hover-state is namely not available for touchscreen devices. In this updated version, feedback on the performed action is presented after clicking the star, instead of presenting the information every time someone hovers over the icon. The changes are visualized in Figure 6.1.

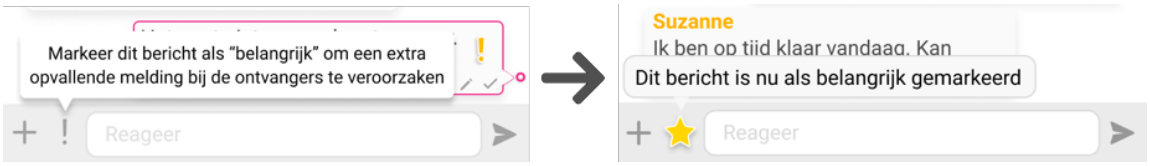


Figure 6.1: Marking a message as important - before and after expert feedback

Then, changes were made in several pop-up screens. Take for example the screens to add someone to a conversation or add a reference to a message. The extra selection step was removed so someone is added to the group immediately after clicking the name. Moreover, title and search bar were merged. The changes are visualized in Figure 6.2.

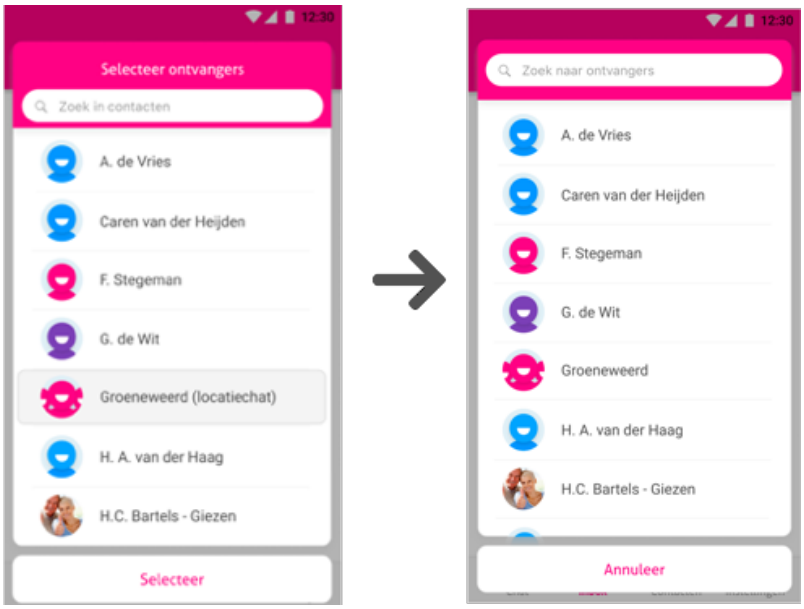


Figure 6.2: Adding someone to a group app - before and after expert feedback

Another element which is adjusted is the way a receiver is added to an email. This was changed from a pop-up interface to an interface that users might recognize from other email services. This is visualized in Figure 6.3.

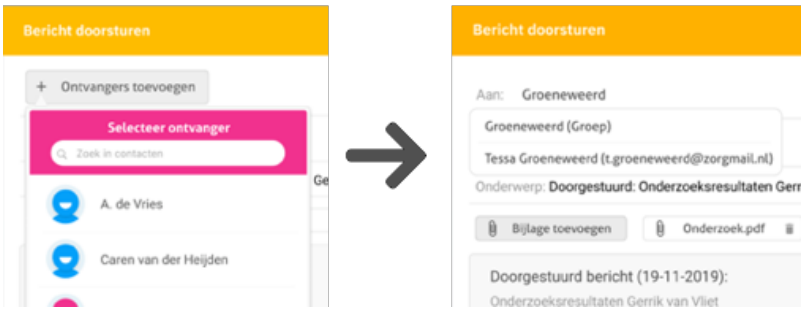


Figure 6.3: Adding receivers to an email - before and after expert feedback

Then, the icons for deleting, forwarding and replying to messages were deleted. These functions were already available using the buttons at the bottom of the screen, which will stick to the bottom for longer email messages. Moreover, the "add-to-folder" icon was added. This is visualized in Figure 6.4.

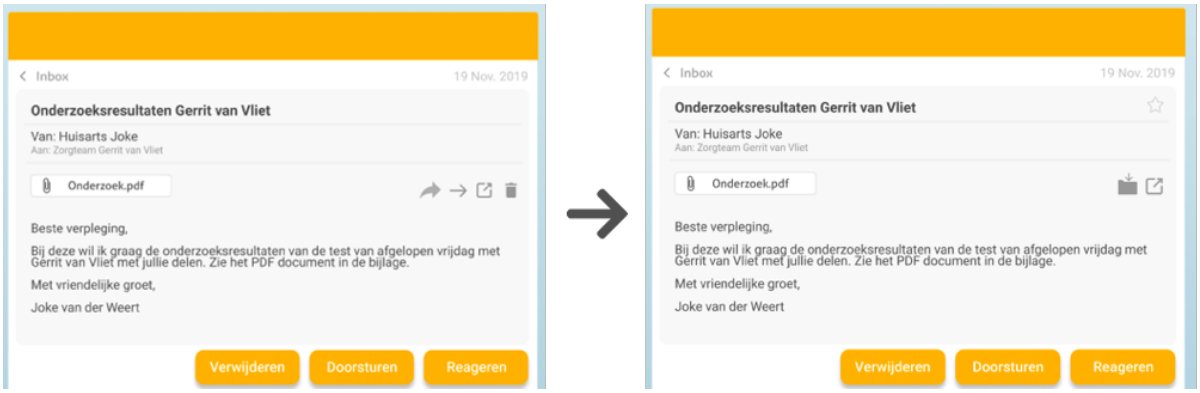


Figure 6.4: Forwarding messages and adding a message to a folder - before and after expert feedback

Next, instead of having icons for editing or removing messages always available, the options are shown when holding the message on the mobile prototype or using a right mouse click in the desktop prototype. This is shown in Figure 6.5.

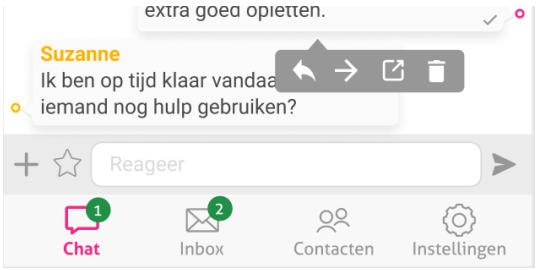


Figure 6.5: Hold/right mouseclick functions

Lastly, in some cases, clearer feedback of what has happened was added, based on the "visibility of system status" heuristic. An example is presented in Figure 6.6, where it is shown to all participants in a group chat that someone has been added to the group.

Figure 6.6: Feedback about adding someone to a group chat

6.5. Discussion

6.5.1. Expert suggestions

Two changes suggested by experts were not implemented. Firstly, the button accessing the folders in the mobile version of the application has not been updated. Only one expert noted this button as being similar to a back button. During the usability tests, it will be learned whether this button causes problems with finding the folders.

Moreover, it was suggested to show a clearer difference between the different roles of contacts, and/or show their profession or relation to a client next to their names. Though this has not been implemented in the new prototype yet, it can be learned during the usability tests whether users have a need for this extra information in the interface.

6.5.2. Questions usability test

During the expert evaluations, some questions to be asked to the users after the usability tests have arisen. Firstly, it is still uncertain whether the users would need both a chat- and email function within Ons. Moreover, use scenarios for marking a message as important before sending are still unclear.

6.5.3. Limitations

While reflecting on the expert evaluations, it should be noted that the heuristic evaluation was only performed with two experts, even though Nielsen [77] states that 4 participants is optimal when considering the costs/benefits ratio of a heuristic evaluation session. Moreover, onky the mobile version of the prototype was evaluated during the heuristic evaluation. Though the desktop version is similar, the aim was to evaluate both versions. However, the heuristic evaluation turned out to be too time consuming to review both versions. The cognitive walkthrough, on the other hand, was performed for both the mobile and the desktop prototype.

7. Usability testing

After rectifying the usability flaws identified during the expert-based tests, and learning what questions still had to be answered, the prototype was ready for the next step: the user evaluation. For the user evaluation, actual users of the software were approached for their feedback on the new prototype.

7.1. Method selection

Considering user evaluations, two widely used methods are lab or usability testing and field studies [76] [78] [79]: Usability testing is used to evaluate the effectiveness, ease of use and satisfaction of an interface or system. Alternatively, field testing is used to assess how the system would support the use within the real use context. During a lab test, the use of an application is evaluated outside of the real use context with a researcher present, where the field test is performed in real-life conditions and context. This makes a lab test more controlled by allowing for the same setting for all participants. However, laboratory settings lack the desired ecological validity [80]. Moreover, during a lab test, participants might feel more pressure to perform [78]. This could cause bias toward usability at the expense of utility [78]. Still, a lab study is recommended when the testing focus is on the user interface and application-oriented usability related issues [81].

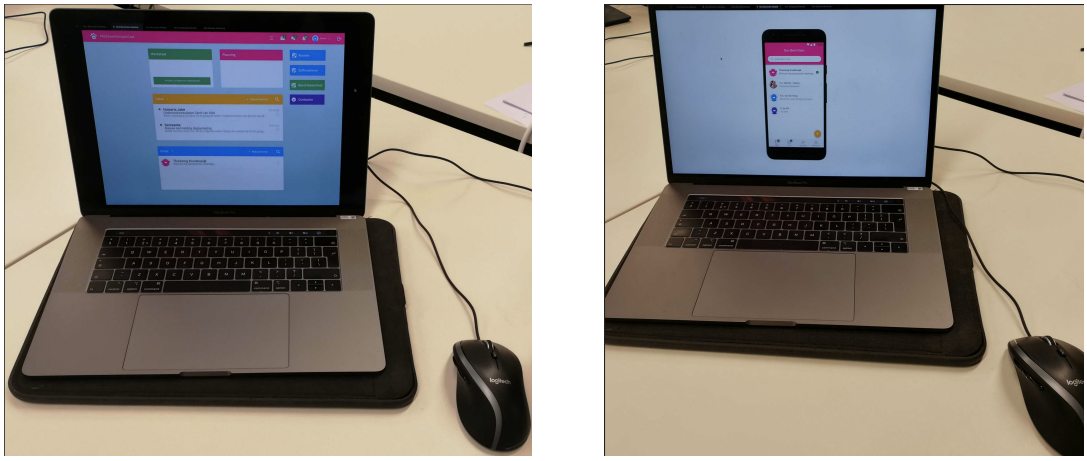
A field study, on the other hand, is more suitable for investigating a wider range of factors affecting the overall acceptability of the designed service, like system function and effects of actual usage [81]. To be able to perform an ecologically valid field study, a prototype must be implemented in real-like conditions with day-to-day duties, workload and technical environment. Taking this into consideration, Kaikkonen et al. [80] conclude that conducting a time-consuming field test rather than a structured lab test may not be worthwhile when searching user interface flaws to improve user interaction. Aziz et al. [82] conclude that the best research approach is to use both lab and field research, using the results of controlled experiments to produce new approaches or hypotheses to be investigated in the field.

For the foregoing reasons, and since a proper field study is not achievable given the context and scope of this research, usability tests are performed as user evaluations.

7.2. Method

A usability test, a structured qualitative research method [78], using the thinking aloud method was performed. With the thinking aloud method, participants are asked to comment on the process during the test. Email addresses of the Ons users that indicated that they were interested in participating in future research were used to approach participants. A selection of these users was made based on their profession and the sector they work in to be able to test with a variety of users. The selected users received an email requesting their participation. In the end, nine Ons users wanted to participate and were available for the usability test within the proposed research period. From disabled care, a manager, coordinator, and personal supervisor participated. From mental health care, two supervisors participated. Lastly, from elderly care, two homecare nurses, one nurse specialist, and one institution nurse participated.

The usability tests were performed individually, at a location to the preference of the participant. This happened in an office during 8 sessions, and at the home of the participant during 1 session. Before the test started, participants were informed about what would happen, and were asked to give their informed consent. The consent form is presented in Appendix D.1. They were asked also which version of Ons Berichten they use most: Desktop or mobile. The corresponding version was set up on a laptop to be evaluated. The test setting is presented in Figure 7.1a.



(a) Desktop version

(b) Mobile version

Figure 7.1: The setting for the usability tests

Next, they received a sheet with instructions for the usability test. This sheet is presented in Appendix D.2. An introduction on the sheet explained that the tasks were to be performed from the perspective of a nurse in elderly care, followed by the ten tasks put into a corresponding context. Two different versions of the instruction sheet were used with each a different order of tasks.

The tasks that were evaluated were:

1. Forwarding a mail
2. Marking a mail as important
3. Sending a chat message
4. Adding a reference to a chat message
5. Marking a chat messages as important before sending
6. Adding someone to a chat group
7. Sending a picture in a chat group
8. Creating a new group with all contacts with a relationship to a particular client
9. Creating new folder in the inbox
10. Moving a message to the new folder in the inbox

Every task was presented with some context. The overall context told the participant to imagine working as a nurse. In this situation, the task "forwarding a mail" was for example presented as follows:

You work in a care institution called Groeneweerd. Gerrit van Vliet lifes in this care institution. You have had contact with his general practitioner considering research that has been done with Gerrit van Vliet. The general practitioner sent you a mail with the results of the research. You want to share those results with all of your colleagues working at Groeneweerd.

> Task 1: Forward the mail "Research results Gerrit van Vliet" to everyone in the group "Groeneweerd".

These tasks were selected because they represent function that are unavailable in the current Ons Berichten, or have a different interface than they used to. It was important to evaluate whether these functions were understood and desired, and whether their interface was easy to use.

During the usability test, screen and audio recordings were made, to be able to look and back at the recordings for data transcription and processing. Several usability measures were made. Effectiveness was evaluated by the percentage of users that was able to complete the task. Efficiency was measured by counting the number of unnecessary clicks, often referred to as errors, that participants performed before accomplishing the task. This number of clicks was used to diagnose usability problems: Many extra clicks are often caused by problems with usability of the interface. Satisfaction was measured by analysing the verbal utterances of the participants during the test, as well as asking their opinions after the test.

The following questions, if not answered during the usability test, were asked afterwards in an interview:

1. What do you think of the new functions you have seen? (Specify functions if necessary)
2. Would you use both mail and chat within Ons? Or would one of the two be enough?
3. What would you mail en what would you chat about?
4. In which situation would you use the important messages?
5. If the application includes the presented functions, could it replace the alternative channels you use? What extra functions would it need?
6. Comparing the presented prototype with the current Ons Berichten application: What are improvements and what did you like better before?

The audio recordings made during the usability tasks were, after the tests, cut into the different tasks and transcribed. The same was done for the audio data from the interviews. Then, verbal outings during the tests considering specific tasks were combined with the answers to the interview considering the same tasks. In this way, for every participant, a summary of their outings considering their satisfaction about every task was derived.

7.3. Results

The participants are numbered 1 to 9. Participants 1, 2, 3, 5, 7 and 8 did the test using the desktop version of the application. Participant 4, 6 and 9 used the mobile version, and are therefore marked in grey in Table 7.1.

The quantitative outcomes of the usability tests are presented in Table 7.1. For every (sub)task, the amount of unnecessary clicks performed by every user are presented in the second to tenth column. The percentage of users that completed the task is presented in the eleventh column. Then, the percentage of users that completed the task without any unnecessary clicks (perfect) is presented. The average number of extra clicks that, among all users, was needed to complete the tasks can be found in the last column.

Finding and creating folders are the only tasks that were not completed by all participants: Participant 4 failed these tasks. Then, finding the chat message and adding the reference to it were the tasks on which the participants performed worst considering the perfect- and error scores. Moreover, participants had some problems with forwarding the mail, creating the group, and finding the folders. Then, one third of the participants used more clicks than necessary for adding a member to a group chat and selecting members for a new group.

A high contrast was found between the results of the tasks "Add member" and "Find folders" for participants using desktop and mobile version. These results are presented in 7.2.

Table 7.1: Results usability tests

Task/Participant nr.	1	2	3	4	5	6	7	8	9	Completed (%)	Perfect (%)	Average errors
Send chat message	6	5	5	0	6	0	4	0	0	100	44	2,9
Chat important	0	0	0	0	0	0	0	0	0	100	100	0
Reference	0	6	1	5	0	3	8	2	0	100	33	2,8
Add member	6	0	0	4	0	2	0	0	8	100	67	2,2
Add picture	0	0	1	2	0	0	4	0	0	100	78	0,8
Find mail	6	0	0	10	0	0	0	0	4	100	89	1,8
Forward mail	2	1	0	0	0	11	0	6	0	100	56	2,2
Mail important	0	0	0	0	0	0	0	0	0	100	100	0
Create group	5	0	0	2	8	0	0	4	2	100	56	2,1
Choose members	4	0	0	0	0	1	4	0	1	100	67	1,1
Find folders	0	0	1	-	0	2	0	0	-	78	56	0,33
Create folder	0	0	0	-	0	0	0	0	-	78	78	0
Move mail	1	1	0	1	0	1	1	0	0	100	44	0,56

Table 7.2: Results usability tests

Task and prototype	Completed (%)	Perfect (%)	Average errors
Add member (Desktop)	100	83,33	1
Add member (Mobile)	100	0	4,67
Find folders (Desktop)	100	100	0
Find folder (Mobile)	33	0	2

Looking at the qualitative outcomes of the tests, the origins of the low scores can be identified. These qualitative outcomes consider the verbal outings of the participants while performing the test as well as their answers to the questions after the test.

Generally, participants were very positive about the new functions and design. This subsection presents a summary of the opinions and feedback of participants on the interface and different functions, divided into topics that are determined through a thematic analysis.

Chat - Considering the chat, many participants were confused in the beginning because, as several mentioned, they were thinking from an “Ons Berichten” perspective. This perspective includes, for example, the assumption that you always have to start a new conversation because there cannot be any existing chats. Therefore, many participants tried to create a new message during the first assignment. It took some participants a while to realize that the chat-part of the new prototype could be considered similar to WhatsApp instead of similar to Ons Berichten as they know it. Since all participants knew and used WhatsApp, this realization helped them interact with the application more efficiently. Many participants mention that they like the similarity to WhatsApp. Two participants mention that chat would be used mostly for communication within the organisation. A participant from mental health care mentions she would also use it for contact with clients.

Sending an important message - Everyone understood at once how to mark a message as important before sending. They thought the star was clear and recognized it as being used in the client record as well. Considering the use of this function, not everyone thought they would use it. Two participants mentioned it is important to discuss with the team when to use the star. Two other participants explain that, when something is really important, they will call instead of sending a message. Moreover, it is mentioned that it would be best if everyone could decide for themselves what notification the important message would trigger. In that way, the function could be available for everyone, without mandatory use.

One of the mental health care supervisors mentioned that she would use the function when she makes a last-minute change in the planning. One of the homecare caregivers mentions that she would use it to let her colleagues know she is ill and needs replacement.

Referencing - Most participants tried to send the message before they had added the reference, but this option was disabled in the prototype. Still, all but one of the participants agreed that it is logical to add the reference using the "+". One mentioned: "Now that I have done it once, I will know it next time because it is easy". Once participants had clicked the "+", they all succeeded in adding the reference without any unnecessary clicks. Several participants mentioned that they would like a reference suggestion while typing. All participants agreed that referring to clients or other items within the software suite in a message would be a useful function. Participants from homecare and supervision in mental health care mentioned that they already sent their colleagues messages with the request to look at a specific client record item, and it would be very helpful to add a reference to such messages.

Custom groups - Several participants encountered problems while trying to add someone to the chat, especially on the mobile version of the prototype. Some tried using the +-button in the chat overview window or adding a new participant through the contacts overview. All participants agreed that adding and removing people from the teams would be useful. They told stories about the organisation taking three weeks to add someone to a group or having sub-groups within the groups in Ons that are not specified as separate groups in the software. The participants also agreed that the new participant of the group should not be able to read the conversation history. Similarly, the participants liked the idea of creating their own groups in the software. They mentioned multidisciplinary groups, or groups of people connected to a specific client. Two participants noted that someone should have the overview of existing groups to cope with potential misuse of the freedom to create groups. Alternatively, creating groups could be a special right for workers with a coordinating task. Considering the interface for creating groups, the participants had different views. Some thought it was clear as it was presented in the prototype, while others would rather see all colleagues connected to the client they are searching for instantly, without an extra click. Moreover, two participants mentioned that they would like to see what the relation of the colleague to the client is.

Sending pictures - Though participants are used to a camera icon to add a picture to the message, it was clear and logical to them to find it behind the +-sign. They liked how easy and accessible sending images or pictures was in the prototype. Use scenarios mentioned were quickly sending a picture of a wound to a nurse specialist for feedback, or sharing beautiful moments in pictures with informal caregivers.

Email - As with the chat messages, the "Ons Berichten" perspective that the participants had while interacting with the prototype made them encounter problems while using the email functions. However, when they realized it was like the email they know, the interaction turned out easy and familiar to them. All participants mentioned they recognized the function as email, and the majority complimented the good overview and clear interface. Email was mentioned to be most important for people with coordinating tasks, and for communication with external parties like the general practitioner. Moreover, staff, support and managers were mentioned to be frequent email users. Several participants mentioned that this function could replace their use of normal email. One participant mentioned that using both normal email and email within Ons Berichten would be confusing.

All participants understood at once how to mark a message in the inbox as important, and several participants mentioned they would use this function. The other option for organising messages, making custom folders, is a function multiple participants would use as well. However, in the mobile prototype, the folders were hard to find. Once the folders were found, creating a new folder and moving an email to it was never a problem. However, five of the participants tried to drag an email to the folder to move it there before using one of the available options to create the folder.

Email and/or chat - The three participants from the disabled care indicated that they do currently not chat with colleagues. They were unsure if they would use secure chat if it would be available. The secured email within Ons, on the other hand, would fit their way of communicating. They mentioned that they see chat as real-time, instant communication. Since they work in shifts and their messages are often for colleagues that are not currently working, the client record and email are better suited for their communication.

The participants from elderly care mention that both chat and email could be helpful to them. Email would be for attachments and communication with the general practitioner, where chat would be used for short messages that need to be read soon. Mail is more professional, but, short and quick messages do not belong in emails. Some mentioned that these functions could offer them all communication opportunity they need. Similarly, the participants from mental health care mentioned that their email- and chat use considering client information could be replaced by this new Ons Berichten. The option to refer to items would make Ons Berichten more practical to use than unsecured alternatives. They would like to use both the chat and mail function in Ons Berichten.

Old vs. New - Comparing the current Ons Berichten with the presented prototype, the participants mentioned many improvements. They liked how it was easier in the new prototype to organise and search for messages. Finding the right information is made easier. The groups in Ons Berichten were already used frequently, and the participants liked the idea of creating and editing the groups. Moreover, the referencing was mentioned as a good new function. Creating own notifications profiles, including when to receive notifications and when not, was mentioned as desired as well. The same counts for contact with external parties, clients, and informal caregivers through Ons Berichten. Lastly, several participants mentioned that they were searching a lot for functions during the test, but that this was because it was all new. They thought they could get used to the new interface and it would eventually be easier to use for them than the current version.

7.4. Conclusion

Several specific suggestions for improvement were made by the participants. These suggestions were taken into consideration for the next version of the prototype. These changes led to the final prototype as presented in the next chapter.

From the quantitative results of the user evaluation we learned that usability could be improved most in the interactions of sending a chat message (especially with a reference), forwarding emails, and creating a group. The usability of the interactions of adding a member and finding the folders could be improved for the mobile prototype specifically. These interactions were redesigned for the final prototypes.

The qualitative part of the user evaluation has taught us that most participants would use both chat and email within Ons, while one participant would specifically use the chat, and two participants would specifically the email function. This suggests that it would be necessary to offer both functions. Moreover, since some participants would, but others would not use the function to mark a message as important before sending it, this could be a function available for everyone without mandatory use. Then, considering references and the creation of custom groups, all participants agreed on the usefulness of these functions. Lastly, the organisation options for the inbox were received very positively.

One of the requirements presented in Appendix D could be updated since all participants agreed that when adding someone to an existing conversation, the person should not be allowed to read the conversation history. Moreover, a requirement considering notification preferences for important messages can be added, since the participants agreed that the notification caused by an important messages should be adjustable. Therefore, the requirement list is updated with:

17. Add contacts to an existing conversation, without allowing them to see the conversation history

40. Set notification preferences for important messages

The changes to the list in Appendix D that were elicited from the user evaluation are presented in purple.

Differences between desktop and mobile tests were found during the usability test. In particular, adding a member and finding the folders were experienced to be harder in the mobile version. This mobile design needs improvement and should be made as clear as the desktop one.

7.5. Discussion

Some bias was present in this usability test. Firstly, the performance of the participants was influenced by their experiences. Because they already use Ons Berichten, they expected the new prototype to be similar. This resulted in for example people wanting to create a new message instead of going to an existing chat, because they are used to always creating new messages. Then, some errors that had nothing to do with the usability of the prototype were caused by participants not understanding what was expected from them after reading the instructions. Because of these biases, the interface for forwarding email and adding a reference were not changed, despite the high number of average errors for these tasks during the usability test. As participants mentioned, they needed to get used to the interface, or thought, though some errors occurred, the interfaces for those tasks were logical and familiar.

Furthermore, differences can be found between the usability scores of the two versions of the instruction sheets with the tasks presented in different orders. It is apparent that, later on in the test, after already seeing some functions or getting used to the interface, the participants performed better.

One participant did not succeed in locating the folders and creating a new one. She quit trying because she could already add the message to the folder before creating the actual folder. This was an accidental shortcut in the prototype. Moreover, considering the mobile test, it would have been better to evaluate the prototype on a touch-screen phone instead of shown on a desktop. Unfortunately, the prototype on a phone screen was so slow that it could not have been used for usability testing.

Lastly, some notes can be made about the use of a usability test as evaluation method. Laboratory settings, as in this usability test, lack ecological validity, and results can include bias because of the pressure to perform that participants might have felt. However, this pressure is kept as low as possible by clearly telling the participants that they cannot do anything wrong, and that their feedback is valuable for improving the prototype. A next prototype, informed by the information gained from the usability tests and expert evaluations, would be more suitable for a more ecologically valid field study or pilot test.

8. Final Proposal Ons Berichten 2.0

In this chapter, the final proposal for the new Ons Berichten will be described.

8.1. The new Ons Berichten

Ons Berichten is a messaging function within the Ons software suite, and *the* place for Ons users to share client-related information. The familiar interface will help users to easily communicate with colleagues, clients, informal caregivers and/or external parties involved in the care or support of a client. Ons Berichten is available for desktop and mobile use.

In the desktop version of Ons, Ons Berichten is available in several ways. The main access point is through the Medewerkersportaal (Figure 8.1), which is opened after logging in.

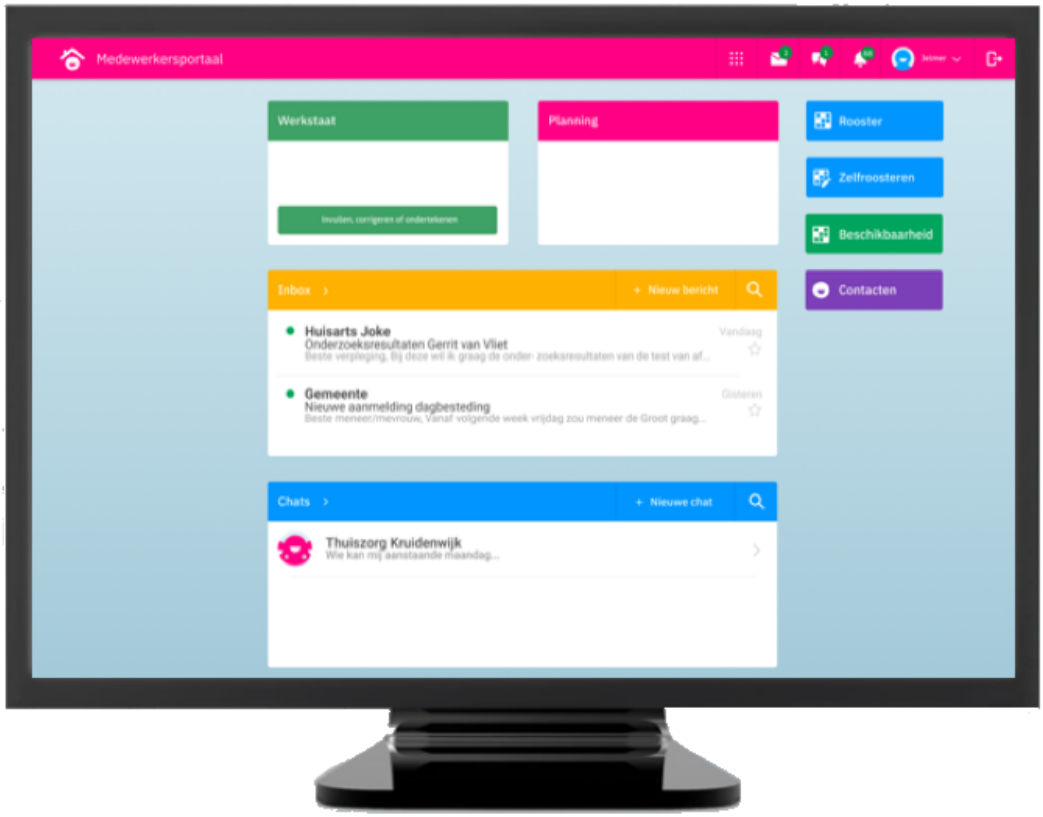


Figure 8.1: The new Ons Berichten in Medewerkersportaal

From here, the inbox and chats are prominently present in the screen and can be accessed by clicking on "inbox" or "chat". Unread messages or chats, with a maximum of two, are presented in the preview in the Medewerkersportaal. Clicking on a message or chat brings the user directly to that message or chat. Clicking on the star marks the messages as important without leaving the Medewerkersportaal. From this screen, a new message or chat can be set up, and by clicking on the magnifying class, an option for

searching through the messages will become available. The contacts can be accessed through the purple button on the right of the screen.

When working in other applications in Ons, the email and chat function can still be accessed through the corresponding icons on the pink menu bar. In the upper right corner, an email-icon can be used to access the email, and the conversation-icon can be used to access the chat.

In the mobile version of Ons, there is no Medewerkersportaal. Therefore, after entering the pincode or using touch ID, opening the Nedap Ons app will bring the user directly into the chat overview. This allows the user to quickly read or send a chat message. From this chat overview and every other screen in the application, navigation options to the inbox, contacts, and settings are available as shown in Figure 8.2.

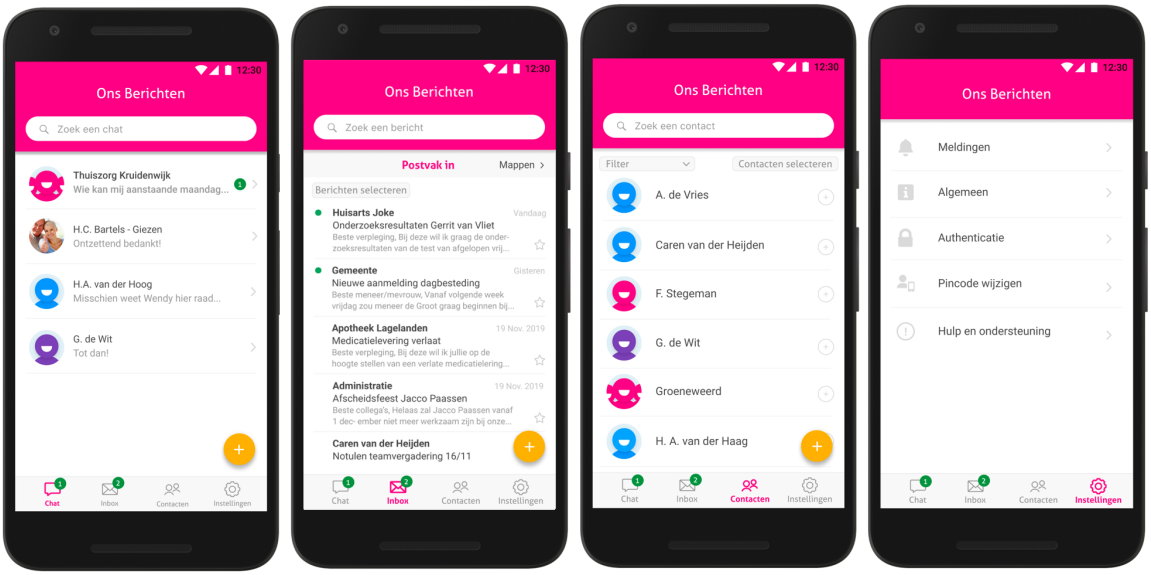


Figure 8.2: Ons Berichten on mobile phone: Overview

8.1.1. The chat

The chat function includes one-on-one chats and group chats. It offers the user the opportunity to send and respond to messages in ongoing conversations: Instead of creating a new thread, the message can be sent in a existing conversation. As can be seen in the uppern left screenshot of Figure 8.3, a message can be marked as important by selecting the star. This message can cause a special notification for the receivers. Moreover, selecting the "+" enables the user to send attachments with a chat message: A picture, image, document, or reference can be attached. These references refer to an item somewhere else in the Ons Software suite, for example a client record item or calendar item. In this way, the receivers will know immediately who or what the sender is talking about. The references can also be added while typing, as shown in the third screenshot of Figure 8.3. Clicking on the suggestion will add a reference to the message. The interface of sending a picture is presented in the fourth image in the figure. Moreover, someone can edit and delete an own message sent in the chat by holding it. However, this can only be done within a time frame of 5 minutes after sending the message: It is meant to be used to edit or delete a message right after sending, but not after many people have already read and potentially acted upon it. The sender can

also see whether (all) receivers have read the message or not, indicated by the little check on the message. Lastly, the group chat overview is shown in the sixth screenshot in Figure 8.3. Here, it is possible to mute a chat, change the name, or add a new member.

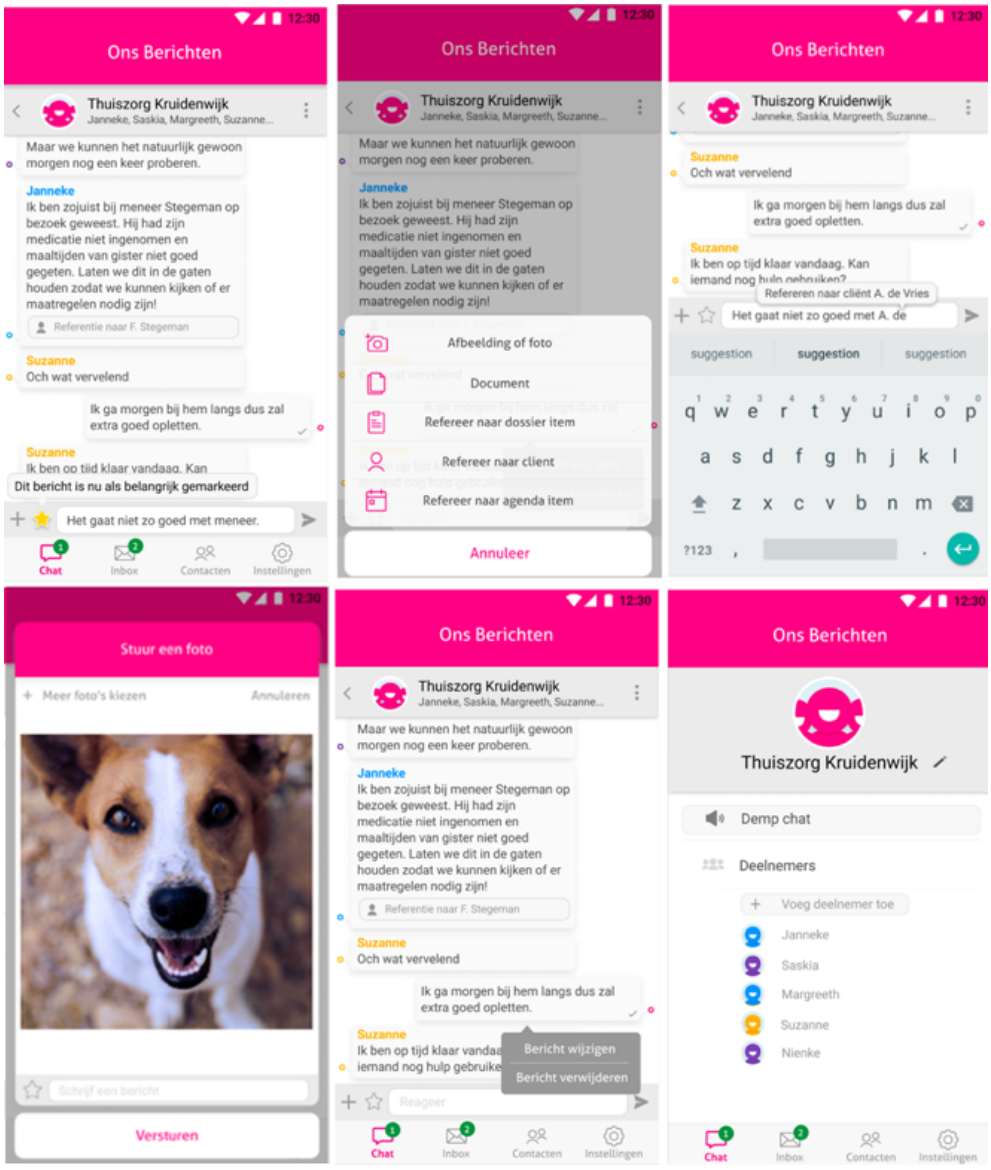


Figure 8.3: The new chat function on mobile phone

The same functions are available in the desktop version of the chat, visualized in Figure 8.4.

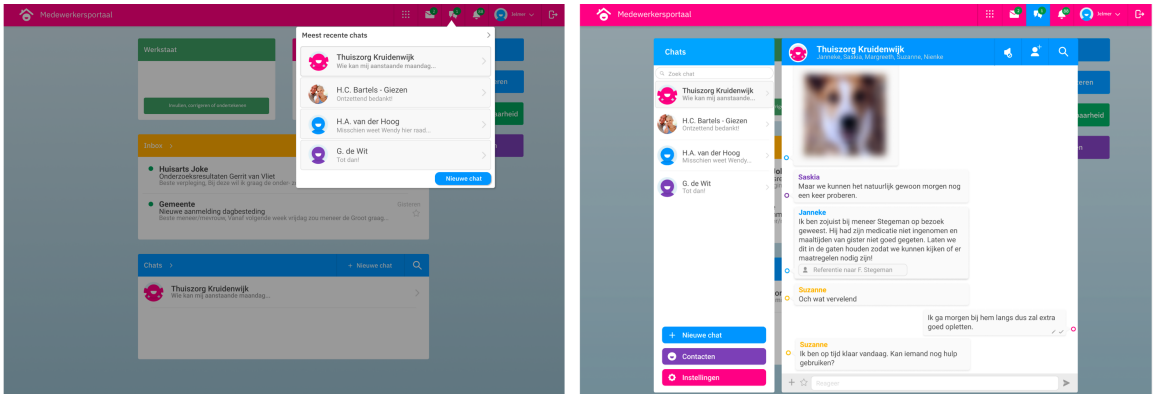


Figure 8.4: The new chat function on Desktop

8.1.2. The inbox

The email option is made for sending emails as users are used to, but secure and within the context of Ons. With the email function, emails with subject and optional attachments can be sent to one or several of the contacts within Ons (see the left screenshot of Figure 8.3). Received emails can be replied to, forwarded, deleted, organised in folders, and exported to the client record (see the second screenshot of Figure 8.3). Emails can be marked as important for future reference and organised and filtered in folders. The email interface on desktop is presented in Figure 8.4.

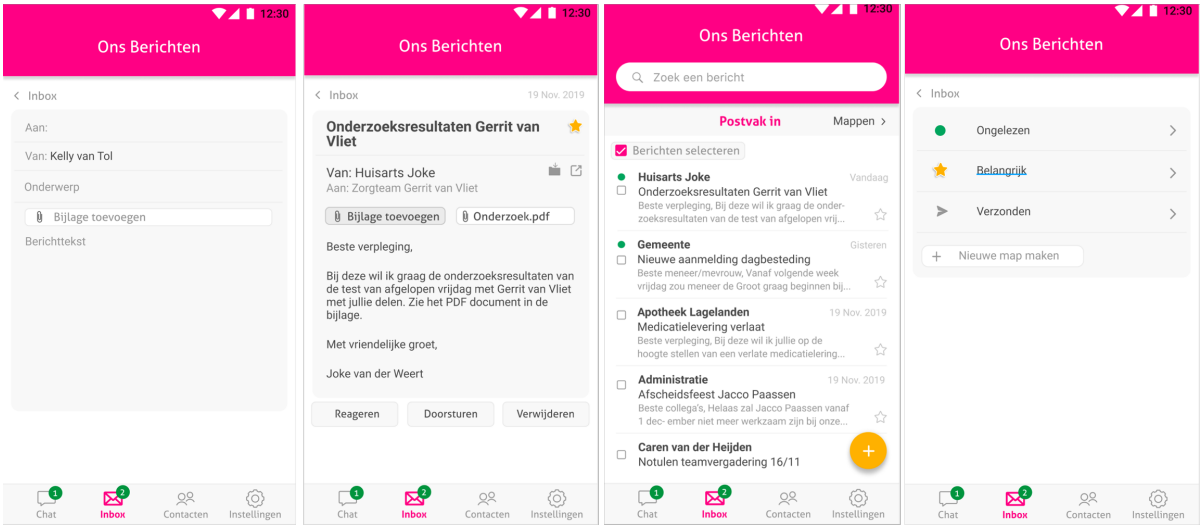


Figure 8.5: Email function on mobile phone

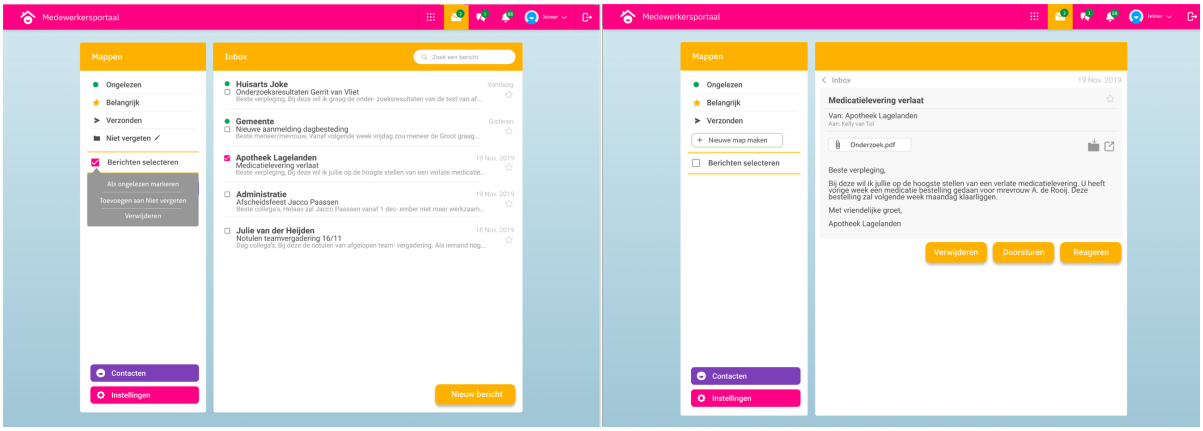


Figure 8.6: Email function on desktop

8.1.3. Contacts

In the contact list, a user can find all colleagues, groups, clients, informal caregivers and external parties with whom secure communication is available. The (dropdown) menu in the contact list can be used to filter the contacts, as visible in the left screenshot of Figure 8.7. Colleagues can communicate securely when both sender and receiver use Ons Berichten. Clients and informal caregivers need a CarenZorgt account, which is integrated with Ons Berichten. Then, external parties can be added manually by inputting their secure email address. From the contacts overview, new groups and contacts can be created, as visualized in Figure 8.7.

These groups can be multidisciplinary, including professionals as well as informal caregivers or clients. The groups can be used for both email contact and chats. While making a new group, one can filter on for example contacts connected to a client, to easily create a client-centered communication group.

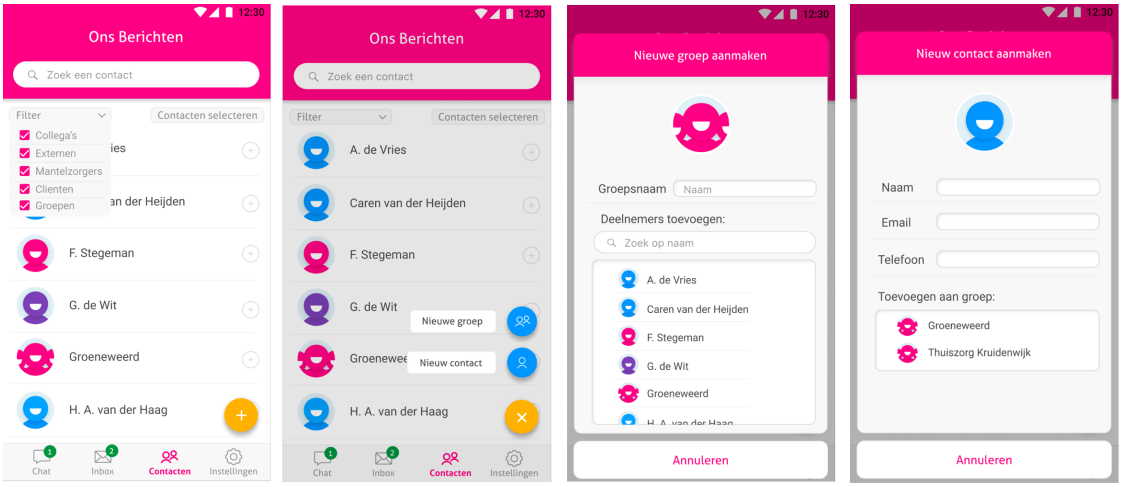


Figure 8.7: Contacts overview on mobile phone

How this looks in the desktop application is shown in Figure 8.8. A new, external contact needs a secure email address, and cannot be contacted by chat, because it cannot be guaranteed that this will be received securely if it is outside of Ons.

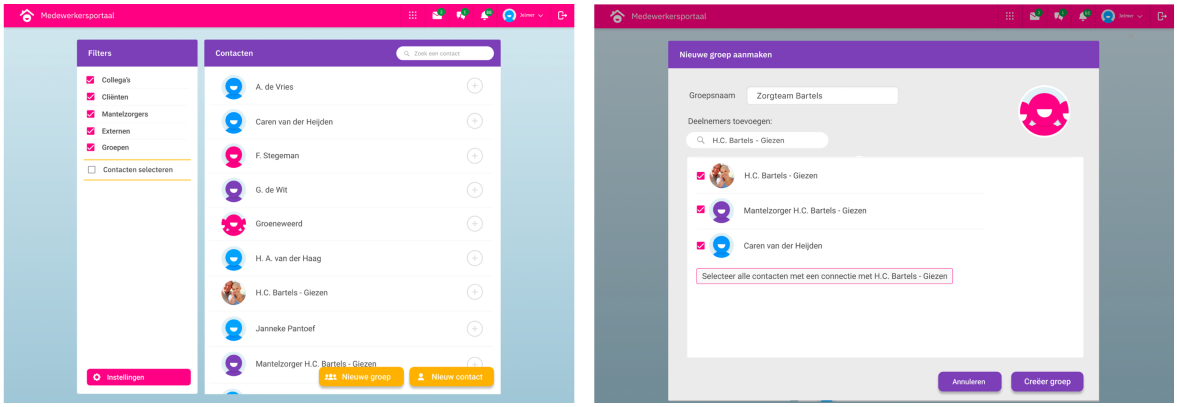


Figure 8.8: Contacts overview on desktop

Though there is a filter available in the contacts list, putting all different contacts together in one list can still cause problems. It is important to avoid, for example, accidentally adding a client to a group chat with only professionals. Therefore, and for usability purposes, it is important to make a clear distinction between the different kinds of contacts and groups. This could be done using the avatars of the contacts: Instead of having personal avatars, an avatar could show what the role of the contact is. A first proposal for the avatars is presented in Figure 8.9.

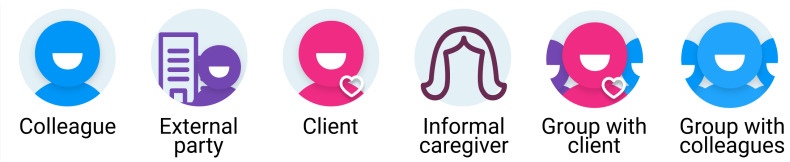


Figure 8.9: Proposal different avatars for different roles

Currently, clients sometimes have a picture as their avatar. These could still be used. However, colleagues should not use pictures, to keep the distinction. If there is no picture available for a client, the client avatar could be used.

8.1.4. Settings

There are some settings available for the user. They can for example change their PIN, delete the data in the application, or modify their notification settings. For this last setting, there are several options available. A user can choose notifications separately for personal chats, group chats, mail messages, and important messages. Moreover, a silent mode of the application can be chosen to be used outside of work hours with a calendar integration. Lastly, the user has the choice to still receive a notification for important messages outside of work hours. The notification settings window for the desktop application is shown in Figure 8.10.

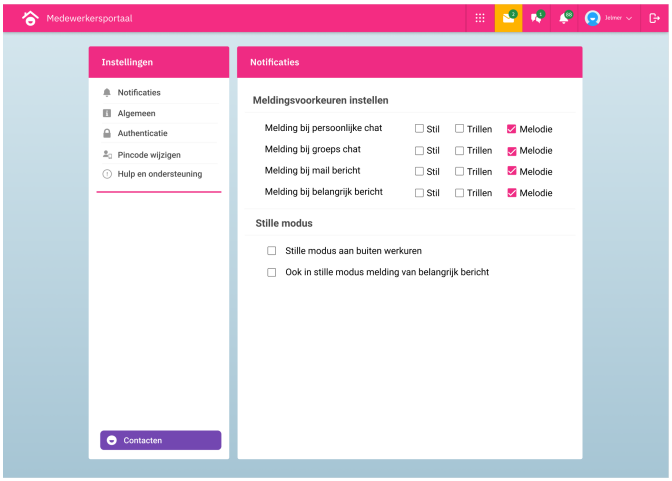


Figure 8.10: Notification settings on desktop

This concludes the final proposal for the new Ons Berichten 2.0.

8.2. Priorities

Though the requirements have already been prioritized using the MoSCoW method, this only divides the proposed functions into three different groups: Musts, Shoulds, and Coulds. Based on the received feedback on the proposed functions during this research, some more comments can be made considering the prioritization of these functions.

Table 8.1 describes the functions in short sentences. The second to fifth column present whether these functions were found to be important during the document review, survey, and expert and user evaluation, and the label of the related requirement is presented in the last column.

Some color-coding is used in Table 8.1 to indicate the importance of a function, ranging from red (most important) to green (least important).

In this overview, it is visible that five functions were found or suggested to be a desired function during document review, survey, expert evaluation, and user evaluation. This makes these functions priorities for implementation for the new Ons Berichten. However, functions that were found to be important during both document review and survey were sometimes excluded from the evaluation with experts and/or users. These functions were either already available but receiving specific feedback from the users, or found to be important to implement without the need for feedback from experts and users considering the function or usability of its interface. Therefore, these functions are priorities for implementation as well. This includes, in total, nine functions, purple in Table 8.1, that fit into this category.

Not only has "Adjusting notification settings" been found to be a desired function using all of the four methods, it is also related to one of the must-requirements, "Becoming aware of an incoming message by a notification". By enabling the user to choose when notifications are received, you support them in receiving notifications in situations when they are important. Therefore, the function for adjusting notification settings should be considered a high priority, and is therefore presented in red in Table 8.1.

Then, there are three functions that were considered useful by only part of the participants of the user evaluation. These functions therefore show +/- in the user evaluation column of Table 8.1. However, all of

Table 8.1: Proposed functions ordered on priority based on feedback from different methods

Function	Document Review	Survey	Expert evaluation	User evaluation	Requirement
Adjust notification preferences	+	+	+	+	Must
Reference to items within other Ons applications	+	+	+	+	Should
Make custom groups	+	+	+	+	Should
Add contacts to an existing conversation	+	+	+	+	Should
Send and receive messages with attachments	+	+	+	+	Should
Delete a message	+	+	+		Should
Forward messages	+	+	+		Should
Add a subject to a message	+	+			Should
Search through messages by name, date, or topic	+	+			Should
Export messages to the client record		+	+		Should
Organise the inbox	+	+	+	+/-	Should
Communicate with informal caregivers/clients		+	+	+/-	Should
Communicate with external parties		+	+	+/-	Should
Send and receive messages labelled as urgent		+	+/-	+/-	Should
Select multiple messages at a time	+	+	+		Could
See if a message is read	+	+			Could

these functions were considered important by some of the participants, since they were mostly interesting for professionals from specific sectors or professions. Though implementing these functions would still be interesting, these functions would have a lower priority then the functions above, and are therefore blue.

Next, there is one function, namely sending and receiving messages labelled as urgent, that received mixed feedback from both experts and users. This function could be implemented, but made optional. This function should have a lower priority than the functions mentioned above, and is light blue.

Lastly, there are two functions presented in table 8.1 that are related to requirements with the label "Could". These functions can be considered as the proposed functions with the lowest priority, and are green.

The implementation cost of a function can be considered for further prioritization.

9. Discussion & Conclusion

In this research, a digital prototype has been made and evaluated with the aim of making well-grounded recommendations for a new version of Ons Berichten, a messaging function within the care administration software suite "Ons". Background research, a context analysis, and a needs assessment have grounded this prototype. During a focus group, heuristic evaluation, cognitive walkthrough and usability tests, opportunities for improvement for this prototype have been identified. Based on these opportunities, an improved version of the prototype was created and described as a final proposal and recommendation to Nedap Healthcare.

9.1. Research questions

The research question addressed with this research was:

What are recommendations for the implementation of a new messaging function within Ons?

To be able to answer this research question, five subquestions were considered. This chapter presents those subquestions and the answers that were found to them. Subsequently, these answers collectively form the answer to the main research question.

Subquestion 1,

How to redesign Ons Berichten to meet the current needs of its users?

has been answered in the first four Chapters of this report.

We learned in Chapter 2 that, while caring for or supporting a client, information has to be constantly updated, shared, and communicated about with everyone involved in the care process. Therefore, there is a need for sending secure messages to everyone involved in the care process. In Chapter 3 we learned that, in all sectors, WhatsApp, email, the client record, Ons berichten, CarenZorgt, phone calls, FamilieNet and meetings are used for communication. This implies that the users need chat, email, the client record, and a way to message informal caregivers next to their phone calls and meetings. Next, Chapter 4 describes most of the needs that have been discovered during this research. Firstly, findings from previous research describe specific needs users have for Ons Berichten. They want notifications of messages sent from CarenZorgt, they want to be able to refer to items in other Ons applications, forward messages, organise their inbox, add a subject to a message, search through messages on name, date or topic, edit a message after sending, delete a message, see who is currently working, see if a message is read, select multiple messages at a time, set an automatic out of office reply, and see if the inbox is up-to-date. Then, during the survey research it was discovered that the respondents need a way to communicate with client and informal caregivers separately. Moreover, the need for clear notifications and quick responses is found. Other needs that became clear during the survey research are the integration of the messaging tool with calendars, other secured communication tools, and a connection to client profiles or dossier items. From the reasons why people use alternative communication channels, it can be learned that people need to be able to reach all their colleagues, make appointments with them, share information with them, and have consults with them. Lastly, most of the survey respondents indicate that they would like to be able to send messages to professionals outside of the organisation, make custom groups, add coworkers to existing conversations, export messages to the client records, send and receive messages labeled as important, and receive a warning message before sending client info to someone outside of the organisation.

Then, subquestion 2,

What are requirements for a messaging function within Ons meeting the needs of professionals

in disabled care, mental health care and elderly care?

is answered with the requirement list presented in Appendix D, based on the findings of the Chapter 2, 3 and 4.

This requirement list is translated into a system design in Chapter 6, answering subquestion 3,

How can these requirements be met in a messaging function within Ons?

This system design includes a secure chat and a secure email function. With the secured chat, messages can be sent to and received from colleagues, informal caregivers, and clients. The message can contain text, attachments, references to other items in Ons, and an important label. Messages can be exported to the client record, and a user can search through them. Then, the email function enables the user to send and receive messages to colleagues, informal caregivers, clients, and external parties. The messages have a subject, and can include attachments and references as well. The email function has an inbox that can be organised using folders and marking messages as unread or important. Moreover, an email can be exported to a client record or forwarded to other contacts. Both chat and email can be used with groups as well as one-on-one. Every user can create groups including any contact, and add contacts to existing groups. Lastly, notifications preferences can be set by the user. This enables users to set separate notifications for groups, one-on-one messages, important messages, and messages outside of work times.

Next, the system as described was implemented into a digital prototype. This prototype was evaluated with a variety of experts and users to be able to answer subquestion 4:

Which aspects of the proposed prototype could be improved considering its usability?

Several specific design aspects with an opportunity for improvement have been identified during a cognitive walkthrough and heuristic evaluation with User Experience Design experts. Even after reconsidering or improving those aspects, usability problems were identified during the usability testing with Ons users. Specifically, potential for improvement considering usability was found for creating a group, adding a chat reference, and forwarding email in both desktop and mobile version of the prototype, and finding folders and adding someone to a group especially for the mobile prototype. These aspects were improved for the final prototype.

Then, the last subquestion,

What are the opinions of users with varying professions from disabled care, mental health care and elderly care about the newly proposed functions?

can be answered using the qualitative outcomes of the user evaluation. From these outcomes, it can be concluded that the overall opinion about all newly proposed functions was very positive. Referencing and the creation of custom groups were functions that all of the participants would use. For the other newly proposed functions, the majority of the participants would at least consider using them, and even came up with interesting use scenarios. Therefore, to answer the main research question of this research,

How to redesign Ons Berichten to meet the current needs of its users?

it is recommended to implement the functions as proposed before the evaluations, in the priority order as presented in Section 8.2. These functions include a chat and an inbox with email, supporting options for referencing, attachments, marking messages as important before sending, editing and deleting chat messages, organising the inbox with stars and folders, custom and editable groups, and customizable notification preferences. A more extensive description of the recommended functions and design is described and shown in Chapter 9: Final Proposal.

9.2. Limitations of the research

Some limitations are present in this research. Firstly, even though 9 people with varying professions participated in the user evaluation, this is not enough to represent all different users of Ons. Considering the 9 different professions as have been determined in Chapter 4 among the 3 different sectors, one would already need 27 participants to have one participant for every profession in every sector. This could have potentially caused missing or under-emphasising points for improvement of the prototype.

While still considering the usability tests, only 30 minutes were planned for every test session. It was found during the testing that the sessions lasted longer than 30 minutes. Ideally, an hour time would have been planned for the sessions, to enable more in-depth discussion during the interviews.

Moreover, reliable generalization of the research results among all Dutch elderly care, mental health care and disabled care organisations cannot be guaranteed since the research has been performed with only Ons users. The use of the Ons software might cause specific behaviour that causes a bias among the results of this result when wanting to apply the findings outside of the Ons context.

Then, some of the proposed functions have not been technically worked out. Considering for example the referencing, the interface is created from the Ons Berichten perspective. However, the way in which Ons Berichten could be linked to the other applications that include the item that is referred to has not been examined yet. The same applies to exporting messages to the client record or receiving messages from external parties.

Moreover, some of the proposed designs have not been evaluated. The adjustments made to the design based on the feedback during the user evaluation still have to be evaluated to determine whether they improve the design.

Lastly, a more extensive needs assessment could have been performed by using more user research methods. This research, for example, does not include a task analysis, contextual interviews, scenarios, personas, individual user interviews, and focus group with users, though these research methods would have been appropriate to learn more about the way of working and needs of the users. Unfortunately, the scope of this research made it necessary to select a limited set of research methods. The same applies to the evaluation methods: Though four proper methods for the evaluation of the functions and usability have been applied, no information has been collected yet about the use of the application in a natural setting.

9.3. Relevance of the findings

As presented in the background research of Chapter 2, much information on communication among care professionals is already available. Especially the literature review on communication tools in health care performed as part of the Related Work presents several interesting insights learned from other communication tools. These reviews include both field studies and controlled trials, and consider both communication among care professionals and connecting care professionals digitally with clients or informal caregivers. They also consider or implement the integration of communication tools with the electronic health record, as proposed in this research. However, these reviews and tools all focus on hospital care or elderly care. Research considering communication in disabled care and mental health care and the care professionals' needs is scarce. Moreover, especially email-inspired communication tools are reviewed in the related work. Integrating both chat and email for communication among the actors in the care team has not been proposed or researched before.

Moreover, the survey considering care communication in the current research provides, with its large

number of respondents, an unique representation of the way communication in elderly care, disabled care and mental health care happens, and the needs of the different care professionals. Though the survey respondents were all users of Ons, the survey was not focused on their Ons use. Therefore, it can provide useful information on the expected situation among non-Ons users as well.

Lastly, considering the relevance of the findings of this research for Nedap Healthcare, knowing who their users are and what they need considering communication is very valuable. Moreover, this research presents well-grounded recommendations for the new Ons Berichten. However, to be able to implement this new messaging function, some steps still need to be taken.

9.4. Future work

One of the findings of this research considers the use of unsecured communication tools in care context. Client data is often communicated over unsecured channels because secure solutions do not fit the needs of the professionals. Therefore, research into and the creation of proper secure communication tools for care professionals, informal caregivers, clients, and all other people with whom privacy-sensitive data is shared should be high on the research agenda. Moreover, the integration of such tools with each other, to providing an interconnected care network, needs more attention.

Considering future work for the new Ons Berichten specifically, several next steps can be undertaken in order to finetune the proposal and requirements presented in this research. Firstly, the last changes to the design should be reviewed. Then, research should be done to the ways in which the integration with other applications can be supported. Before the functions dependent on other applications can be implemented, the applications owners or engineers have to agree on modifying their application to enable the integration as well. This counts for both referencing and contact with external parties. For contact with clients or informal caregivers, for example, a connection to a client portal would be necessary. Then, a next step could be the technical implementation of the new Ons Berichten. Once the application works and is integrated in the Ons context, a pilot study could be performed.

This pilot study could be a field test that helps assess the way in which the proposed application supports the users in real life setting. Starting with a small group of users, feedback about the use could be collected, and while improving the application, the pilot could be extended to more users to eventually be made available to all of the users of the current application. Ideally, the integration with other applications would be implemented for this pilot as well.

Moreover, or alternatively, an A/B test could be performed for the separate functions, to see whether the changes are actually considered to be improvements by the users. During such a test, the experience of users using the old and the new version could be compared.

References

[1] Detlev H. Smaltz. Quantifying the Economic Impact of Communication Inefficiencies in U.S. Hospitals. *Journal of Healthcare Management*, 55(4):281–282, 2010.

[2] Jennifer Weller, Matt Boyd, and David Cumin. Teams, tribes and patient safety: Overcoming barriers to effective teamwork in healthcare. *Postgraduate Medical Journal*, 90(1061):149–154, 2014.

[3] K.M. Haig, S. Suttons, and J. Whittington. SBAR: A shared mental model for improving communication between clinicians. *Joint Commission Journal on Quality and Patient Safety*, 2006.

[4] J. H. Larrabee, C. Lynne Ostrow, Mary Lynne Withrow, Michelle A. Janney, Gerald R. Hobbs Jr., and Christopher Burant. Predictors of patient satisfaction with inpatient hospital nursing care. *Research in Nursing and Health*, 27(4):254–268, 2004.

[5] Dana Tschannen and Beatrice J. Kalisch. The impact of nurse/physician collaboration on patient length of stay. *Journal of Nursing Management*, 17(7):796–803, 2009.

[6] Marina Riga, Athanassios Vozikis, Yannis Pollalis, and Kyriakos Souliotis. MERIS (Medical Error Reporting Information System) as an innovative patient safety intervention: A health policy perspective. *Health Policy*, 119(4):539–548, 2015.

[7] Anjali Choudhary and Vineeta Gupta. Teaching communications skills to medical students: Introducing the fine art of medical practice. *International Journal of Applied and Basic Medical Research*, 5(4):41, 2015.

[8] Mallory Williams, Nathanael Hevelone, Rodrigo F. Alban, James P. Hardy, David A. Oxman, Ed Garcia, Cristina Thorsen, Gyorgy Frendl, and Selwyn O. Rogers. Measuring Communication in the Surgical ICU: Better Communication Equals Better Care. *Journal of the American College of Surgeons*, 210(1):17–22, 2010.

[9] L. Lingard, S. Espin, S. Whyte, G. Regehr, G. R. Baker, R. Reznick, J. Bohnen, B. Orser, D. Doran, and E. Grober. Communication failures in the operating room: An observational classification of recurrent types and effects. *Quality and Safety in Health Care*, 13(5):330–334, 2004.

[10] The Joint Commission. Sentinel Event Data 2004 – 2013. Technical report.

[11] ACSQHC. *Standard 6 Clinical Handover Safety and Quality Improvement Guide Australian Commission on Safety and Quality in Health Care*. Number October. 2012.

[12] IPEC. Core competencies for interprofessional practice: Report on an expert panel. *American Association of Colleges of Nursing*, (May):56, 2011.

[13] M. Jacobs, Broese Van M. Groenou, and D. Deeg. The role of caregivers' dispositions in informal-formal caregiver discussion. *Tijdschrift voor Gerontologie en Geriatrie*, 45(2):69–81, 2014.

[14] Ger Palmboom and Jeanette Pols. *Wa bezielt de mantelzorger?* Number c. 2008.

[15] Alcione Leite Silva and Teixeira. The needs of informal caregivers of elderly people living at home: An integrative review. *Scandinavian Journal of Caring Sciences*, 27(4):792–803, 2013.

[16] van Dongen. Interprofessional collaboration in primary care teams. (2017), 2017.

[17] Marlène Karam, Isabelle Brault, Thérèse Van Durme, and Jean Macq. Comparing interprofessional and interorganizational collaboration in healthcare: A systematic review of the qualitative research. *International Journal of Nursing Studies*, 79(December 2016):70–83, 2018.

[18] Kevin Grumbach and Thomas Bodenheimer. A primary care home for Americans: Putting the house in order. *Journal of the American Medical Association*, 288(7):889–893, 2002.

[19] Catharina Carolina De Jong, Wynand J.G. Ros, and Guus Schrijvers. The effects on health behavior and health outcomes of internet-based asynchronous communication between health providers and patients with a chronic condition: A systematic Review. *Journal of Medical Internet Research*, 16(1), 2014.

[20] Cynthia M. Thomas, Evelyn Bertram, and Doreen Johnson. The SBAR Communication Technique. *Nurse Educator*, 34(4):176–180, 2009.

[21] Charlotte Tang, Yunan Chen, Karen Cheng, Victor Ngo, and John E. Mattison. Awareness and hand-offs in home care: coordination among informal caregivers. *Behaviour and Information Technology*, 37(1):66–86, 2018.

[22] Andreas Xyrichis and Karen Lowton. What fosters or prevents interprofessional teamworking in primary and community care? A literature review. *International Journal of Nursing Studies*, 45(1):140–153, 2008.

[23] Chad Boult and G. Darryl Wieland. Comprehensive primary care for older patients with multiple chronic conditions: "Nobody rushes you through". *JAMA - Journal of the American Medical Association*, 304(17):1936–1943, 2010.

[24] Craig E. Kuziemsky, Elizabeth M. Borycki, Mary Ellen Purkis, Fraser Black, Michael Boyle, Denise Cloutier-Fisher, Lee Ann Fox, Patricia MacKenzie, Ann Syme, Coby Tschanz, Wendy Wainwright, and Helen Wong. An interdisciplinary team communication framework and its application to healthcare 'e-teams' systems design. *BMC Medical Informatics and Decision Making*, 9(1):1–15, 2009.

[25] Teja Voruganti, Eva Grunfeld, Trevor Jamieson, Allison M. Kurahashi, Bhadra Lokuge, Monika K. Krzyzanowska, Muhammad Mamdani, Rahim Moineddin, and Amna Husain. My team of care study: A pilot randomized controlled trial of a web-based communication tool for collaborative care in patients with advanced cancer. *Journal of Medical Internet Research*, 19(7), 2017.

[26] Irene Aasmul, Bettina S. Husebo, Elizabeth L. Sampson, and Elisabeth Flo. Advance care planning in nursing homes - Improving the communication among patient, family, and staff: Results from a cluster randomized controlled trial (COSMOS). *Frontiers in Psychology*, 9(DEC):1–10, 2018.

[27] Ann Scott Blouin. Improving hand-off communications: New solutions for nurses. *Journal of Nursing Care Quality*, 26(2):97–100, 2011.

[28] P. Vermeir, D. Vandijck, S. Degroote, R. Peleman, R. Verhaeghe, E. Mortier, G. Hallaert, S. Van Daele, W. Buylaert, and D. Vogelaers. Communication in healthcare: A narrative review of the literature and practical recommendations. *International Journal of Clinical Practice*, 69(11):1257–1267, 2015.

[29] Anette Johnsson, Petra Wagman, Åse Boman, and Sandra Pennbrant. What are they talking about? Content of the communication exchanges between nurses, patients and relatives in a department of medicine for older people—An ethnographic study. *Journal of Clinical Nursing*, 27(7-8):e1651–e1659, 2018.

[30] Sofian Berrouiguet, Enrique Baca-García, Sara Brandt, Michel Walter, and Philippe Courtet. Fundamentals for future mobile-health (mHealth):A systematic review of mobile phone and web-based text messaging in mental health. *Journal of Medical Internet Research*, 18(6):1–16, 2016.

[31] L. G. Conn, L. Lingard, S. Reeves, K. L. Miller, A. Russell, and M. Zwarenstein. Communication channels in general internal medicine: a description of baseline patterns for improved interprofessional collaboration. *Qualitative health research*, 19(7):943–53, 2009.

[32] Nadzam DM. Nurses' role in communication and patient safety. *Journal of nursing care quality*, 24(3):184–188, 2009.

[33] Jelle Stoffers. The promise of eHealth for primary care: Opportunities for service delivery, patient–doctor communication, self-management, shared decision making and research. *European Journal of General Practice*, 24(1):146–148, 2018.

[34] Cristina Verea Linares and Johno Breeze. Is instant messaging the future of workplace communication for oral and maxillofacial surgery? *Faculty Dental Journal*, 6(4):180–186, 2015.

[35] Jacqui Allen, Goetz Ottmann, and Gail Robers. Multi-professional communication for older people in transitional care: A review of the literature. *International Journal of Older People Nursing*, 8(4):253–269, 2013.

[36] Robert Wu, Peter Rossos, Sherman Quan, Scott Reeves, Vivian Lo, Brian Wong, Mark Cheung, and Dante Morra. An evaluation of the use of smartphones to communicate between clinicians: A mixed-methods study. *Journal of Medical Internet Research*, 13(3), 2011.

[37] Pradeep Nair and Harikrishnan Bhaskaran. The emerging interface of healthcare system and mobile communication technologies. *Health and Technology*, 4(4):337–343, 2015.

[38] Jeremy Goldfarb, Ahmed Kayssi, Karen Devon, Peter G. Rossos, and Tulin D. Cil. Smartphones and Patient Care: Exploring the Use of Text-Based Messaging for Patient-Related Communication. *Surgical Innovation*, 23(3):305–308, 2015.

[39] Susan P. Kossman, Leigh Ann Bonney, and Myoung Jin Kim. Electronic health record tools' support of nurses' clinical judgment and team communication. *CIN - Computers Informatics Nursing*, 31(11):539–544, 2013.

[40] Shoshana H. Bardach, Kevin Real, and David R. Bardach. Perspectives of healthcare practitioners: An exploration of interprofessional communication using electronic medical records. 31(3):300–306, 2017.

[41] Ellen A A Jaatun, Kari Sand, and Martin Gilje Jaatun. HealthIn : Toward a New Paradigm for Physician-Patient Communication HealthIn : Toward a New Paradigm for Physician-Patient Communication. (October 2014), 2013.

[42] Andreas M. Kaplan and Michael Haenlein. Users of the world, unite! The challenges and opportunities of Social Media. *Business Horizons*, 53(1):59–68, 2010.

[43] Marjolijn L. Antheunis, Kiek Tates, and Theodoor E. Nieboer. Patients' and health professionals' use of social media in health care: Motives, barriers and expectations. *Patient Education and Counseling*, 92(3):426 – 431, 2013. The Science of Health Communication: Impressions from the International Conference on Communication in Healthcare in St Andrews, Scotland, UK.

[44] A. Benetoli, T.F. Chen, and P. Aslani. How patients' use of social media impacts their interactions with healthcare professional. *Patient Education and Counseling*, 101(3):439–444, 2018.

[45] Shashi Pratap Singh, Ankita Wal, and Ruchi Tiwari. Effect of Social Media in Health Care : Uses , Risks , and Barriers. *World Journal of Pharmacy and pharmaceuticals*, 5(7):282–303, 2016.

[46] Daniel Robledo. Integrative use of Social Media in Health Communication. *Online Journal of Communication & Media Technologies*, 2(4):77–95, 2012.

[47] Kristi L. Kirschner, Valarie Blake, Danielle Hahn, Farris K. Timimi, and Mark Huang. Social Media: Boon or Boondoggle for Health Care Professionals? *PM and R*, 5(4):335–339, 2013.

[48] Raman R. Khanna, Robert M. Wachter, and Michael Blum. Reimagining electronic clinical communication in the post-pager, smartphone era. *JAMA - Journal of the American Medical Association*, 315(1):21–22, 2016.

[49] Sherman D. Quan, Robert C. Wu, Peter G. Rossos, Teri Arany, Silvi Groe, Dante Morra, Brian M. Wong,

Rodrigo Cavalcanti, William Coke, and Francis Y. Lau. It's not about pager replacement: An in-depth look at the interprofessional nature of communication in healthcare. *Journal of Hospital Medicine*, 8(3):137–143, 2013.

[50] Alireza Sahami Shirazi, Niels Henze, Tilman Dingler, Martin Pielot, Dominik Weber, and Albrecht Schmidt. Large-scale assessment of mobile notifications. *Conference on Human Factors in Computing Systems - Proceedings*, pages 3055–3064, 2014.

[51] S. D. Quan, D. Morra, F. Y. Lau, W. Coke, B. M. Wong, R. C. Wu, and P. G. Rossos. Perceptions of urgency: Defining the gap between what physicians and nurses perceive to be an urgent issue. *International Journal of Medical Informatics*, 82(5):378–386, 2013.

[52] B. Kamps. Optimalisatie aanmelding en communicatie tussen zorginstellingen. *Verbetering ICT rondom binnen de oncologische (thuis)zorg*, pages 1–2, 2012.

[53] Annet Sollie and Bart Timmers. Apptip Siilo. *Huisarts en wetenschap*, 62(9):70–70, 2019.

[54] H.J. Schuiteman. *The use of ICT to support informal caregiving in eldercare: a systemic approach*. PhD thesis, Wageningen, 2017.

[55] Xiaoshi Zhang, Martijn H. Vastenburg, and Natalia Romero Herrera. Design of a Caregiver Collaboration Tool Using Subtle Group Awareness. In *Design4Health*, number July, pages 324–332, 2011.

[56] Maged N. Kamel Boulos, Dean M. Giustini, and Steve Wheeler. Instagram and WhatsApp in health and healthcare: An overview. *Future Internet*, 8(3), 2016.

[57] Vishesh Khanna, Senthil N. Sambandam, Arif Gul, and Varatharaj Mounasamy. "WhatsApp"ening in orthopedic care: a concise report from a 300-bedded tertiary care teaching center. *European Journal of Orthopaedic Surgery and Traumatology*, 25(5):821–826, 2015.

[58] Maurice Mars, Richard E Scott, and Malina Jordanova. Whats(h)app(ening) in Telemedicine? *Journal of the International Society for Telemedicine and eHealth*, 4(e1):1–2, 2016.

[59] Kurubaran Ganasegeran, Pukunan Renganathan, Abdul Rashid, and Sami Abdo Radman Al-Dubai. The m-Health revolution: Exploring perceived benefits of WhatsApp use in clinical practice. *International Journal of Medical Informatics*, 97:145–151, 2017.

[60] Feroze Kaliyadan, K. T. Ashique, Soumya Jagadeesan, and Boby Krishna. What's up dermatology? A pilot survey of the use of WhatsApp in dermatology practice and case discussion among members of WhatsApp dermatology groups. *Indian Journal of Dermatology, Venereology and Leprology*, 82(1):67–69, 2016.

[61] David B. Brecher. The use of Skype in a community hospital inpatient palliative medicine consultation service. *Journal of Palliative Medicine*, 16(1):110–112, 2013.

[62] J E Battley, L Balding, O Gilligan, C O'Connell, and T O'Brien. From Cork to Budapest by Skype: living and dying. *BMJ Support Palliat Care*, 2(2):168–9, 2012.

[63] Valerie J.M. Watzlaf, Sohrab Moeini, Laura Matusow, and Patti Firouzan. VOIP for Telerehabilitation: A Risk Analysis for Privacy, Security and HIPAA Compliance: Part II. *International Journal of Telerehabilitation*, 3(1):3–14, 2011.

[64] Ilse Zwart-Olde and Marieke van Wieringen. Zorgnetwerken van Kwetsbare Ouderen: Veldwerkverslag. pages 1–55, 2013.

[65] Suzanne Verheijden. Steeds meer aandacht voor digitale vaardigheden in de zorg. *ICT&Health*, (03), 2019.

[66] Centre for Developmental Disability Studies. *Health Care in People with Intellectual Disability Guide-*

lines for General Practitioners. 2006.

[67] Ryan Watkins, Maurya West Meiers, and Yusra Laila Visser. *A Guide to Assessing Needs*. 2012.

[68] James W. Altschuld and Ryan Watkins. A primer on Needs Assessment: More Than 40 Years of Research and Practice. *New Directions for Evaluation*, 147(2):117–127, 2015.

[69] Joseph Check and Russell K Schutt. Research Methods in Education, 2012.

[70] Virginia Braun and Victoria Clarke. Chapter 4: Thematic Analysis. *APA Handbook of Research Methods in Psychology*, 2:57–71, 2012.

[71] Janet Kuhn. Decrypting the moscow analysis. *The workable, practical guide to Do IT Yourself*, 5, 2009.

[72] Cheri Mullins. Responsive, mobile app, mobile first: Untangling the UX design web in practical experience. *SIGDOC 2015 - Proceedings of the 33rd Annual International Conference on the Design of Communication*, 2015.

[73] Jari Pekka Voutilainen, Jaakko Salonen, and Tommi Mikkonen. On the Design of a Responsive User Interface for a Multi-device Web Service. *Proceedings - 2nd ACM International Conference on Mobile Software Engineering and Systems, MOBILESoft 2015*, pages 60–63, 2015.

[74] Monique W.M. Jaspers. A comparison of usability methods for testing interactive health technologies: Methodological aspects and empirical evidence. *International Journal of Medical Informatics*, 78(5):340–353, 2009.

[75] Riccardo Mazza and Alessandra Berrè. Focus group methodology for evaluating information visualization techniques and tools. *Proceedings of the International Conference on Information Visualisation*, pages 74–78, 2007.

[76] Tasha Hollingsed and David G. Novick. Usability inspection methods after 15 years of research and practice. *SIGDOC'07: Proceedings of the 25th ACM International Conference on Design of Communication*, (May):249–255, 2007.

[77] Jakob Nielsen. How to conduct a heuristic evaluation. *Nielsen Norman Group*, 1:1–8, 1995.

[78] Morten Hertzum. User testing in industry: A case study of laboratory, workshop, and field tests. *Proceedings of the 5th ERCIM Workshop on User Interfaces for All*, pages 59–72, 1999.

[79] Jennifer L Ward, Steve Hiller, Jennifer L Ward, and Steve Hiller. Usability Testing , Interface Design , and Portals. 0826(January), 2016.

[80] Anne Kaikkonen, Aki Kekäläinen, Mihael Cankar, Titti Kallio, and Anu Kankainen. Usability testing of mobile applications: a comparison between laboratory and field testing. *Journal of Usability Studies*, 1(1):4–16, 2005.

[81] Xu Sun and Andrew May. A comparison of field-based and lab-based experiments to evaluate user experience of personalised mobile devices. *Advances in Human-Computer Interaction*, 2013, 2013.

[82] Hassan A. Aziz. Comparison between Field Research and Controlled Laboratory Research. *Archives of Clinical and Biomedical Research*, 01(02):101–104, 2017.

Appendices

A. Interviews

A.1. Interview Questions

A.1.1. Sales managers

The sales managers at Nedap focus on either elderly care, disabled care, or mental health care. They communicate with the organisations that use Nedap Ons, and promote the application to potential users. Therefore, they have good insight into communication within the sector they focus on. The interviews with the sales managers are therefore focused on learning about communication within the user sectors: Who communicates, what is communicated, and how is it communicated? Additionally, complications users mention are collected.

The following questions are used for the interviews with the sales managers:

1. What work do you do and how does it connect you to the mental health care/disabled care/elderly care?

   Who communicates?

2. What does the care team of a client in mental health care/disabled care/elderly care often look like?

   What is communicated?

3. What is communicated within this care team?
4. What is communicated with the family of the client?

   How is it communicated?

5. How do these actors communicate with each other? What channels are used?
6. What goes well with this communication?
7. What goes wrong with this communication?
8. How do the care professionals communicate with informal carers?
9. What goes well with this communication?
10. What goes wrong with this communication?

    Other

11. What problems with or desires for communication within mental health care/disabled care/elderly care have been pronounced to you?
12. What would the ideal communication tool be for mental health care/disabled care/elderly care? What would its functions be?

A.1.2. CarenZorgt

CarenZorgt is part of Nedap Ons, and facilitates communication between formal and informal caregivers. Ons berichten facilitates the formal caregiver side of this communication. Integration should be well approached and duplicate functions should be avoided. It is therefore important that the vision and use of CarenZorgt are well understood. Therefore, the product owner of CarenZorgt is interviewed with the following questions:

1. What work do you do and how does it connect you to the mental health care/disabled care/elderly care?
2. What is the goal of CarenZorgt?
3. Which functions does CarenZorgt have?
4. What is the difference between CarenZorgt and Ons berichten?
5. What does a care network within CarenZorgt often look like?
6. What is communicated using CarenZorgt?
7. Which problems with or desires for CarenZorgt have been pronounced to you?

A.1.3. Elderly Care Ons use information

Lastly, one of Nedap's software developers with a background in technical Healthcare works in a care facility for elderly and uses Ons berichten himself. This could give some valuable first use information. The following questions were asked to this developer to gain some first insights into the use of Ons berichten and communication channels:

1. What work do you do and how does it connect you to the mental health care/disabled care/elderly care?
2. How do you use Ons berichten?
3. How do you communicate with parties outside Nedap Ons?
4. How do you communicate with your clients?
5. How do you communicate with informal caregivers?
6. What other communication channels do you use?
7. Why do you use those instead of Ons berichten?
8. How do you communicate in case of emergency?
9. What do you think are good things of the current Ons berichten?
10. How do you think Ons berichten could be improved?
11. What would the ideal communication tool be for mental health care/disabled care/elderly care? What would its functions be?

A.2. Interview Nedap Sales manager mental health care

A.2.1. Key points

Mark Nijkamp is part of the Ons Salesteam for Mental Health Care, and used to work at another developer/supplier for mental health care. He has been part of the implementation of Ons for mental health care since the very beginning.

Who communicates?
The care team of a client in mental health care normally consists of a practitioner with the final responsibility (eindverantwoordelijke), co-practitioners (therapists, psychologists, psychiatrists..), general practitioner, care assistants, and family. With for example children, schools might be included in communication as well.

What is communicated?
The practitioners inform the general practitioner about the diagnosis and care plan. This same information could be shared with the (family of the) client, but with less jargon and more sensitivity. Sometimes a questionnaire or report about a meeting is shared. Officially, the (family of the) client is allowed to see everything the practitioners document. Sometimes, the practitioners would like to be able to select information which is not free to view for the (family of the) client, or change the information before it is shared. Among each other, the practitioners discuss the progress of their clients. It is sometimes relevant to share with other practitioners what you discussed with the client. Sometimes, urgent messages, like "Do not approach the client on your own because of aggressive behavior" need to be shared. And sometimes you just want to send a quick message to all practitioners of the patient.

How is it communicated?
Diagnosis and care plan are shared with the general practitioner by secured email (Like ZorgMessenger) or mail. For the communication with the (family of the) client, mostly CarenZorgt is used. This is a Nedap app connected to Ons with which you can access the client's dossier, comment on it, and communicate with the practitioners. When the practitioners receive these messages, they don't get a clear notification. Invitations, reports, contracts, care plans, or other things that need to be signed are sent by mail. It would be better to do this digitally, or even be able to digitally sign within the Nedap app and after returning them automatically add them to the dossier and notify the practitioner that it is signed. Urgent messages for practitioners should pop up when opening the client in the app. Signing care plans happens digitally with Caren. Currently, Whatsapp and Email are used by the practitioners, even though these are not as safe as Nedap Ons is. More client context and extra functions within Ons berichten could help make it a better alternative. Sometimes, safe alternatives like "ZorgMessenger" are used. The ideal communication tool would be an app within the Ons application, with which you can send messages in which you can tag a client. When sending a message about a client, an automatic authorization procedure is executed to give the person you send the message to authorization to access the client info. And linking to "to do items" in emails would be practical. Interprofessionally, most communication happens with Ons, by using each others rapports, and planning/scheduling. Additionally, Ons berichten is used. To send a document, sometimes email is used. Calls are used for emergencies. Expectedly, Whatsapp is still used as well, suggesting that Ons is not a proper alternative yet. Face-to-face updates are shared during an MDO. The perfect communication tool for disabled care would be an app, safe, with the opportunity for both group and one-on-one messaging and picture sharing.

A.3. Interview Nedap Sales manager disabled care

A.3.1. Key points

Anne Wieskamp – te Linde has a sales role within Nedap Healthcare. She focuses on the disabled care. This is a very broad target group ranging from people with a light handicap still living at home to severely handicapped people in need of constant care, both physically and mentally.

Who communicate?
The disabled can be separated into lightly handicapped in need of some support but living at home (for example ASD, low IQ, visually impaired), medium handicapped, in need of some care and more support and living in an institution (for example Down Syndrome), and people with a severe handicap and need of much care and support, institutionalized as well (for example heavily physically disabled).
Considering care teams and communication, it is convenient to divide these people into the following three groups: Ambulant, living, and day care.
In ambulant care, there are mostly a few personal supervisors involved, with one primary supervisor. They visit the client at home to offer support. They have a very personal relationship with the client. Apart from those, family is included in the care network, and potentially a mentor from school or supervisor from day care.
In living care, you have a team of health professionals and caregivers offering care and support. The more severe the handicap, the larger the care team. There is a behavioral expert involved, as well as often a physiotherapist, psychologist, and always an AVG physician (disabled doctor, like a general practitioner to them). The parents of the client really want to be involved as well.
At day care, a few supervisors are present. Every client has a main supervisor.

What is communicated?
In ambulant care, because of the close one on one relationships, personal messages are sent. If the client has a problem or is not feeling well, this is communicated with one of the personal supervisors. In living care, there is communication from health professionals to the family through the dossier. Families wish to be able to receive images as well, to share content of, for example, a fun activity. Sometimes, some serious conversations are held about the status of the client. Between health care professionals, the care is aligned and the progress of the client is discussed. They read each other's rapports, and send each other documents if necessary. With day care, it is important to communicate with the care facility about transport or for example holidays. A lot of all communication is about planning and scheduling.

How is it communicated?
The communication with the family happens mostly using CarenZorgt: The family can read the dossier and respond to it. As an alternative, they use FamilieNet, because this tool has the option to share pictures as well. Apart from that, families communicate face-to-face with some care professionals. They call for emergencies, but calling and emailing are used less than CarenZorgt. One of the problems the clients experience with CarenZorgt is the lack of a one-to-one message function. Everything you do in CarenZorgt can be seen by anyone related to the client. Therefore, WhatsApp is still often used. In Ambulant care, WhatsApp is the number one communication tool between clients and professionals.

A.4. Interview Nedap Sales manager elderly care

A.4.1. Key points

Jan-Willem Mooij is part of the elderly care sales team of Nedap Healthcare. This means he visits organisations that are not working with the products of Nedap yet to stimulate them to decide to do so.

Who communicate?
Extramural: The district nurse, caregivers, nurses, VIGers, help with cleaning, supervisor.. And sometimes extra help like a case manager for someone with dementia (could be in or outside the organisation). Intramural: First contact carer, for example the care coordinator, nurses, caregivers, practitioners like general practitioner, physiotherapists, occupational therapists and speech therapists.. Sometimes within the organisations and sometimes not.

What is communicated?
When there is a care request, information about the problem and needed care is exchanged between the general practitioner and care facility. Then, within the team, information is exchanged about the state of the client, the situation of that day, how is the client doing?

How is it communicated?
The care dossier is used as communication tool about the client, because they can document in it and read it. Whatsapp is often used among the carers. Then also email is used. Outside of the organisation email is used as well. Sometimes secure using ZorgMail, but not always. Communication with informal caregivers happens using Email, calls, written documents (not digital) and sometimes WhatsApp as well. Sometimes CarenZorgt is used. The client, if still able to, uses CarenZorgt as well.

A.5. Interview Nedap Software engineer/Elderly care specialist

A.5.1. Key points

My name is Michiel Klitsie and I work at Careas in elderly care. As a technical doctor, I spend one day a week as specialist elderly care, and one day focusing on care technologies.

Who communicates?
My care team consists of caregivers, nurses, specialists, psychologists, and physiotherapists. Within the organization, there are carers (niveau 3/4) and nurses (niveau 5/6), nurse specialists, elderly care specialists, and volunteers. The paramedical specialists or not part of the organisation. These could be psychologists, physiologists, occupational therapists, speech therapists.. I communicate with external companies and management as well.

What is communicated?
I use Ons berichten to communicate who is present, if something special happens, or to share good news, work-related. It is allowed to talk about clients on Ons berichten (and just there) so that's what we use it for. Ons is used for quick communication: I found this in your mailbox, but also group announcements, one on one talk about a client, requests for consult, or to inform me someone has passed away. For home care, the carers communicate about planning. With families, sometimes sensitive information about the client's health is shared, but you also have to talk to them about for example a lack of pants that fit the client or to make an appointment.

How is it communicated?
With my colleagues, I call, email, use Nedap Ons, or our facebook-ish platform OnderOns for non-work-related things. We also have an MDO. Video calling would be nice, but we do not use it yet. You see that in ambulant care, more frequent and short messages are sent with Ons. They sometimes use calling or WhatsApp to contact a family, especially when the family does not use Caren. Since the clients often do not use computers or smartphones, you just talk with them. Their families stay up to date with CarenZorgt, and we can request them things in the dossier to which they respond. If something is sensitive or urgent, they are called. We often communicate with general practitioners by calling, and sometimes use Zorgmail or Zorgdomein. Zorgmail is secure email, and zorgdomein connects different software, among which Ons, with each other. When an external specialist is involved in the care, they get a Ons account for communication and access to the dossier.

Ons Berichten: Value and opportunity
There could be better promotion of the fact that Ons berichten is safe for the sharing of client related information. This is a real value. Another value is the connection to the rest of Ons: You easily find your collegues, and do not have to manually input their information. However, finding and referring to a client is harder: It would be good if you could just easily find a client and refer to them in a message, so the receiver can just as easily go to their page. The same for planning items, dossier items, etc. By sharing the information with someone, the receiver could automatically get access to this information. A preview of what kind of information is referred to would be nice as well. And a connection to Zorgdomein and Caren so you can send them messages from Ons berichten as well. I would also like to be able to create my own groups, and delete them again if they are unneccesary after time has passed. Then, messaging using Caren without adding the message to the dossier would be nice. And the other way around: Choosing to add a message or thread to the dossier as well. Lastly, I would like to see a videochat/calling function in Ons Berichten, for client contact, informal caregiver contact, and collegue contact.

A.6. Interview product owner CarenZorgt

A.6.1. Key points

Peter Leppers is productowner of CarenZorgt. CarenZorgt is a Nedap desktop app made for clients instead of care professionals. It focuses on the communication between clients and care professionals. It supports communication, information sharing, and giving the client and informal caregivers insight into the care process. Additionally, communication between informal caregivers is supported.

The functions CarenZorgt offers are: Insight into the dossier, messages between informal caregivers and formal and informal caregivers, and a client calendar. With the message function, informal caregivers can share documents/images with each other. Though messaging from formal to informal caregivers is possible, everyone within the "trust group" of the client will be able to see the messages: One-on-one messaging is not an option. A new future of the app is "Client Story": A feature with which the client story can be described, for formal caregivers to get a better understanding of who the client is. This story can include a life description, goals, dreams, or important happenings like marriage or childbirth. Input for CarenZorgt from the formal caregivers is provided via Ons: They do not use a separate CarenZorgt application. The CarenZorgt interface is kept very simple, since users are not necessarily familiar with digital applications.

The informal care network of a client using CarenZorgt often exists of a client + two or three informal carers. Some clients do not need any informal carers. The informal carers are mostly parents, children, siblings or neighbours. Current CarenZorgt users long for the ability to send pictures to/from informal to/from formal caregiver and one-on-one messaging.

B. Previous evaluations

B.1. Onderzoek 'Ons Berichten' 1.0

In onderzoek Ons Berichten 1.0 is gekeken naar in hoeverre 'Ons Berichten' aansluit op de manier waarop de zorg vandaag de dag werkt. M.a.w. sluit de huidige oplossing goed aan bij de doelgroep en op welke manier kan 'Ons Berichten' worden verbeterd, zodat we een optimale gebruikservaring creëren voor de klant? Hieruit kwamen verschillende onderwerpen en mogelijkheden om 'Ons Berichten' te verbeteren. Een aantal vraagstukken dienden nog geverifieerd te worden met de doelgroep en een aantal vraagstukken vergden meer onderzoek om er gedegen uitspraken over te doen. Onderzoeksrichtingen: overzichtelijk houden van de berichtenpagina, groepen/subteams, communicatie met externen en consistentie.

B.1.1. Onderzoeksvragen

1. Sluit 'Ons Berichten' aan op de manier waarop de zorg vandaag de dag werkt? Is de manier waarop 'Ons Berichten' momenteel is opgebouwd wenselijk?
2. Op welke manier kunnen we ervoor zorgen dat de webapplicaties (medewerkerportaal en webversie) en mobiele applicaties samen één geheel vormen?
3. Wat is de behoefte binnen de bestaande markten binnen Nedap Healthcare wat betreft de communicatie met cliënten?

B.1.2. Onderzoeksmethoden en technieken

Interviews: Eén-op-één interviews voor individuele ervaringen en ervaringen binnen de organisatie m.b.t. de berichtenfunctie. Kwalitatief waarbij op basis van vooraf vastgestelde vraagpunten een gesprek wordt aangegaan met de klant en waar interessant is dieper op wordt ingegaan op de besproken onderwerpen

Observatie: Op welke manier wordt de berichtenfunctie gebruikt door de verschillende zorgmedewerkers (feitelijk gedrag van klanten observeren)

Focusgroepen: Verkenning van groepsbeleving en gezamenlijk brainstormen

Feedback vanuit het Ons systeem: Zijn er klachten, opmerkingen of suggesties voor verbetering van gebruikers over de berichtenfunctie?

Statistieken: Zijn er opvallendheden?

B.1.3. Resultaten

Overzichtelijk houden van de berichtenpagina
Problemen:

1. Berichten zoeken: Het is niet mogelijk om even snel een bericht op te zoeken. Er is behoefte aan een zoekfunctie waarbij men op verschillende zoektermen kan zoeken: Naam (collega, client, team), datum, en onderwerp.
2. Berichten selecteren: Momenteel is er geen optie om verschillende berichten tegelijkertijd te selecteren om vervolgens, bijvoorbeeld, te verwijderen.

3. Berichtenbox organiseren: Momenteel kan een berichtenbox niet op bijvoorbeeld relevantie gesorteerd worden.
4. Berichten archiveren/doorsturen/verwijderen: De archiveer/doorstuur/verwijder functies zijn momenteel niet handig geimplementeerd.
5. Berichten automatisch naar team sturen: Mensen ontvangen veel voor hen irrelevante berichten omdat de berichten momenteel automatisch naar het hele team gestuurd worden.
6. Onderwerpregel toevoegen: Er is weinig overzicht in de inbox doordat de berichten geen 'Onderwerp' hebben.

Optimaliseren van de functionaliteit
Problemen:

1. Personen toevoegen aan conversatie: Soms is een conversatie al gestart, en wordt pas bedacht dat iemand anders hier ook aan mee moet doen. Deze persoon kan nu niet toegevoegd worden aan dat gesprek.
2. Foto's toevoegen: Er kunnen geen foto's aan de berichten toegevoegd worden.
3. Bijlages toevoegen: Er kunnen geen documenten aan de berichten toegevoegd worden.
4. Afwezigheidsassistent instellen: Het is niet mogelijk een automatisch bericht op te stellen bij afwezigheid.
5. Ontvangen/gelezen status zichbaar stelen: Het is belangrijk om te weten of iemand een bericht heeft gezien/gelezen: Momenteel is dit niet automatisch zichtbaar.
6. Groepen aanmaken: Er is een grote behoefte om naast teams ook zelf groepen aan te maken, bijvoorbeeld per discipline. Dit kan momenteel niet.
7. Meldingen ontvangen: Voor sommige disciplines is het belangrijk altijd meldingen te krijgen: Het is momenteel onduidelijk wanneer iemand wel of geen melding zal ontvangen.

Optimaliseren van de layout
Problemen:

1. Reageren op berichten: Er is veel verwarring met de layout van het reageren op berichten.
2. Hover state toevoegen: Symbolen zijn niet altijd duidelijk, er is extra uitleg nodig.
3. Ontvangers inzien: Binnen de webapplicatie kunnen niet alle ontvangers ingezien worden.
4. Consistentie aanbrengen: De functionaliteit en layout in de verschillende applicaties komen niet overeen.

Optimaliseren van de performance
Problemen:

1. Laden van gegevens: Berichten worden niet altijd meteen opgehaald, en het is onduidelijk of de inbox up-to-date is.
2. Beveiliging instellen: Er zijn problemen met de frequentie waarin mensen zich opnieuw moeten aanmelden.

Communiceren met externe zorgleveranciers

Met welke externen wordt gecommuniceerd en hoe?

- Mantelzorger: Telefoon, Caren, ECD
- Huisarts: ECD, Whatsapp, fax en telefoon
- Bewindvoerders: Mail en telefoon
- Huisartsassistent: Mail
- Transferpunten van ziekenhuizen: Pointsysteem
- Apotheker: Telefoon, face to face
- Dietiste: ECD
- Ergotherapeut: ECD
- Client: Telefoon of face to face
- Polikliniek: Telefoon of mail
- Verpleegkundige specialist: Mail
- Dementieconsulent
- Verzekering
- Dermatoloog
- Chirurg
- Internist
- Palliatief team
- Gemeente
- Vrijwilligersorganisatie (boodschappen)

B.2. Onderzoek 'Ons Berichten' 2.0

Apart from the research presented in section B.2, other, partially corresponding problems have been collected during conversations with app users and analysis of the app data:

Talking about a client: I want to be able to..

- Talk to anybody related to the client
- Reference the client when talking to somebody
  - Create report
- Keep in mind other Ons objects
  - Switch shifts
  - Reports

Better recipient selection: I want to be able to..

- Create dynamic teams
- Add people to a conversation
  - Forward messages
- Sub-threads for branches
- Reach next or previous person on shift
- Send messages to people at a certain location
- Send messages to people that are currently working

Manage messages better: I want to be able to..

- Use labels/folders
- Archive/delete message easily
- Easily add starrings/reminders
- See who read my message
- Add a topic to my message

Update messages: I want to be able to..

- Get logical notifications

Improve search: I want to be able to..

- Use CreadB for search

Reaching people at home: I want to be able to..

- Reach someone at home in case of urgency
- Know who to contact in case of urgency
- Have a manual setting to only get notifications when at work

Extended formatting: I want to be able to..

- Give my message a special layout
- Add several attachments to my message

Chain communication: I want to be able to..

- Communicate with clients
- Communicate with the client's network

C. Survey

C.1. Survey questions

The full survey is presented on the following pages. The survey has been created and distributed using Qualtrics[27]. This survey starts with a information page asking for the consent of the respondent. Then, the survey consists of multiple Blocks. The titles of these blocks "Default Question Block", "Block 9", etc. are presented in this document, but were not visible for the respondents.

[27] www.qualtrics.com

Block 6

Beste gebruiker van Ons,

Hartelijk dank voor uw bereidheid om deze vragenlijst in te vullen. Deze vragenlijst maakt deel uit van een onderzoek van de Universiteit Twente in samenwerking met Nedap Healthcare. In deze vragenlijst zullen vragen gesteld worden over uw communicatie op het werk. Deze vragen gaan niet alleen over Ons: Het gaat over alle manieren waarop u communiceert rondom de zorg, bijvoorbeeld tijdens een normaal gesprek of via een SMS bericht. Vragen over de mensen met wie u communiceert, dingen waarover u communiceert, en manieren waarop u communiceert zullen ons helpen een beeld te schetsen van hoe de communicatie binnen de zorg er aan toe gaat. Zo kunnen we Ons Berichten verbeteren om zo goed mogelijk op uw behoeftes in te spelen en een veilige en complete manier van communiceren aan te bieden.

Vragen over met wie u communiceert zullen meerkeuzevragen zijn met algemene antwoorden als “Artsen” en “Verpleegkundigen”. Hetzelfde geldt voor vragen over de content van de communicatie, met algemene antwoordopties als “Test resultaten” of “Planning van de zorg”. Er wordt niet om persoonlijke of medische informatie gevraagd, en het is ook niet de bedoeling dat u specifieke, cliënt gerelateerde content of andere privacy-gevoelige informatie deelt in deze vragenlijst.

Het invullen van deze vragenlijst kost ongeveer 10 minuten. Gegevens worden volledig anoniem en op veilige wijze verwerkt. Deelname is vrijwillig, wat betekent dat u op elk gewenst moment kunt stoppen met het invullen van de vragenlijst.

Indien u vragen heeft of graag meer informatie wilt ontvangen, kunt u contact opnemen met Kelly van Tol, email: k.m.vantol@student.utwente.nl

Voor klachten kunt u bij het secretariaat van de ethische commissie van de faculteit voor elektrotechniek, wiskunde en informatica van de Universiteit Twente terecht: P.O. Box 217,

7500 AE Enschede (NL), telefoon: +31 (0)53 489 6719; email: ethics-comm-ewi@utwente.nl).

Wanneer u de volgende stellingen selecteert geeft u aan het hiermee eens te zijn, en kunt u met de vragenlijst beginnen.

- [ ] Ik heb bovenstaande informatie gelezen en ga ermee akkoord
- [ ] Ik doe vrijwillig mee aan dit onderzoek
- [ ] Ik ben 18 jaar of ouder

Default Question Block

In welke sector werkt u? (Meerdere antwoorden mogelijk)

- [ ] Ouderenzorg
- [ ] Gehandicaptenzorg
- [ ] Geestelijke gezondheidszorg
- [ ] Jeugdzorg

Block 9

Binnen welke groep past u het best?

- ○ Administratief medewerkers
- ○ Begeleiders
- ○ Artsen
- ○ Cliënten
- ○ Coordinatoren
- ○ Management
- ○ Mantelzorgers
- ○ Overige hulp (Hulp in huishouden, ondersteuning, maaltijdverzorgers..)
- ○ Specialisten
- ○ Therapeuten
- ○ Verpleegkundigen
- ○ Verzorgenden

De volgende vragen gaan over al uw communicatie op het werk, en dus niet alleen over communicatie die via Ons plaatsvindt.

Met wie communiceert u of met wie zou u willen communiceren? (Meerdere antwoorden mogelijk)

- [ ] Administratief medewerkers
- [ ] Begeleiders
- [ ] Behandelaren (Artsen, specialisten, therapeuten)
- [ ] Cliënten
- [ ] Coordinatoren
- [ ] Management
- [ ] Mantelzorgers
- [ ] Overige hulp (Hulp in huishouden, ondersteuning, maaltijdverzorgers..)
- [ ] Specialisten
- [ ] Therapeuten
- [ ] Verpleegkundigen
- [ ] Verzorgenden

Block 4

Waarover communiceert u of waarover zou u willen communiceren? (Meerdere antwoorden mogelijk)

- [ ] Planning van de zorg
- [ ] Zorgplan van een client
- [ ] Bevonden symptomen
- [ ] Zorgmanagement
- [ ] Afspraken maken (meeting)
- [ ] Afspraken maken (overeenkomst)
- [ ] Voorgeschreven recepten
- [ ] Medicatie informatie of verandering
- [ ] Administratieve zaken
- [ ] Snelle updates
- [ ] Staat van de client
- [ ] Info uit het dossier
- [ ] Test resultaten
- [ ] Dringende informatie
- [ ] Client diagnose
- [ ] Vervolgregelingen voor een client
- [ ] Omgang met gedragsproblemen
- [ ] Zorgen
- [ ] Behoeftes
- [ ] Problemen
- [ ] Voortgang
- [ ] Verslagen
- [ ] Contracten
- [ ] Anders, namelijk..
- [ ] Anders, namelijk..
- [ ] Anders, namelijk..

Block 7

Wat communiceert u met cliënten en/of mantelzorgers?

	Cliënt	Mantelzorger
Informatie over de diagnose of toestand van de client	☐	☐
Erkenning	☐	☐
Aanmoediging	☐	☐
Sociale steun	☐	☐
Emotionele steun	☐	☐
Contracten	☐	☐
Uitnodigingen	☐	☐
Verslagen	☐	☐
Testuitslagen	☐	☐
Informatie over beschikbare hulp	☐	☐
Informatie over behandelingen	☐	☐
Informatie over omgang met een aandoening	☐	☐
Overleg afspraken (overeenkomst)	☐	☐
Overleg afspraken (meetings)	☐	☐
Anders, namelijk..	☐	☐
Anders, namelijk..	☐	☐
Anders, namelijk..	☐	☐

Block 5

Op wat voor manier communiceert u? (Zorg-gerelateerd) Via..

- [ ] Team meetings
- [ ] Spontane gesprekken/Gang
- [ ] Interdisciplinaire ronde
- [ ] Notities op papier
- [ ] Whiteboard notities
- [ ] Brieven
- [ ] Fax
- [ ] Memos
- [ ] Bellen
- [ ] Geluidsopname
- [ ] Berichten via WhatsApp
- [ ] Berichten via Siilo
- [ ] Berichten via ZorgMessenger
- [ ] Berichten via SMS
- [ ] Pager meldingen
- [ ] Client dossier (papier)
- [ ] Client dossier (Ons)
- [ ] Client portaal (CarenZorgt)
- [ ] Client portaal (Anders)
- [ ] Normale email
- [ ] ZorgMail
- [ ] Email met ZIVVER
- [ ] Beeldbellen
- [ ] Anders, namelijk..
- [ ] Anders, namelijk..
- [ ] Anders, namelijk..

Block 3

U heeft (een) manier(en) van communiceren geselecteerd waarvan wij benieuwd zijn waarom u deze gebruikt.

Om welke redenen gebruikt u WhatsApp werk-gerelateerd?

Om welke redenen gebruikt u Siilo?

Om welke redenen gebruikt u ZorgMessenger?

Om welke redenen gebruikt u SMS?

Om welke redenen gebruikt u uw pager?

Om welke redenen gebruikt u het cliëntportaal?

Om welke redenen gebruikt u email?

Om welke redenen gebruikt u ZorgMail?

Om welke redenen gebruikt u ZIVVER?

Block 1

In hoeverre bent u het eens met de volgende stellingen? Ik heb interesse in..

	Sterk mee oneens	Oneens	Neutraal	Eens	Sterk mee eens
Een extra waarschuwingsmelding voordat ik een bericht met clientinformatie buiten de organisatie stuur	○	○	○	○	○
Een functie binnen Ons voor video-consult/video-overleg	○	○	○	○	○
Berichtenverkeer vanuit Ons berichten naar professionals buiten de organisatie	○	○	○	○	○
Het slim kunnen refereren naar bijvoorbeeld cliëntprofielen, agenda items of dossier items.	○	○	○	○	○
Zelf een groep aan kunnen maken	○	○	○	○	○
Berichten kunnen exporteren naar een dossier	○	○	○	○	○
Medewerkers aan bestaande gesprekken kunnen toevoegen	○	○	○	○	○
Berichten versturen met de label "dringend"	○	○	○	○	○
Berichten ontvangen met de label "dringend"	○	○	○	○	○

Block 10

Hoe zou u op de hoogte gesteld willen worden van een dringend bericht?

C.2. Survey results

Apart from the results as presented in the report, a document summarizing the results, shared with the employees of Nedap Healthcare. This document presents the survey results as information about the users of their software and the way they communicate, potentially useful for other purposes than this research.

Communicatie in de zorg

Ons gebruikers over communicatie in de ouderenzorg, gehandicaptenzorg en geestelijke gezondheidszorg

Inleiding

Voor het onderzoek wat ik binnen Nedap Healthcare doe, voor het verbeteren van Ons Berichten en het afstuderen van mijn master Interaction Technology, heb ik een survey onder de gebruikers van Ons verspreid.

Deze survey ging over communicatie binnen de zorg: Wie communiceren er, waarover communiceren zij, en hoe communiceren zij? Dit is natuurlijk cruciale informatie wanneer je een communicatietool voor deze gebruikers wilt maken. Maar niet alleen dan: Ik vermoed dat de informatie die ik tijdens dit onderzoek heb verzameld ook voor andere doeleinden gebruikt kan worden. Duidelijke en verwerkte informatie over je gebruikers hebben kan in ieder geval nooit kwaad, toch? ;)

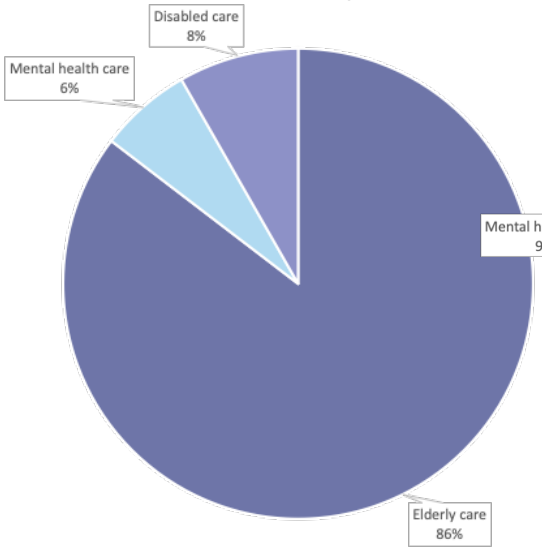
Vandaar dat ik deze informatie via dit document met jullie wil delen. De vragen die gesteld werden in de survey waren zowel open als meerkeuze vragen, en de antwoorden zullen in de document samengevat worden.
De inhoud van dit document is als volgt:

Samenvatting respondenten

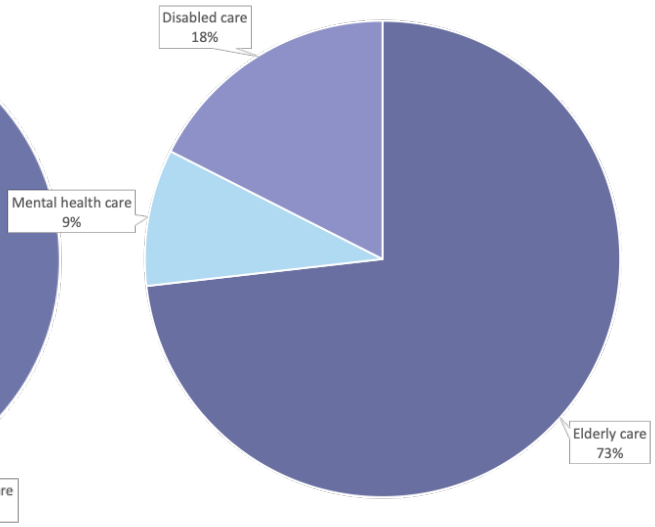
De survey is 5858 keer ingevuld. Na het verwijderen van verwarrende of incomplete reacties bleven er 3357 respondenten over.

Tijdens de eerste meerkeuzevraag konden de respondenten aangeven in welke sector(en) zij werken: Ouderenzorg, gehandicaptenzorg, of geestelijke gezondheidszorg. De antwoorden op deze vraag zijn gevisualiseerd in figuur 1a. Het merendeel van de respondenten werkt in de ouderenzorg, maar ook de andere sectoren zijn goed vertegenwoordigd. Sommige respondenten gaven aan in meerdere sectoren te werken: Deze mensen zijn in deze grafiek dubbel meegenomen.

Figuur 1b presenteert een inschatting van de verdeling van respondenten onder alle Ons gebruikers. Ondanks dat deze verdeling niet exact overeenkomt zullen de respondenten zeker een goed beeld kunnen geven van het gedrag, de mening en de ideeën van alle Ons gebruikers.



Figuur 1a: Verdeling respondenten op basis van sector

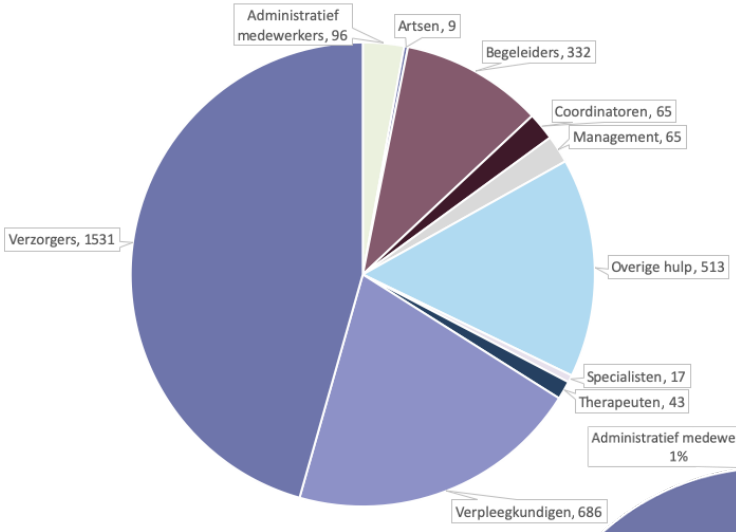


Figuur 2b: Verdeling Ons gebruikers op basis van sector

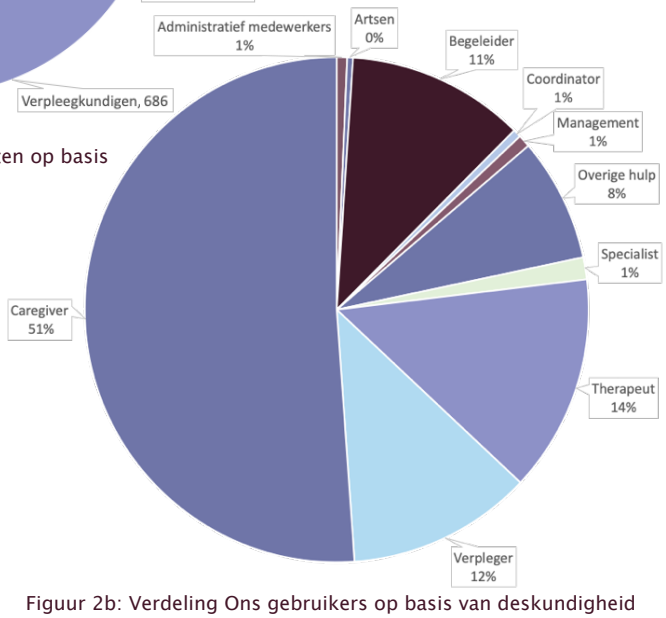
Samenvatting respondenten

Tijdens de tweede meerkeuzevraag konden de respondenten aangeven binnen welke groep van deskundigheden zij behoorden. Figuur 2a laat zien wat de respondenten hier antwoordden. De opties waren, van meest ingevuld naar minst ingevuld: Verzorgers, verpleegkundigen, overige hulp, begeleiders, administratief medewerkers, management, coördinatoren, therapeuten, specialisten, en artsen.

Deze verdeling komt redelijk overeen met de ingeschatte verdeling van Ons gebruikers zoals weergegeven in figuur 2b: Alleen het aantal therapeuten ligt in de survey respondenten heel veel lager.



Figuur 2a: Verdeling respondenten op basis van deskundigheid



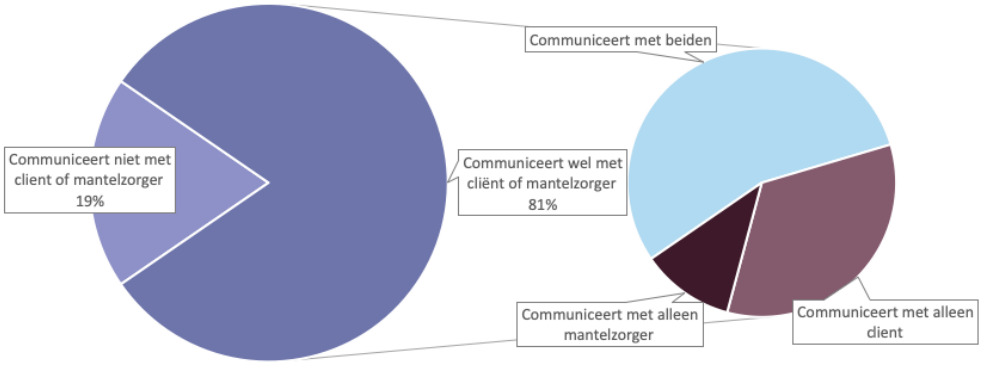
Figuur 2b: Verdeling Ons gebruikers op basis van deskundigheid

3

Cliënten en mantelzorgers

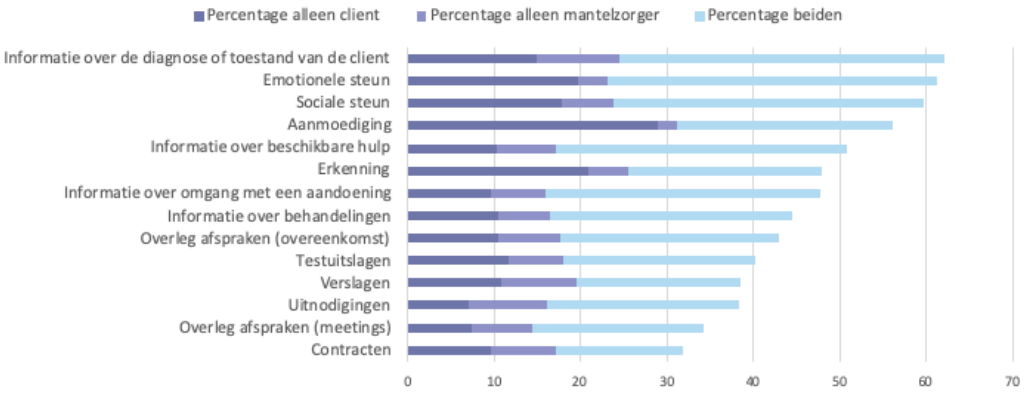
Een deel van de vragenlijst ging over het communiceren met mantelzorgers en cliënten. Hoeveel van de professionals communiceren nu eigenlijk met mantelzorgers en cliënten? En waarover gaat deze communicatie? Zijn deze dingen voor beide partijen bedoeld, of zouden ze sommige dingen het liefst met alleen cliënt of mantelzorger delen?

Figuur 3 geeft weer hoeveel respondenten met cliënten en/of mantelzorgers communiceren.



Figuur 3: De communicatie tussen respondenten en cliënten en/of mantelzorgers: Met wie?

Figuur 4 laat zien waarover de 81% van de respondenten die aangegeven hebben met cliënten en/of mantelzorgers communiceren het met hen hebben. Het is hier ook weergegeven welke onderwerpen zij graag met wie bespreken.



Figuur 4: De communicatie tussen respondenten en cliënten en/of mantelzorgers: Waarover?

Dit was een meerkeuzevraag, en alle opties weergegeven in figuur 4 zijn dus voor de respondent bedacht. Wel waren er "Anders, namelijk..' opties waar respondenten onderwerpen konden invullen die niet in de lijst stonden. Hier waren de meest voorkomende antwoorden: Planning zorg, zorg/behandelplan, praktische zaken, persoonlijke ervaringen, tevredenheid, informatie voortgang, medicatie, signaleringen, vragen, activiteiten, voorbereiden overlijden, zorgen en wensen.

Data per sector

Per sector is aangegeven waarover gecommuniceerd wordt (hoe groter het woord, hoe meer respondenten erover communiceren) en waarmee (middelen die door meer dan 20% aangegeven zijn).

Ouderenzorg

Wij communiceren over:

Wij communiceren door middel van:

Figuur 5 en 6: Communicatie topics en middelen tussen zorgprofessionals in de ouderenzorg

Gehandicaptenzorg

Wij communiceren over:

Wij communiceren door middel van:

Figuur 7 en 8: Communicatie topics en middelen zorgprofessionals in de gehandicaptenzorg

Geestelijke gezondheidszorg

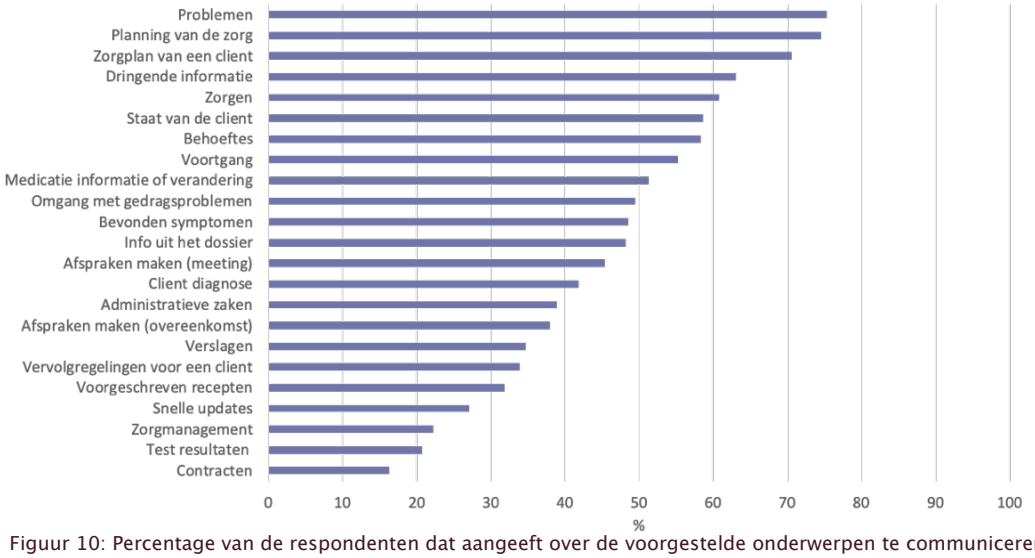
Wij communiceren over:

Wij communiceren door middel van:

Figuur 8 en 9: Communicatie topics en middelen zorgprofessionals in de geestelijke gezondheidszorg

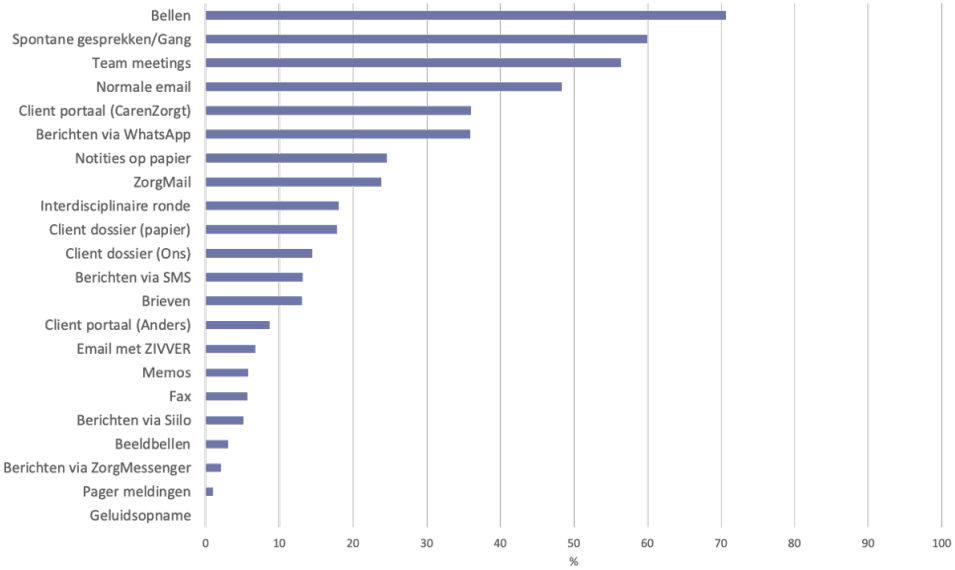
Hoe en wat?

De respondenten kregen een meerkeuzevraag over de onderwerpen waarover zij communiceren. Zij hadden hierbij 23 opties. Figuur 10 geeft weer welk percentage van de respondenten elke optie heeft gekozen:



Figuur 10: Percentage van de respondenten dat aangeeft over de voorgestelde onderwerpen te communiceren

Vervolgens is er gevraagd, opnieuw in een meerkeuze vraag, op welke manier zij communiceren. Figuur 11 geeft weer welk percentage van de respondenten elk van de 22 opties koos.



Figuur 11: Percentage van de respondenten dat aangeeft de voorgestelde methodes te gebruiken

Om te achterhalen voor welk van deze middelen Ons Berichten een goed alternatief zou kunnen zijn werd er over een aantal van de opties een vervolgvraag gesteld: Waarom gebruikt u (de optie)? De antwoorden op deze open vraag zijn gecategoriseerd en weergegeven in figuur 12. De volgende categorieën zijn vastgesteld:

Contact met collega's. Er worden bijvoorbeeld vragen gesteld, afspraken gemaakt, dingen medegedeeld, en er vindt overleg plaats.

Contact met externen. Communicatie met partijen of mensen die buiten de organisatie vallen, voor bijvoorbeeld overleg met een huisarts of de bestelling van medicatie.

Cliënt en/of mantelzorgercontact. Er worden bijvoorbeeld vragen gesteld, afspraken gemaakt, en herinneringen gestuurd. Vaak is dit omdat er geen alternatieve, veilige opties beschikbaar zijn.

Communicatie over diensten/planning. Bijvoorbeeld voor vervanging regelen of diensten ruilen.

Praktische redenen. Mensen zijn het gewend, iedereen heeft het, het gaat snel, en er is bijvoorbeeld een optie voor een automatisch out-of-office bericht of het organiseren van de inbox.

Lange berichten sturen. Berichten kunnen bijvoorbeeld met het toetsenbord getypt worden, of hebben een bijzondere opmaak.

Contact zonder spoed. Wanneer er geen spoedige reactie nodig is, of iemand zelfs even de tijd moet nemen voor het bericht.

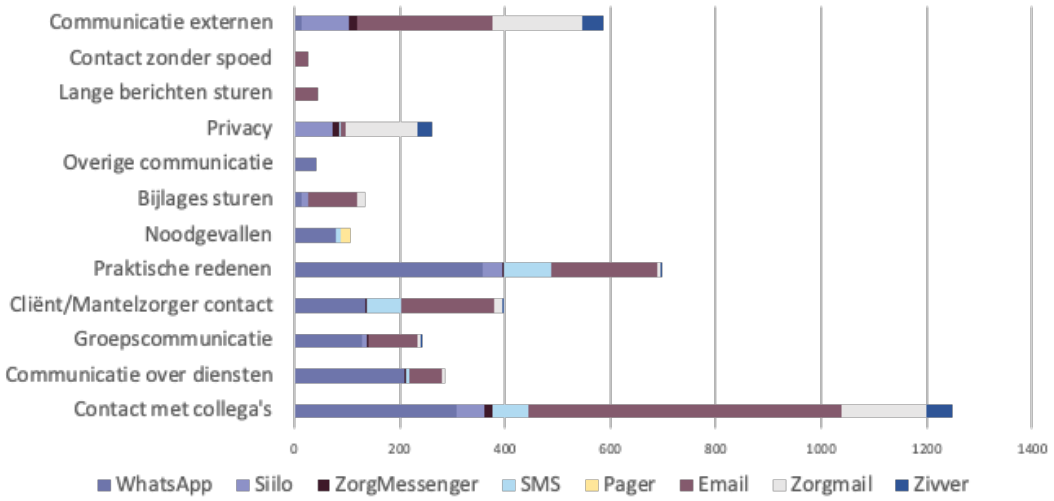
Bijlages sturen. Bijvoorbeeld de foto van een wond of de notulen van een bespreking.

Privacy. Mensen noemen privacy, beveiligde berichten sturen, en de VOG als redenen voor het gebruik.

Groepscommunicatie. Met een groep te communiceren, in de vorm van bijvoorbeeld een bericht naar meerdere ontvangers.

Noodgevallen. Bijvoorbeeld een groepsapp speciaal voor nood, of berichten over shifts die last-minute ingevuld moeten worden.

Overige communicatie. Over dingen communiceren die los van het werk of de zorg staan, zoals interessante informatie/artikelen of persoonlijke dingen.



Figuur 12: Aantal respondenten dat alternatieven communicatiemiddelen gebruikt om en waarom/waarvoor

7

Per deskundigheid

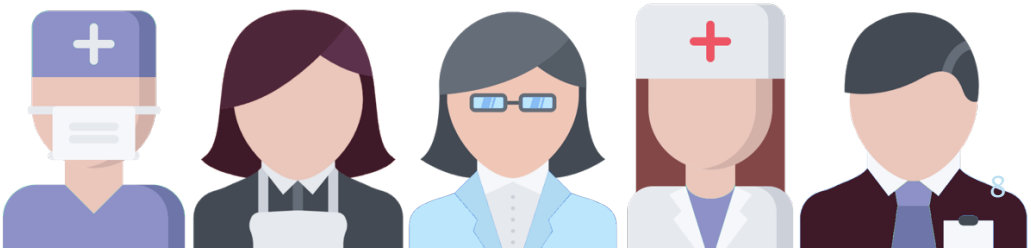
Door de data van alle respondenten als geheel te bekijken kan er informatie verloren gaan. Er zijn namelijk deskundigheden die door een grote groep vertegenwoordigd zijn, bijvoorbeeld verzorgers met ruim 1500 respondenten, en groepen die minder goed vertegenwoordigd zijn, zoals de artsen met slechts 9 respondenten. Gezien deze groepen andere behoeftes hebben en het niet de bedoeling is dat de behoeftes van de kleinere groepen verloren gaan, wordt in het volgende deel van dit document de data opgedeeld per deskundigheid.

Per deskundigheid zal laten zien worden met wie er het meest gecommuniceerd wordt: De groepen die door meer dan 50% van de respondenten met deze deskundigheid gekozen zijn worden genoemd.

Ook zal er gekeken worden naar de communicatiemiddelen die zij gebruiken: De top 7 zal genoemd worden. Als er in deze top 7 middelen zitten die mogelijk onveilig zijn of waarvoor Ons Berichten een goed alternatief zou kunnen bieden, zijn de redenen voor het gebruik van deze middelen vervolgens ook genoemd. Deze middelen zijn dikgedrukt weergegeven.

Verder is er ook per deskundigheid gekeken naar welke functies zij belangrijk vinden voor een communicatietool binnen Ons. Een lijst van de meest genoemde functies per deskundigheid is weergegeven.

Als laatste is er aandacht besteed aan meldingen: Uit de vragenlijst bleek dat het labelen van een bericht als "dringend" een functie is waar veel respondenten behoefte aan hebben. Dit, met daarnaast de meest genoemde manieren waarop zij een belangrijke melding willen ontvangen, is ook per deskundigheid weergegeven.



Administratief medewerkers

Met wie?

Meer dan de helft geeft aan te communiceren met

1. Administratie medewerkers
2. Verzorgers
3. Verpleegkundigen
4. Management
5. Coördinatoren

Waarmee?

Zij communiceren werk-gerelateerd vooral door middel van

1. Bellen
2. Normale email
3. Spontane gesprekken
4. Team meetings
5. **WhatsApp**
6. Brieven
7. Notities op papier

Waarom?

Zij gebruiken WhatsApp voor/bij

Figuur 13: Redenen WhatsApp gebruik

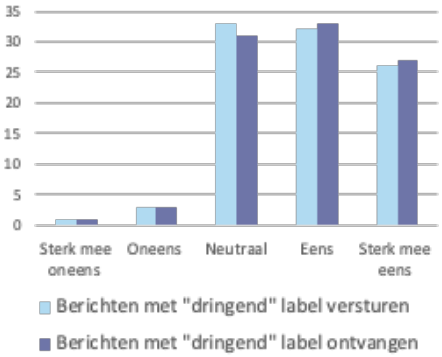
Functies

Voor hen zijn de belangrijkste functies voor het nieuwe Ons Berichten

- Mensen toevoegen aan een bericht
- Zelf groepen maken
- Bericht als dringend markeren
- Berichten sturen buiten Ons
- Snel vinden medewerkers
- Bericht aan de hele organisatie sturen
- Veilige communicatie
- Berichten verplaatsen naar het dossier
- Berichten als ongelezen markeren
- De opmaak van een bericht aanpassen
- Berichten kunnen verwijderen
- Berichten kunnen organiseren

Meldingen

Zij willen berichten als "dringend" kunnen labelen:



Figuur 14: Reacties stelling "dringend" label

Bij een dringende melding willen zij

- Mail ontvangen
- Een pop-up in Ons krijgen
- Een speciale melding (kleur, symbool, geluid)

Artsen

Met wie?

Meer dan de helft geeft aan te communiceren met

1. Therapeuten
2. Verpleegkundigen
3. Verzorging
4. Specialisten
5. Artsen

Waarmee?

Zij communiceren werk-gerelateerd vooral door middel van

1. Bellen
2. Spontane gesprekken
3. **Normale email**
4. Brieven
5. Interdisciplinaire ronde
6. Beeldbellen
7. **WhatsApp**

Waarom?

Zij gebruiken normale email en WhatsApp voor/bij

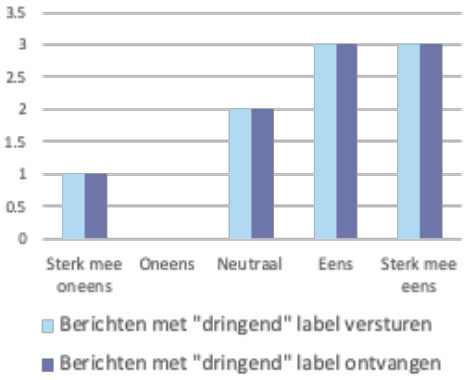
Figuur 15: Redenen WhatsApp/Mail gebruik

Functies

Voor hen zijn de belangrijkste functies voor het nieuwe Ons Berichten
- Persoonlijk kunnen communiceren met mantelzorgers
- Een automatisch bericht kunnen laten sturen bij afwezigheid
- Het kunnen communiceren van uitslagen die binnen zijn gekomen
- Inbox kunnen organiseren op basis van urgentie

Meldingen

Zij willen berichten als "dringend" kunnen labelen:



Figuur 16: Reacties stelling "dringend" label

Bij een dringende melding willen zij een speciale mobiele melding ontvangen

Begeleiders

Met wie?

Meer dan de helft geeft aan te communiceren met

1. Begeleiders
2. Therapeuten
3. Specialisten
4. Artsen
5. Coördinatoren

Waarmee?

Zij communiceren werk-gerelateerd vooral door middel van

1. Bellen
2. Spontane gesprekken
3. Team meetings
4. **Normale email**
5. **WhatsApp**
6. Notities op papier
7. **Zorgmail**

Waarom?

Zij gebruiken normale email, Zorgmail en WhatsApp voor/bij

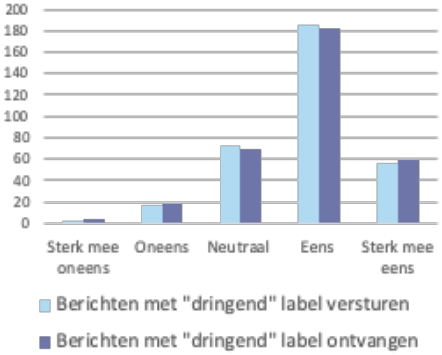
Figuur 17: Redenen WhatsApp/(Zorg)Mail gebruik

Functies

Voor hen zijn de belangrijkste functies voor het nieuwe Ons Berichten
- Berichten als dringend markeren
- Veilige communicatie
- Berichten kunnen sturen buiten Ons
- Zelf groepen maken
- Cliëntinfo makkelijk delen
- Berichten exporteren naar dossier
- Mensen toevoegen aan bericht
- Snel medewerkers vinden
- Berichten organiseren
- Betere zoekfunctie
- Berichten doorsturen

Meldingen

Zij willen berichten als "dringend" kunnen labelen:



Figuur 18: Reacties stelling "dringend" label

Bij een dringende melding willen zij
- Mail ontvangen
- Een pop-up in Ons krijgen

Coördinatoren

Met wie?

Meer dan de helft geeft aan te communiceren met

1. Therapeuten
2. Coördinatoren
3. Specialisten
4. Artsen
5. (En alle andere opties)

Waarmee?

Zij communiceren werk-gerelateerd vooral door middel van

1. Bellen
2. **Normale email**
3. Spontane gesprekken
4. Team meetings
5. **WhatsApp**
6. Interdisciplinaire ronde
7. Notities op papier

Waarom?

Zij gebruiken normale email en WhatsApp voor/bij

Figuur 19: Redenen WhatsApp/Mail gebruik

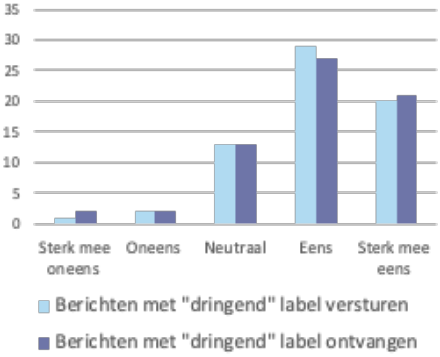
Functies

Voor hen zijn de belangrijkste functies voor het nieuwe Ons Berichten

- Berichten als dringend markeren
- Veilige communicatie
- Communiceren met mantelzorger
- Berichten sturen buiten Ons
- Zelf groepen maken
- Mensen toevoegen aan bericht
- Berichten exporteren naar dossier
- Berichten organiseren
- Leesbevestiging
- Betere zoekfunctie
- Berichten doorsturen
- Berichten labelen

Meldingen

Zij willen berichten als "dringend" kunnen labelen:



Figuur 20: Reacties stelling "dringend" label

Bij een dringende melding willen zij

- Mail ontvangen
- Een pop-up in Ons krijgen
- Een speciaal label aan het bericht

Management

Met wie?

Meer dan de helft geeft aan te communiceren met

1. Verpleegkundigen
2. Verzorgers
3. Administratief medewerkers
4. Management
5. Specialisten
6. Therapeuten
7. Coördinatoren

Waarmee?

Zij communiceren werk-gerelateerd vooral door middel van

1. Bellen
2. Team meetings
3. Spontane gesprekken
4. **Normale email**
5. **WhatsApp**
6. Brieven
7. **ZorgMail**

Waarom?

Zij gebruiken normale email, ZorgMail en WhatsApp voor/bij

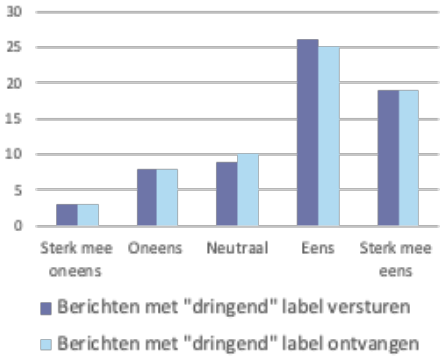
Figuur 21: Redenen WhatsApp/(Zorg)Mail gebruik

Functies

Voor hen zijn de belangrijkste functies voor het nieuwe Ons Berichten
- Veilige communicatie
- Berichten sturen buiten Ons
- Zelf groepen maken
- Mensen toevoegen aan bericht
- Bijlagen delen
- Berichten organiseren
- Betere zoekfunctie
- Berichten labelen

Meldingen

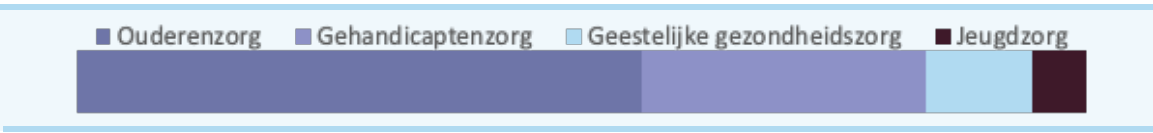
Zij willen berichten als "dringend" kunnen labelen:



Figuur 22: Reacties stelling "dringend" label

Bij een dringende melding willen zij
- Mail ontvangen
- Een pop-up in Ons krijgen
- Een speciaal label aan het bericht
- Een speciaal geluidssignaal

Overige hulp



Met wie?

Meer dan de helft geeft aan te communiceren met andere overige hulp.

Waarmee?

Zij communiceren werk-gerelateerd vooral door middel van

1. Bellen
2. **Normale email**
3. Spontane gesprekken
4. Team meetings
5. **WhatsApp**
6. Notities op papier
7. Client dossier (ons)

Waarom?

Zij gebruiken normale email en WhatsApp voor/bij

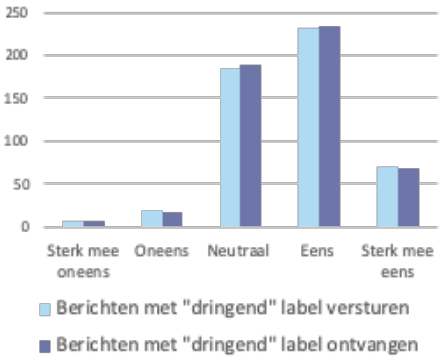
Figuur 23: Redenen WhatsApp/Mail gebruik

Functies

Voor hen zijn de belangrijkste functies voor het nieuwe Ons Berichten
- Berichten als dringend markeren
- Cliënt info makkelijk delen
- Communiceren met cliënt
- Bijlagen delen
- Betere zoekfunctie
- Berichten bewerken
- Berichten labelen

Meldingen

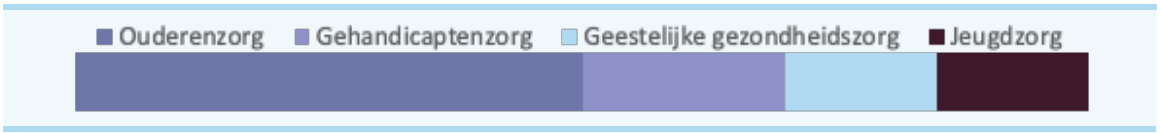
Zij willen berichten als "dringend" kunnen labelen:



Figuur 24: Reacties stelling "dringend" label

Bij een dringende melding willen zij
- Gebeld worden
- Een pushmelding ontvangen
- Een herhaalde melding ontvangen
- Een pop-up in Ons krijgen

Specialisten



Met wie?

Meer dan de helft geeft aan te communiceren met
- Specialisten
- Therapeuten
- Verzorgers
- Verpleegkundigen
- Artsen
- Management

Waarmee?

Zij communiceren werk-gerelateerd vooral door middel van

1. Bellen
2. Team meetings
3. Spontane gesprekken
4. **Normale email**
5. Interdisciplinaire ronde
6. **ZorgMail**
7. **WhatsApp**

Waarom?

Zij gebruiken normale email, ZorgMail en WhatsApp voor/bij

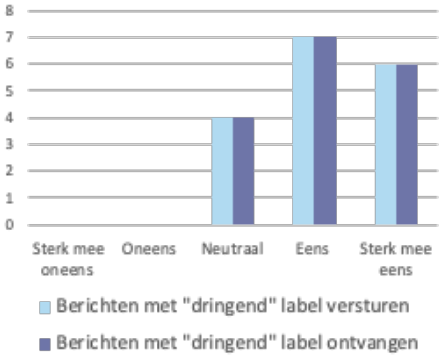
Figuur 25: Redenen WhatsApp/(Zorg)Mail gebruik

Functies

Voor hen zijn de belangrijkste functies voor het nieuwe Ons Berichten
- Veilige communicatie
- Zelf groepen maken
- Berichten als dringend markeren
- Berichten sturen buiten Ons
- Iemand aan bericht toevoegen
- Bijlages sturen
- Betere zoekfunctie

Meldingen

Zij willen berichten als "dringend" kunnen labelen:



Figuur 26: Reacties stelling "dringend" label

Bij een dringende melding willen zij
- Een email ontvangen
- Een pushmelding ontvangen
- Een pop-up in Ons krijgen

Therapeuten

Met wie?

Meer dan de helft geeft aan te communiceren met
- Therapeuten
- Specialisten
- Artsen
- Verzorgers
- Verpleegkundigen
- Administratief medewerkers
- Management
- Coördinatoren
- Begeleiders

Waarmee?

Zij communiceren werk-gerelateerd vooral door middel van
1. Bellen
2. Spontane gesprekken
3. Team meetings
4. **Normale email**
5. Brieven
6. **ZorgMail**
7. Interdisciplinaire ronde

Waarom?

Zij gebruiken normale email en ZorgMail voor/bij

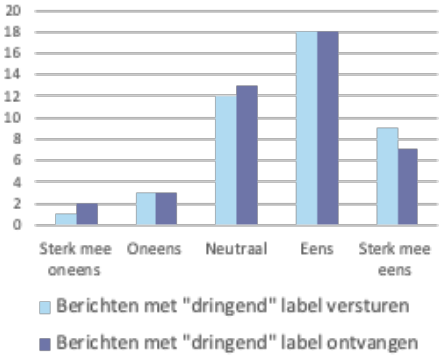
Figuur 27: Redenen (Zorg)Mail gebruik

Functies

Voor hen zijn de belangrijkste functies voor het nieuwe Ons Berichten
- Veilige communicatie
- Berichten als dringend markeren

Meldingen

Zij willen berichten als "dringend" kunnen labelen:



Figuur 28: Reacties stelling "dringend" label

Bij een dringende melding willen zij
- Een email ontvangen
- Een pushmelding ontvangen
- Een pop-up in Ons krijgen

Verpleegkundigen

Met wie?

Meer dan de helft geeft aan te communiceren met
- Verpleegkundigen
- Specialisten
- Therapeuten
- Verzorgers
- Artsen
- Overige hulp

Waarmee?

Zij communiceren werk-gerelateerd vooral door middel van

1. Bellen
2. Spontane gesprekken
3. Team meetings
4. Client portaal (CarenZorgt)
5. **Normale email**
6. **WhatsApp**
7. **ZorgMail**

Waarom?

Zij gebruiken normale email, ZorgMail en WhatsApp voor/bij

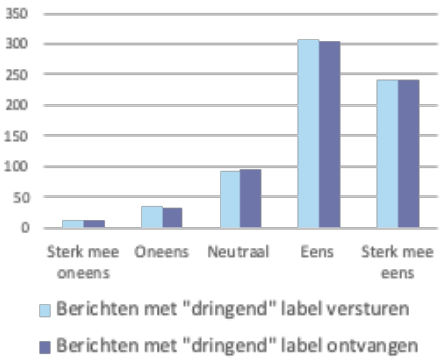
Figuur 29: Redenen WhatsApp/(Zorg)Mail gebruik

Functies

Voor hen zijn de belangrijkste functies voor het nieuwe Ons Berichten
- Berichten sturen buiten Ons
- Veilige communicatie
- Berichten als dringend markeren
- Zelf groepen maken
- Cliëntinfo makkelijk delen
- Berichten labelen
- Iemand aan bericht toevoegen
- Communicatie mantelzorger
- Bijlages sturen
- Betere zoekfunctie

Meldingen

Zij willen berichten als "dringend" kunnen labelen:



Figuur 30: Reacties stelling "dringend" label

Bij een dringende melding willen zij
- Een email ontvangen
- Een pushmelding ontvangen
- Een pop-up in Ons krijgen
- Afwijkende beltoon/Speciaal symbool
- Blijft bovenaan de inbox

Verzorgers

Met wie?

Meer dan de helft geeft aan te communiceren met
- Verzorgers
- Verpleegkundigen
- Therapeuten
- Specialisten
- Artsen

Waarmee?

Zij communiceren werk-gerelateerd vooral door middel van

1. Bellen
2. Spontane gesprekken
3. Team meetings
4. Cliënt portaal (CarenZorgt)
5. **Normale email**
6. **WhatsApp**
7. Notities op papier

Waarom?

Zij gebruiken normale email, ZorgMail en WhatsApp voor/bij

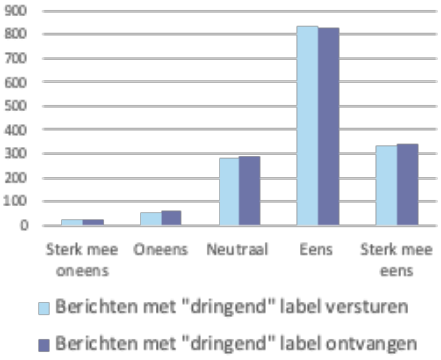
Figuur 31: Redenen WhatsApp/(Zorg)Mail gebruik

Functies

Voor hen zijn de belangrijkste functies voor het nieuwe Ons Berichten
- Berichten als dringend markeren
- Berichten sturen buiten Ons
- Cliëntinfo makkelijk delen
- Veilige communicatie
- Iemand aan bericht toevoegen
- Zelf groepen maken
- Berichten organiseren
- Leesbevestiging
- Berichten verwijderen
- Bijlages sturen
- Interdisciplinaire groepen
- Communicatie mantelzorger

Meldingen

Zij willen berichten als "dringend" kunnen labelen:



Figuur 32: Reacties stelling "dringend" label

Bij een dringende melding willen zij
- Een email ontvangen
- Een pushmelding ontvangen
- Een pop-up in Ons krijgen
- Afwijkende beltoon/Speciaal symbool

Voorbeeld redenen

Om door middel van het nieuwe Ons Berichten een goed alternatief voor bijvoorbeeld WhatsApp en email te bieden, en misschien ook ZorgMail en veel van de andere alternatieven overbodig te maken, is het belangrijk te kijken naar de redenen voor het gebruik van deze middelen. Op de volgende pagina werden deze redenen in categoriën genoemd. In het geval van deze vraag is het ook interessant naar de daadwerkelijke reacties te kijken: Vandaar dat hieronder voor WhatsApp, email en ZorgMail een paar reacties zijn gequote die een duidelijk beeld geven van veelvoorkomende redenen voor het gebruik van deze tool.

Ik gebruik WhatsApp op het werk omdat...

"Ik snelle reactie ontvang"
"Ik kan zien of mijn bericht gelezen is"
"Ik zo mijn team laat weten dat ik aan mijn route begonnen ben (thuiszorg)"
"We zo diensten ruilen"
"Er geen veilig alternatief is om digitaal met cliënten te communiceren"

Ik gebruik email op het werk omdat...

"Ik daar mij inbox kan organiseren"
"Ik berichten makkelijk terug kan vinden"
"Het herkenbaar en makkelijk is"
"Ik zo lange berichten kan sturen met een speciale opmaak en bijlages"
"Dit de manier is om met de huisarts te communiceren"

Ik gebruik ZorgMail omdat...

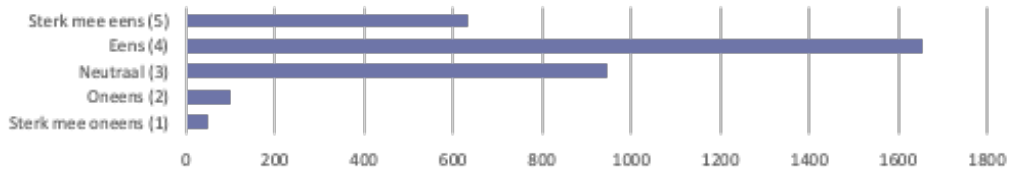
"Ik hier privacy-gevoelige informatie mag delen"
"Het een veilig alternatief is"
"Extere partners ZorgMail gebruiken"

Stellingen functiesuggesties

Onderzoek naar communicatie in de zorg en interviews binnen Nedap hebben geholpen om al wat mogelijke nieuwe functies voor Ons Berichten voor te stellen. Door middel van een Likert-scale vraag in de vragenlijst is de feedback van de respondenten gevraagd op deze voorgestelde functies.

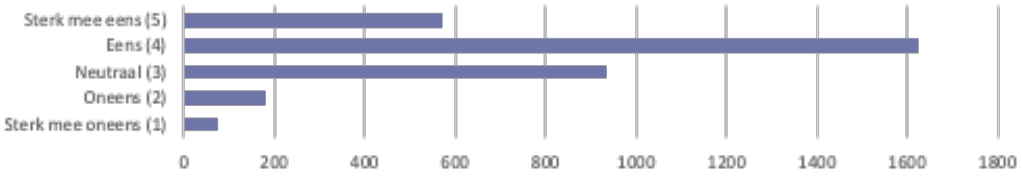
Op deze en de volgende pagina worden de scores van de zeven voorgestelde functies, gesorteerd van gemiddeld hoogst tot laagst, laten zien.

Ik heb interesse in...
(1) het slim kunnen refereren naar bijvoorbeeld agenda items of dossier items: 3.8/5



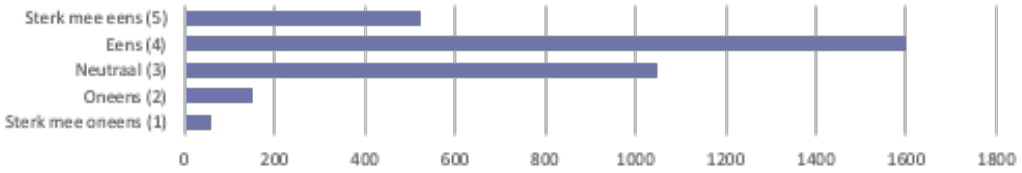
Figuur 33: Stelling nummer 1: Referenties

(2) berichten kunnen exporteren naar een dossier: 3.7/5



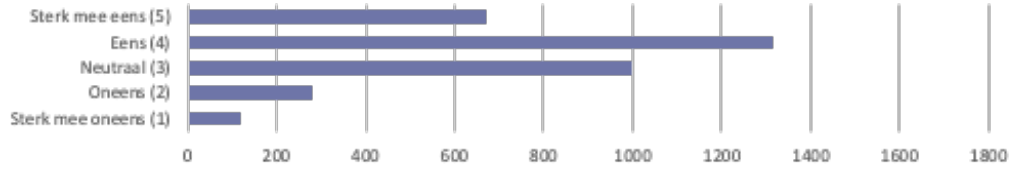
Figuur 34: Stelling nummer 2: Export naar dossier

(3) medewerkers aan bestaande gesprekken kunnen toevoegen: 3.7/5



Figuur 35: Stelling nummer 3: Medewerkers toevoegen aan gesprekken

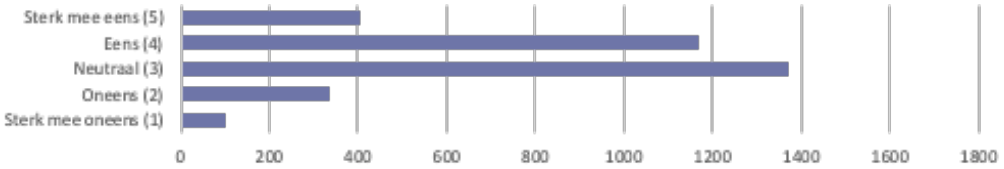
(4) een extra waarschuwingsmelding voordat ik een bericht met clientinformatie buiten de organisatie stuur: 3.6/5



Figuur 36: Stelling nummer 4: Waarschuwingsmelding externe berichten

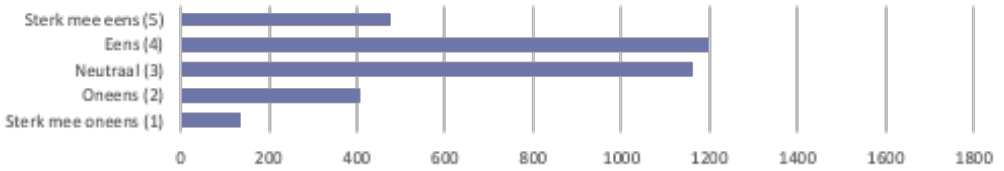
Stelling functiesuggesties

Ik heb interesse in...
(5) zelf een groep aan kunnen maken: 3.4/5



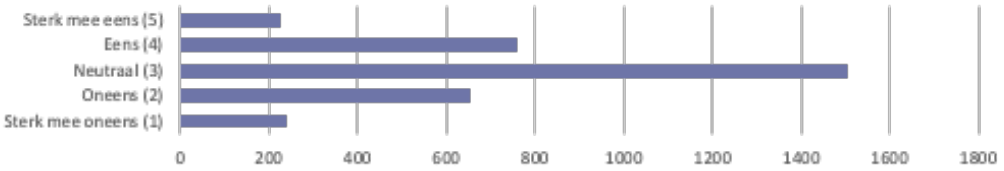
Figuur 37: Stelling nummer 5: Zelf groep maken

(6) berichtenverkeer vanuit Ons berichten naar professionals buiten de organisatie: 3.4/5



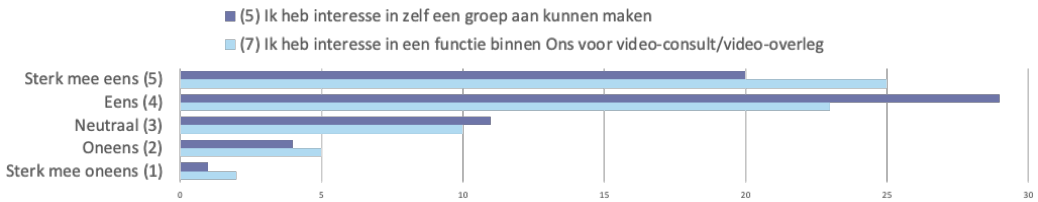
Figuur 38: Stelling nummer 6: Berichten naar externen

(7) een functie binnen Ons voor video-consult/video-overleg: 3.0/5



Figuur 39: Stelling nummer 7: Videofunctie

Alle voorgestelde functies scoren gemiddeld 3.0 of meer punten (van de 5). Dit gemiddelde zegt helaas niet zo veel: Een gemiddelde tussen "Sterk mee eens" en "Sterk mee oneens" bepalen is niet mogelijk. Wel kunnen we kijken wat het meest gekozen antwoord is en of er niet veel negatieve reacties zijn. Bij stelling (1), (2), (3), (4) en (6) zien we "Eens" als meest gekozen optie en relatief weinig "(Sterk mee) oneens".
Opnieuw is het belangrijk naar de deskundigheden los van elkaar te kijken. De behoeftes van kleinere groepen, zoals Management, gaan namelijk verloren in het totaal. Zij geven namelijk, zoals te zien is in figuur 40, aan wel behoefte te hebben aan functie (5) en (7). Hetzelfde geldt voor begeleiders, coördinatoren, therapeuten, en verpleegkundigen.



Figuur 40: Stelling nummer 5 en 7 vanuit management

D. Requirements

The application **must** enable the user to

1. Compose a message (Chapter 2)
2. Send and receive messages securely (Chapter 2)
3. Send messages to and receive messages from all colleagues (Chapter 2)
4. Send and receive messages one-on-one (Chapter 3)
5. Send messages to and receive messages in a group (Chapter 3)
6. Access the software on a mobile device (Chapter 3)
7. Access the software on a desktop (Chapter 3)
8. Become aware of an incoming message by a notification (Section 4.2)

The application **should** enable the user to

9. Send messages to and receive messages from informal caregivers (Chapter 2)
10. Send messages to and receive messages from clients (Chapter 2)
11. Send and receive messages with attachments (Images, documents, spreadsheets or videos) (Chapter 3 and 7)
12. Take a picture (Chapter 3)
13. Become aware of an incoming message from CarenZorgt by a notification (Section 4.2)
14. Reference to items within other Ons applications[28] (Section 4.2)
15. Make custom groups of colleagues, informal caregivers and/or clients (Section 4.2)
16. Forward messages (Section 4.2)
17. Add contacts to an existing conversation, without allowing them to see the conversation history (Section 4.2 and 7)
18. Organise the inbox by adding an "important" label to messages (Section 4.2)
19. Create new folders in the inbox (Section 4.2)
20. Organise the inbox by putting messages in folders (Section 4.2)
21. Add a subject to a message (Section 4.2)
22. Delete a message from their own inbox (Section 4.2)
23. Search through messages by name, date, or topic (section 4.2)
24. Export a message to a dossier (Section 4.4)
25. Send and receive messages labelled as urgent (Section 4.4)
26. Organise the inbox by marking a message as unread

The application **could** enable the user to

27. Edit a message after sending (Section 4.2) within a time span of 5 minutes after sending (Section 7)

[28] To for example a client profile or dossier/calendar item. A linked reference can be added to a message and, when the receivers clicks on it, navigate the receiver to the item within another Ons application/in the desktop version of the application.

28. Delete a message for all receivers within a time span of 5 minutes after sending (Section 7)
29. Send messages to and receive messages from professionals outside of the organisation (Section 4.2)
30. Send messages to all people working at the same organisation (Section 4.2)
31. See whether a colleague is currently working (Section 4.2)
32. See if a message is read (Section 4.2)
33. Reach people not working (Section 4.2)
34. Select multiple messages at a time in the inbox (Section 4.2)
35. Set an automatic out of office reply (Section 4.2)
36. See if the inbox is up-to-date (Section 4.2)
37. Receive a warning message before sending client information outside of the organisation (Section 4.4)
38. Have video-consults with contacts (Section 4.4)
39. Set notification preferences for a silent mode outside of work hours (Section 4.4 and 7)
40. Set notification preferences for important messages (Section 4.4 and 8)
41. Add a new contact using a secure email address (Section 4.4)

The application should support **users**

- ☐ In elderly care, disabled care and mental health care (Chapter 3)
- ☐ Working in intra- and extramural care (Chapter 3)
- ☐ With fundamental computer skills (Chapter 3)

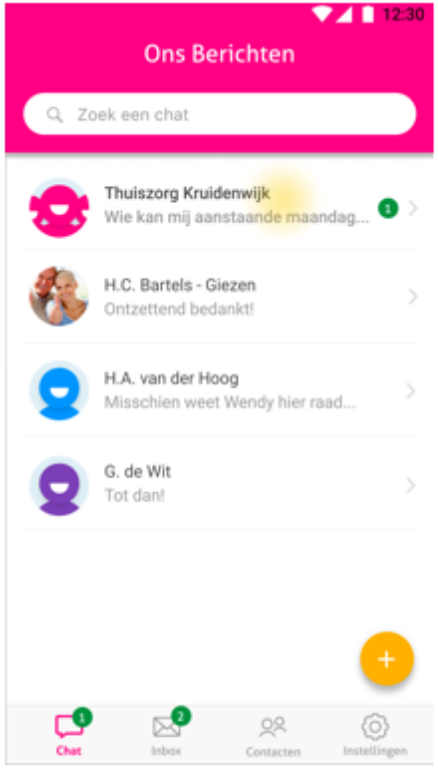
Considering **usability**, the application should

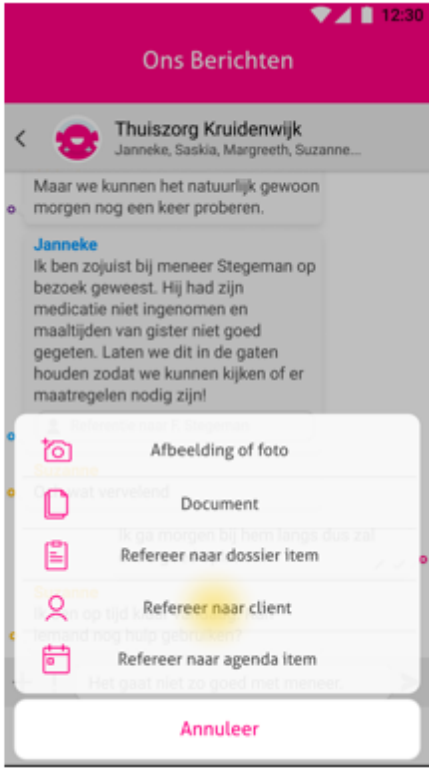
- ☐ Have a consistent layout (Section 4.2)
- ☐ Use clear symbols (Section 4.2)
- ☐ Include functions and interface elements that users already know, from for example WhatsApp or email (Section 4.4)

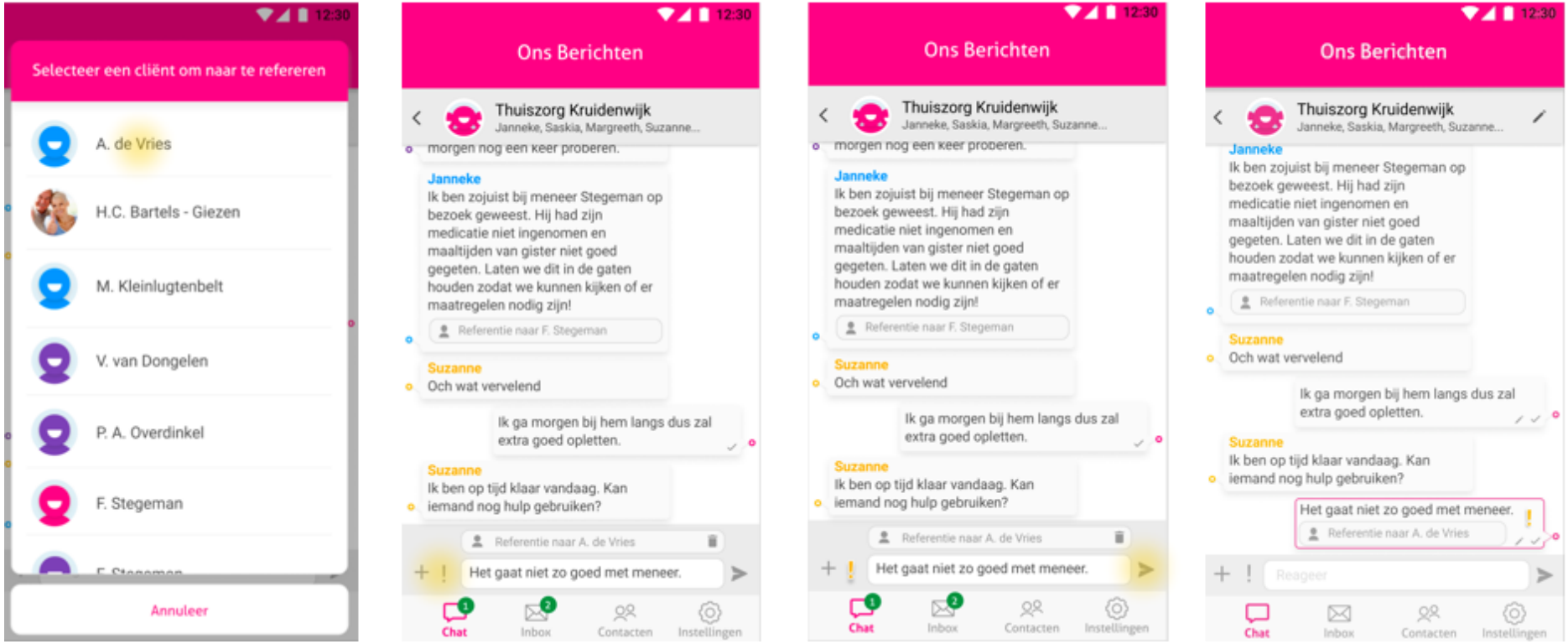
E. System Design flows

E.1 Mobile flows

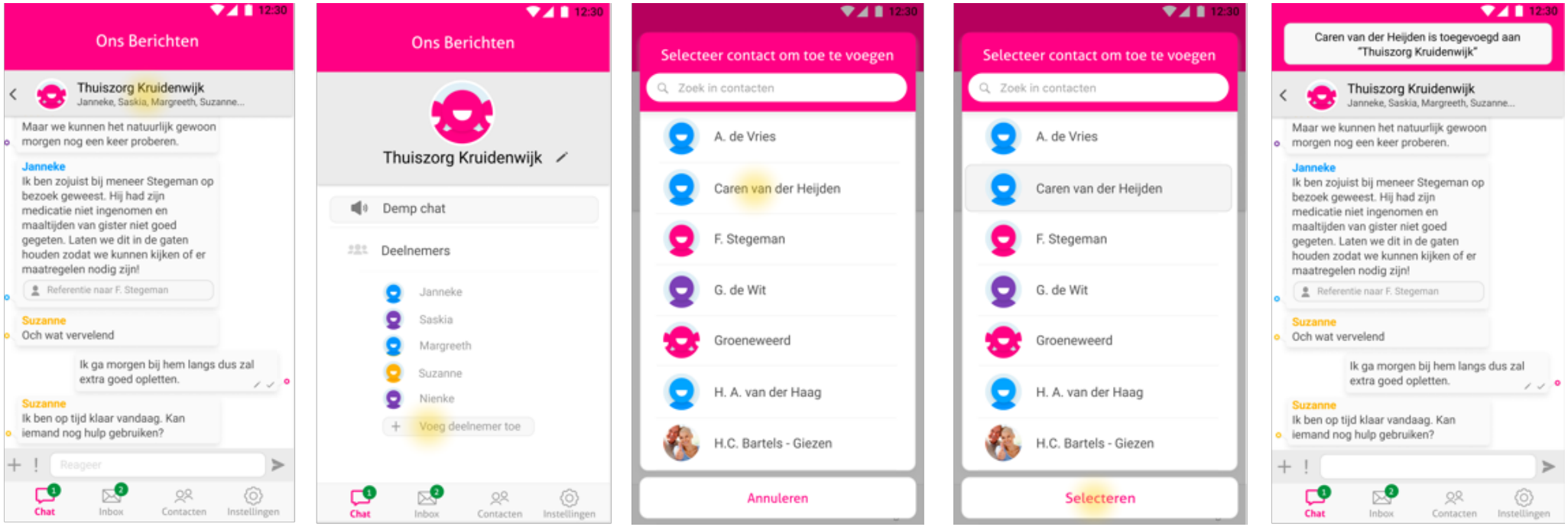
Flow 1: Send a chat message to the chat group Thuiszorg Kruidenwijk with the text "Things are not so well for mister". Refer to client A. de Vries in this message and mark it as important. *(Secure chat, urgent messages, references)*



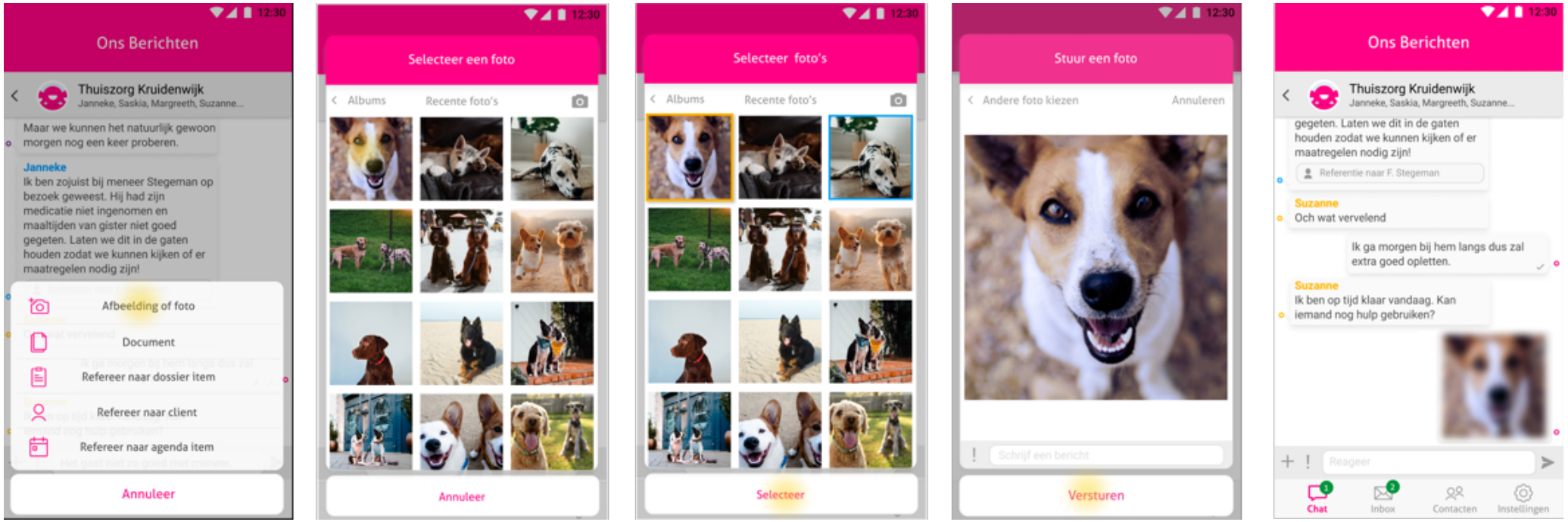



12:30
Selecteer een cliënt om naar te refereren
A. de Vries
H.C. Bartels - Giezen
M. Kleinlugtenbelt
V. van Dongelen
P. A. Overdinkel
F. Stegeman
Annuleer
Ons Berichten
Thuiszorg Kruidenwijk
Janneke, Saskia, Margreeth, Suzanne...
Janneke
Ik ben zojuist bij meneer Stegeman op bezoek geweest. Hij had zijn medicatie niet ingenomen en maaltijden van gister niet goed gegeten. Laten we dit in de gaten houden zodat we kunnen kijken of er maatregelen nodig zijn!
Referentie naar F. Stegeman
Suzanne
Och wat vervelend
Ik ga morgen bij hem langs dus zal extra goed opletten.
Suzanne
Ik ben op tijd klaar vandaag. Kan iemand nog hulp gebruiken?
Referentie naar A. de Vries
Het gaat niet zo goed met meneer.
Reageer
Chat
Inbox
Contacten
Instellingen

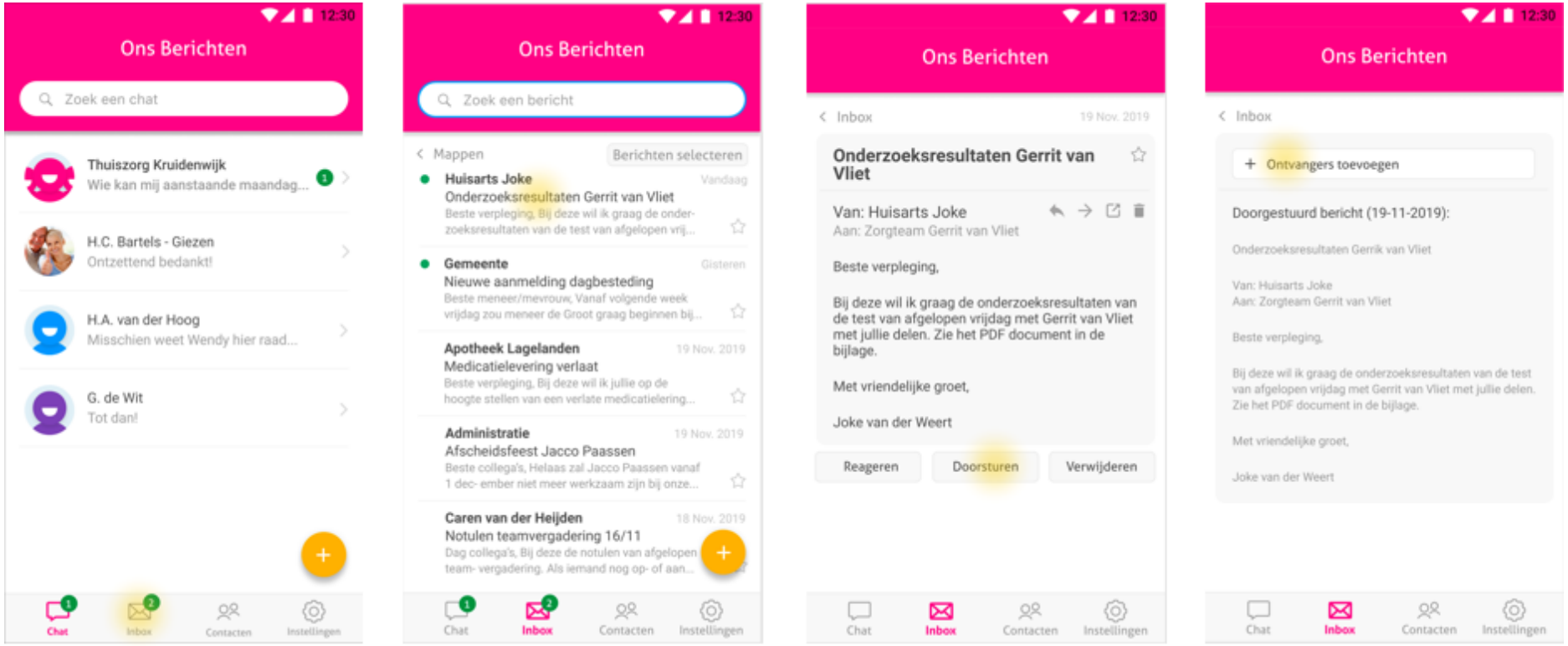
Flow 2: Add Caren van der Heijden to the chat group Thuiszorg Kruidenwijk. *(Add someone to an existing chat)*

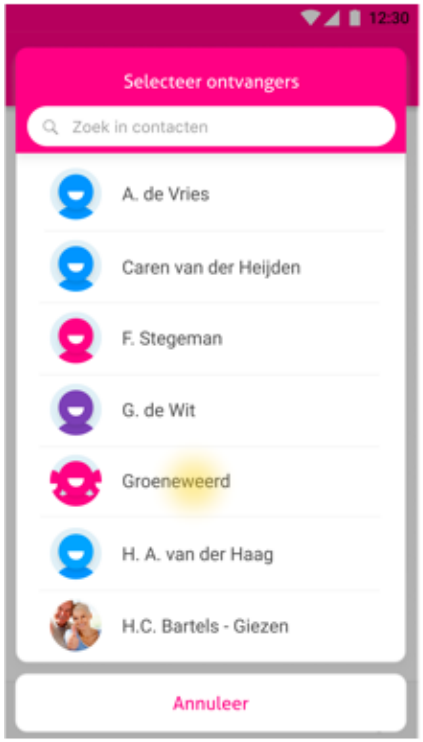


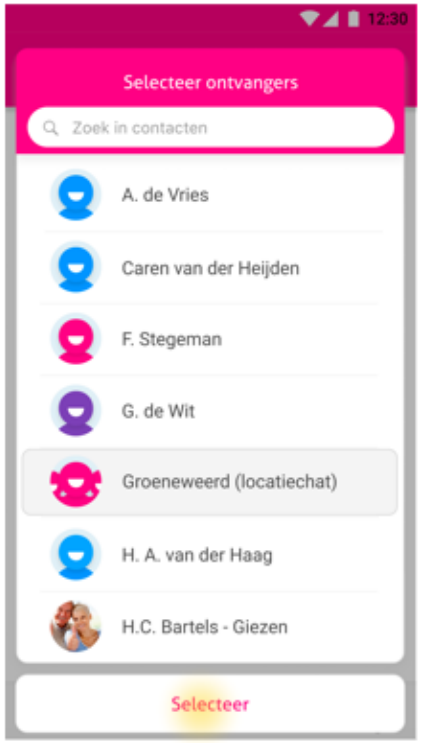
Flow 3: Send your mest recently made picture to the chatgroup Thuiszorg Kruidenwijk. *(Send attachments (chat))*

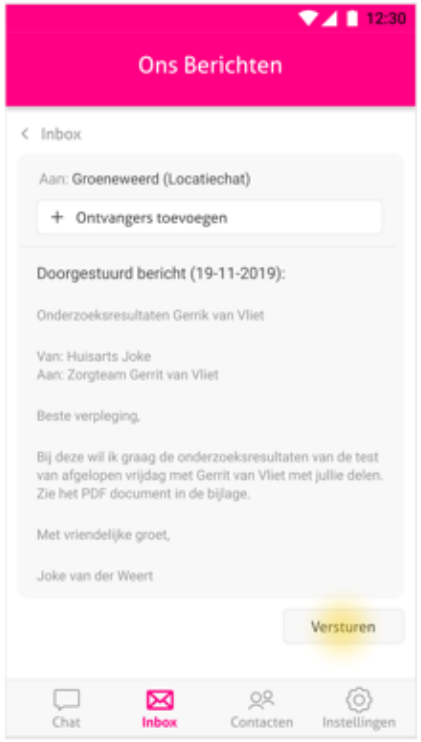


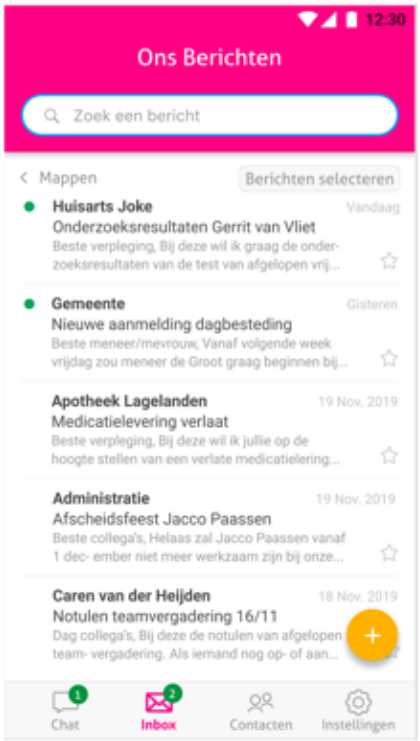
Flow 4: Forward the message "Onderzoeksresultaten Gerrit van Vliet" to all people in the group "Groeneweerd". *(Forward messages, communication external parties)*



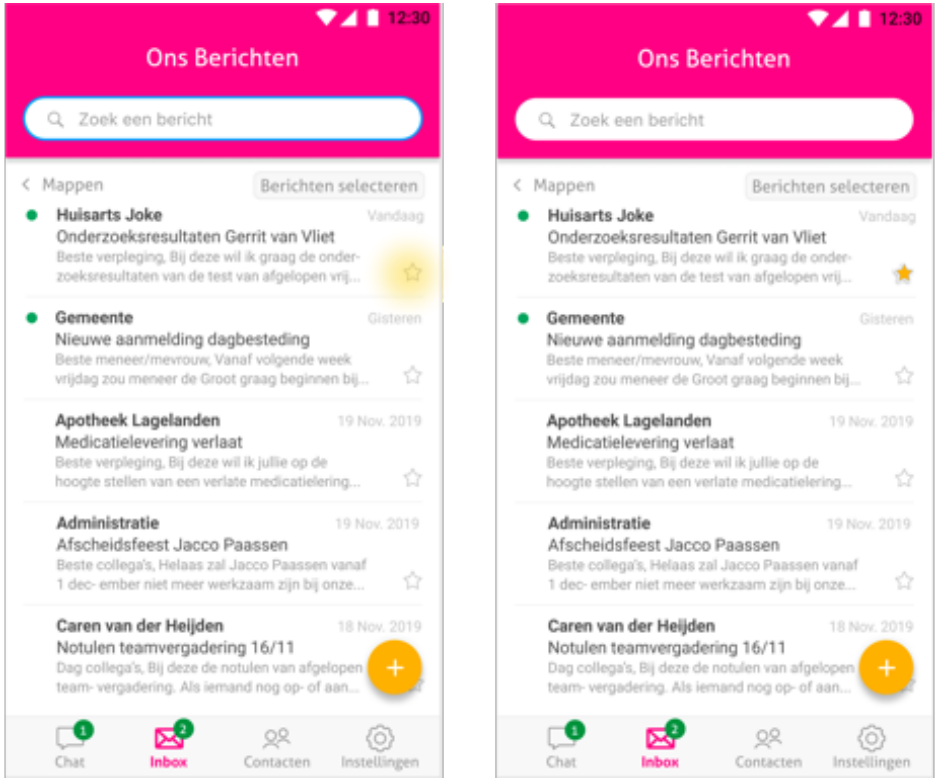

12:30
Selecteer ontvangers
Zoek in contacten
A. de Vries
Caren van der Heijden
F. Stegeman
G. de Wit
Groeneweerd
H. A. van der Haag
H.C. Bartels - Giezen
Annuleer


12:30
Selecteer ontvangers
Zoek in contacten
A. de Vries
Caren van der Heijden
F. Stegeman
G. de Wit
Groeneweerd (locatiechat)
H. A. van der Haag
H.C. Bartels - Giezen
Selecteer

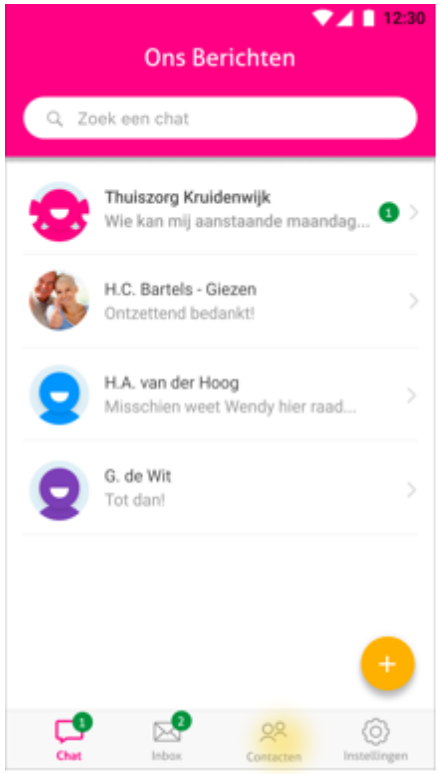

12:30
Ons Berichten
Inbox
Aan: Groeneweerd (Locatiechat)
Ontvangers toevoegen
Doorgestuurd bericht (19-11-2019):
Onderzoeksresultaten Gerrik van Vliet
Van: Huisarts Joke
Aan: Zorgteam Gerrit van Vliet
Beste verpleging,
Bij deze wil ik graag de onderzoeksresultaten van de test van afgelopen vrijdag met Gerrit van Vliet met jullie delen. Zie het PDF document in de bijlage.
Met vriendelijke groet,
Joke van der Weert
Versturen
Chat
Inbox
Contacten
Instellingen

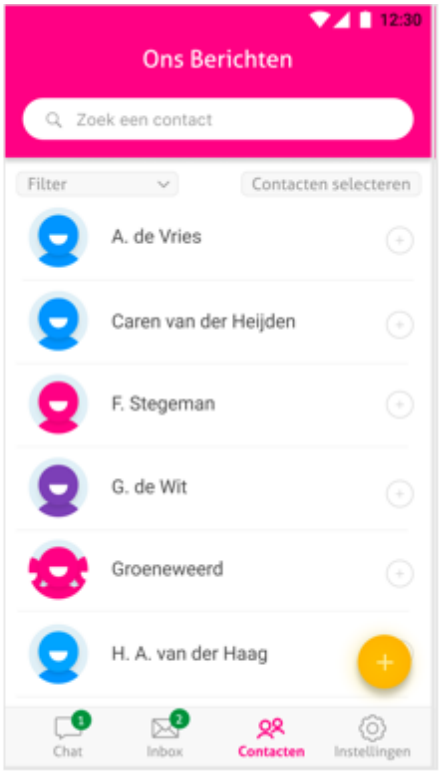

12:30
Ons Berichten
Zoek een bericht
Mappen
Berichten selecteren
Huisarts Joke
Vandaag
Onderzoeksresultaten Gerrit van Vliet
Beste verpleging, Bij deze wil ik graag de onderzoeksresultaten van de test van afgelopen vrij...
Gemeente
Gisteren
Nieuwe aanmelding dagbesteding
Beste meneer/mevrouw, Vanaf volgende week vrijdag zou meneer de Groot graag beginnen bij...
Apotheek Lagelanden
19 Nov. 2019
Medicatielevering verlaat
Beste verpleging, Bij deze wil ik jullie op de hoogte stellen van een verlate medicatielering...
Administratie
19 Nov. 2019
Afscheidsfeest Jacco Paassen
Beste collega's, Helaas zal Jacco Paassen vanaf 1 dec- ember niet meer werkzaam zijn bij onze...
Caren van der Heijden
18 Nov. 2019
Notulen teamvergadering 16/11
Dag collega's, Bij deze de notulen van afgelopen team- vergadering. Als iemand nog op- of aan...
Chat
Inbox
Contacten
Instellingen

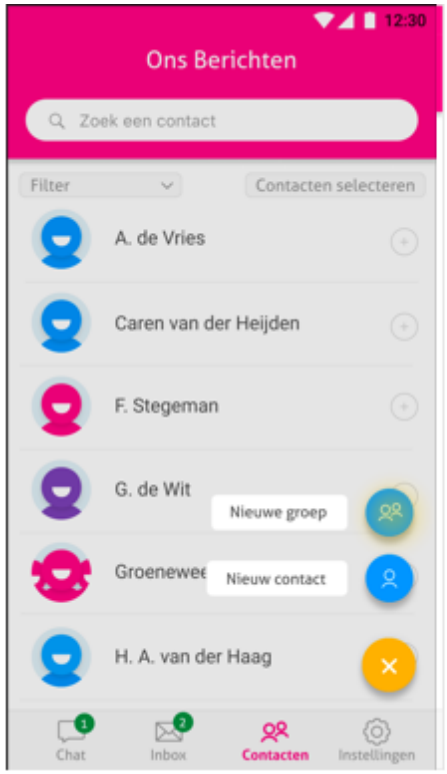
Flow 5: Mark the message "Onderzoeksresultaten Gerrit van Vliet" as important. *(Organise inbox option 1)*

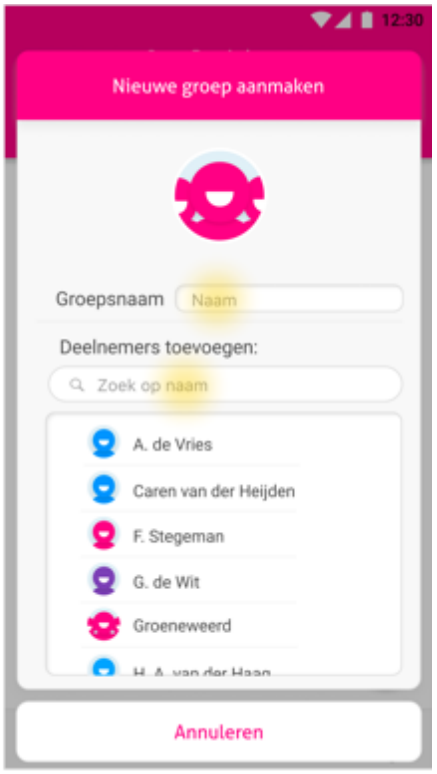


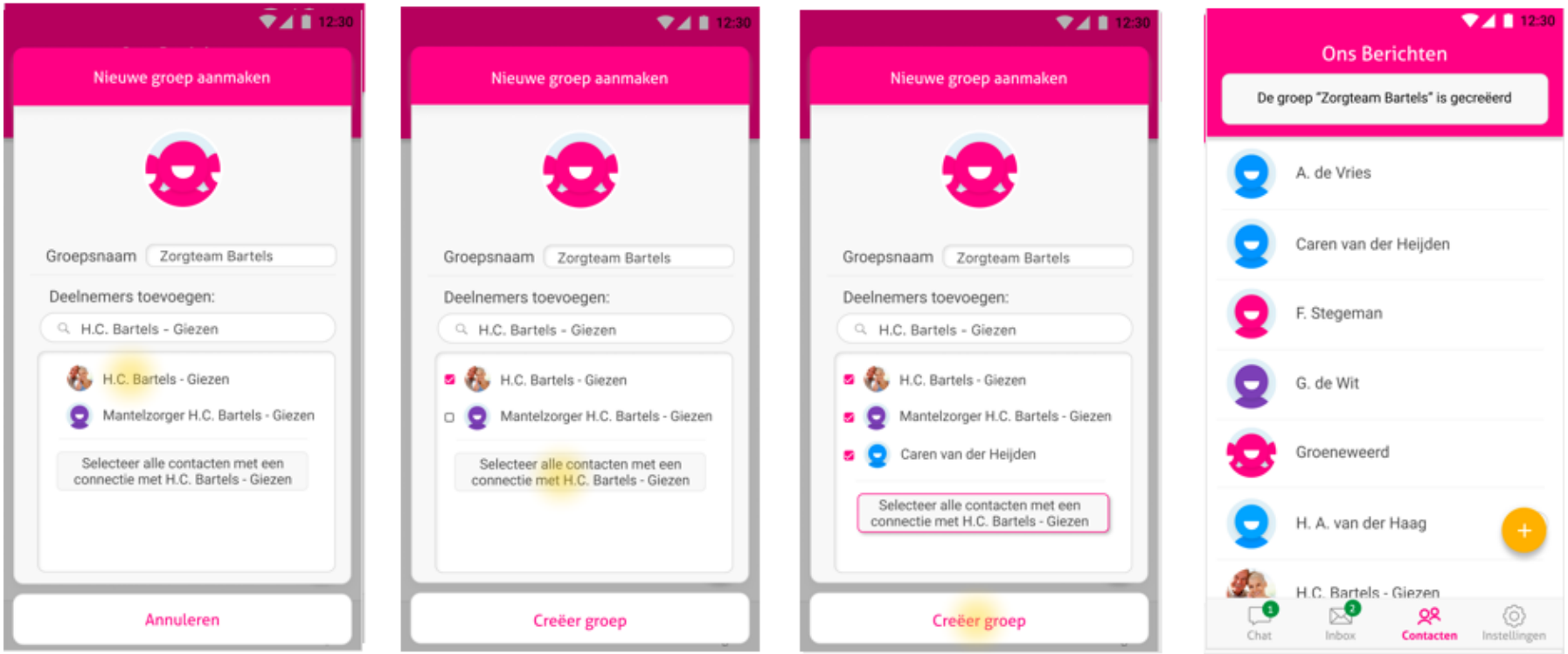
Flow 6: Create a group with the name "Zorgteam Bartels". Add all contacts with a connection to client H.C. Bartels- Giezen to this group. *(Create (client-centered) group)*



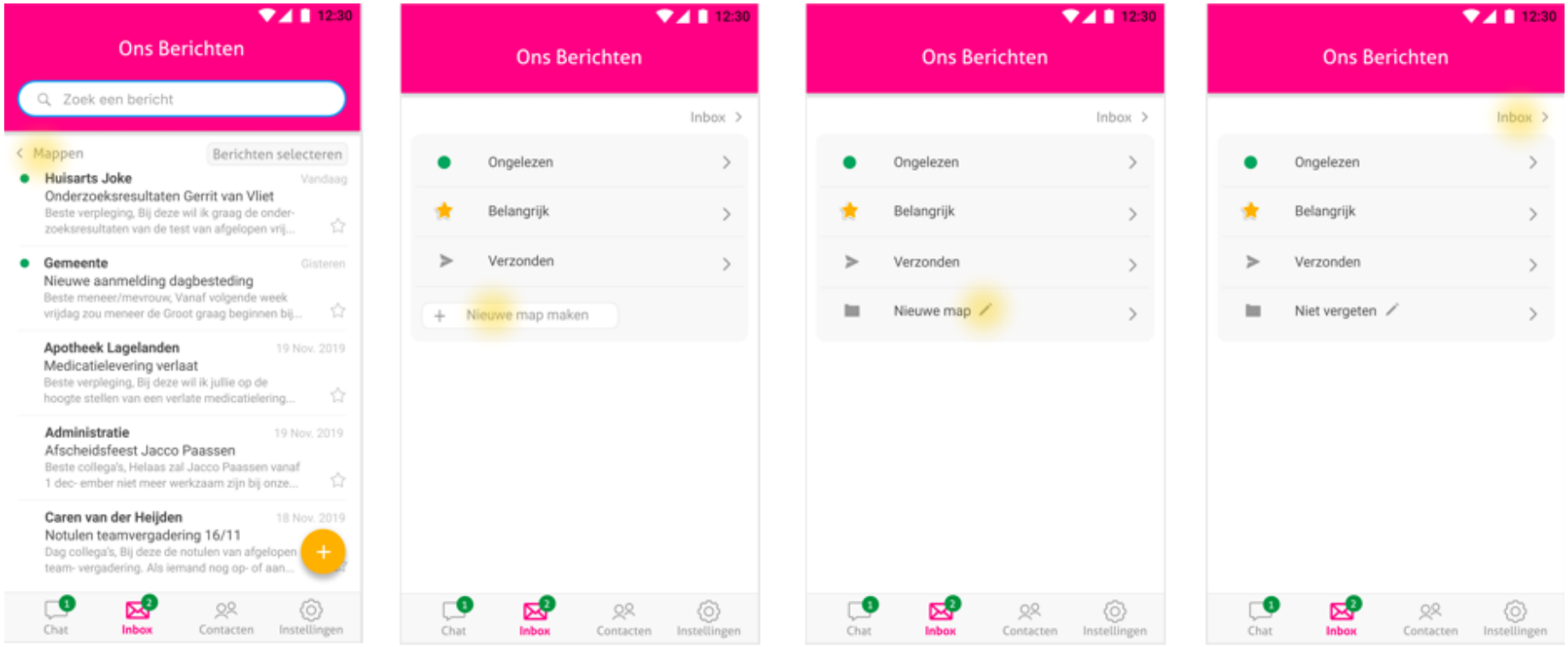


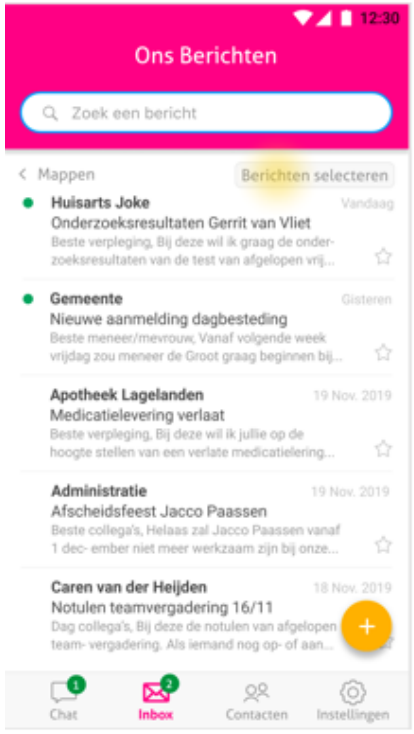


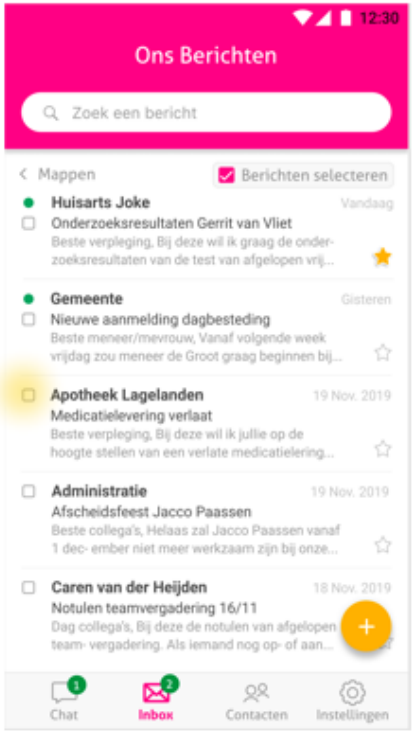


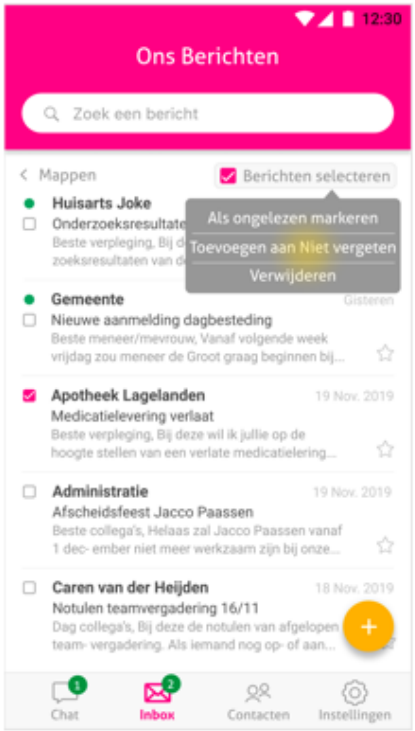

12:30
Nieuwe groep aanmaken
Groepsnaam
Zorgteam Bartels
Deelnemers toevoegen:
H.C. Bartels - Giezen
H.C. Bartels - Giezen
Mantelzorger H.C. Bartels - Giezen
Selecteer alle contacten met een connectie met H.C. Bartels - Giezen
Annuleren
12:30
Nieuwe groep aanmaken
Groepsnaam
Zorgteam Bartels
Deelnemers toevoegen:
H.C. Bartels - Giezen
H.C. Bartels - Giezen
Mantelzorger H.C. Bartels - Giezen
Selecteer alle contacten met een connectie met H.C. Bartels - Giezen
Creëer groep
12:30
Nieuwe groep aanmaken
Groepsnaam
Zorgteam Bartels
Deelnemers toevoegen:
H.C. Bartels - Giezen
H.C. Bartels - Giezen
Mantelzorger H.C. Bartels - Giezen
Caren van der Heijden
Selecteer alle contacten met een connectie met H.C. Bartels - Giezen
Creëer groep
12:30
Ons Berichten
De groep "Zorgteam Bartels" is gecreëerd
A. de Vries
Caren van der Heijden
F. Stegeman
G. de Wit
Groeneweerd
H. A. van der Haag
H.C. Bartels - Giezen
Chat
Inbox
Contacten
Instellingen

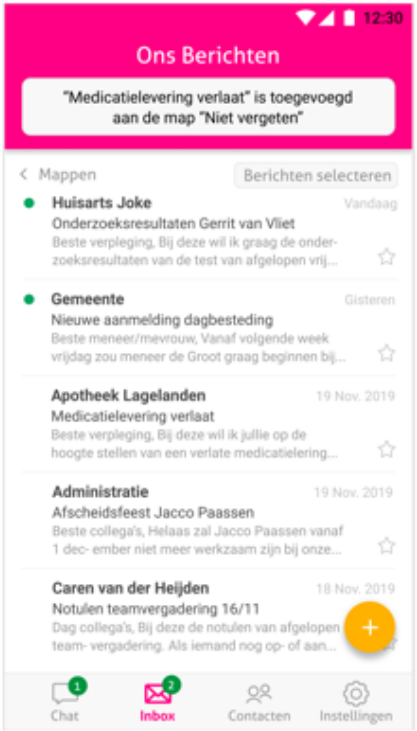
Flow 7: Create a folder in your inbox named "Niet vergeten". Move the message "medicatielevering verlaat" from the pharmacy to this folder. *(Organise inbox option 2, communication external parties)*




12:30
Ons Berichten
Zoek een bericht
Mappen
Berichten selecteren
Huisarts Joke
Vandaag
Onderzoeksresultaten Gerrit van Vliet
Beste verpleging, Bij deze wil ik graag de onder-
zoeksresultaten van de test van afgelopen vrij...
Gemeente
Gisteren
Nieuwe aanmelding dagbesteding
Beste meneer/mevrouw, Vanaf volgende week
vrijdag zou meneer de Groot graag beginnen bij...
Apotheek Lagelanden
19 Nov. 2019
Medicatielevering verlaat
Beste verpleging, Bij deze wil ik jullie op de
hoogte stellen van een verlate medicatielering...
Administratie
19 Nov. 2019
Afscheidsfeest Jacco Paassen
Beste collega's, Helaas zal Jacco Paassen vanaf
1 dec- ember niet meer werkzaam zijn bij onze...
Caren van der Heijden
18 Nov. 2019
Notulen teamvergadering 16/11
Dag collega's, Bij deze de notulen van afgelopen
team- vergadering. Als iemand nog op- of aan...
Chat
Inbox
Contacten
Instellingen

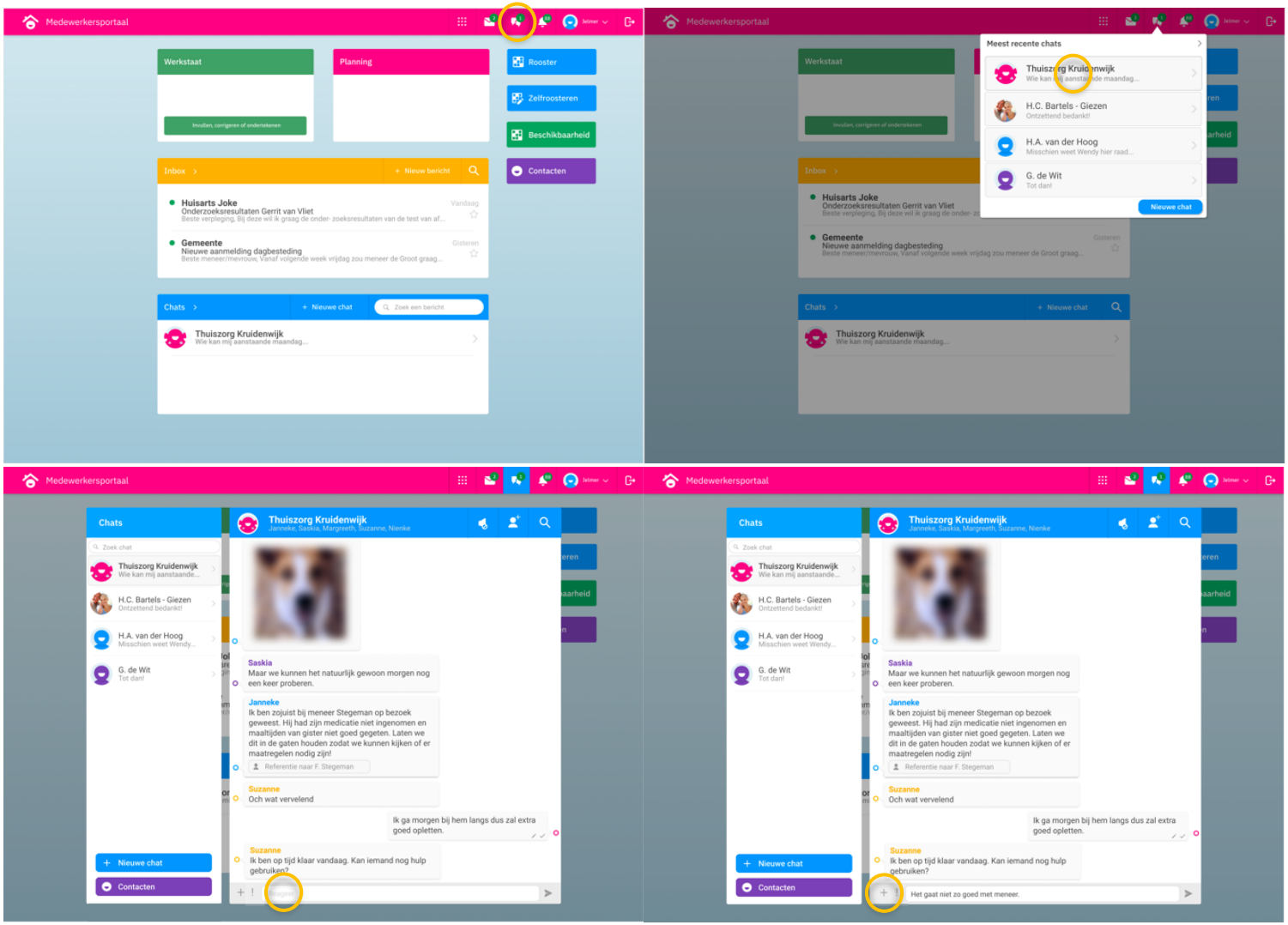

12:30
Ons Berichten
Zoek een bericht
Mappen
Berichten selecteren
Huisarts Joke
Vandaag
Onderzoeksresultaten Gerrit van Vliet
Beste verpleging, Bij deze wil ik graag de onder-
zoeksresultaten van de test van afgelopen vrij...
Gemeente
Gisteren
Nieuwe aanmelding dagbesteding
Beste meneer/mevrouw, Vanaf volgende week
vrijdag zou meneer de Groot graag beginnen bij...
Apotheek Lagelanden
19 Nov. 2019
Medicatielevering verlaat
Beste verpleging, Bij deze wil ik jullie op de
hoogte stellen van een verlate medicatielering...
Administratie
19 Nov. 2019
Afscheidsfeest Jacco Paassen
Beste collega's, Helaas zal Jacco Paassen vanaf
1 dec- ember niet meer werkzaam zijn bij onze...
Caren van der Heijden
18 Nov. 2019
Notulen teamvergadering 16/11
Dag collega's, Bij deze de notulen van afgelopen
team- vergadering. Als iemand nog op- of aan...
Chat
Inbox
Contacten
Instellingen

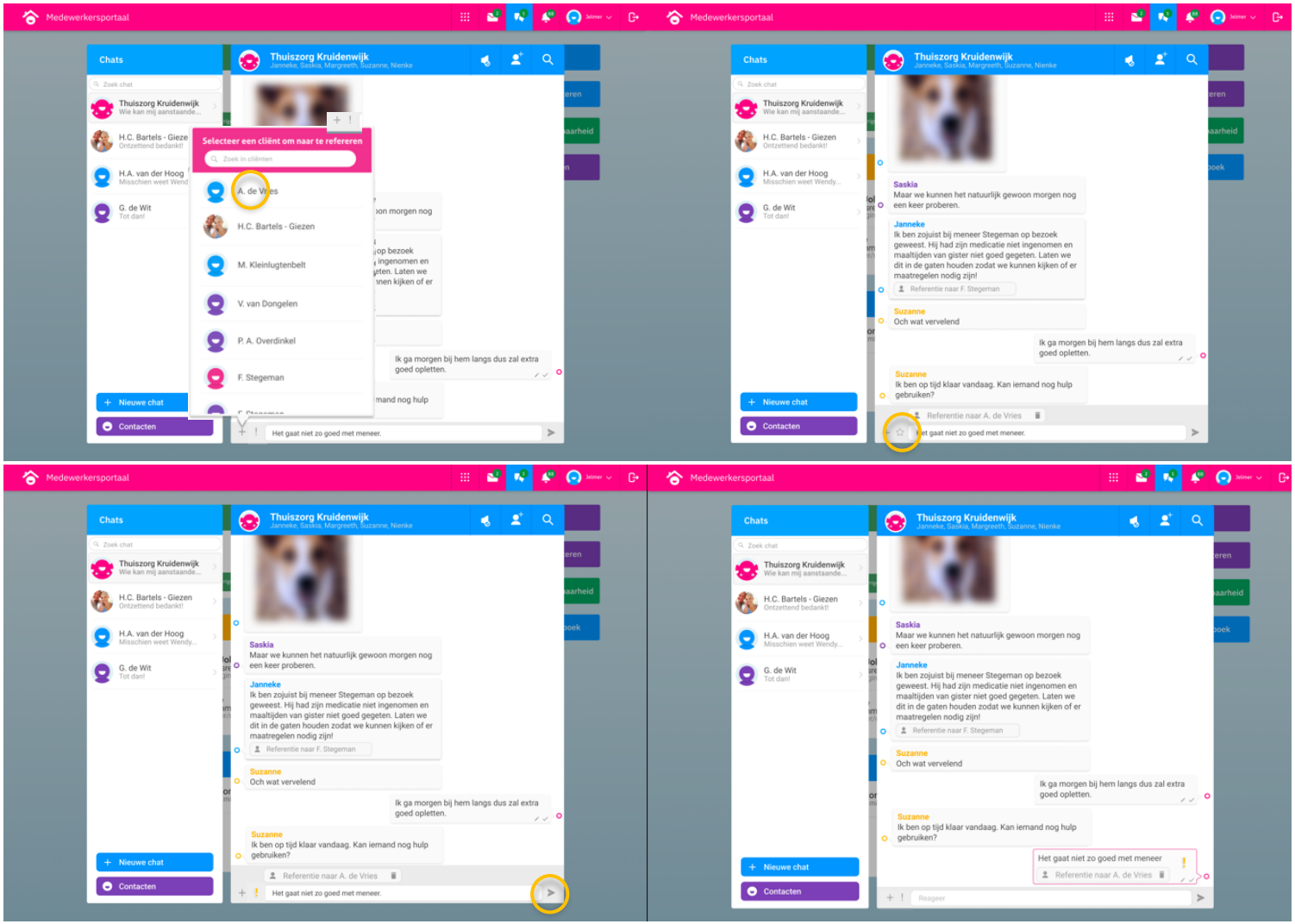

12:30
Ons Berichten
Zoek een bericht
Mappen
Berichten selecteren
Als ongelezen markeren
Toevoegen aan Niet vergeten
Verwijderen
Gemeente
Gisteren
Nieuwe aanmelding dagbesteding
Beste meneer/mevrouw, Vanaf volgende week
vrijdag zou meneer de Groot graag beginnen bij...
Apotheek Lagelanden
19 Nov. 2019
Medicatielevering verlaat
Beste verpleging, Bij deze wil ik jullie op de
hoogte stellen van een verlate medicatielering...
Administratie
19 Nov. 2019
Afscheidsfeest Jacco Paassen
Beste collega's, Helaas zal Jacco Paassen vanaf
1 dec- ember niet meer werkzaam zijn bij onze...
Caren van der Heijden
18 Nov. 2019
Notulen teamvergadering 16/11
Dag collega's, Bij deze de notulen van afgelopen
team- vergadering. Als iemand nog op- of aan...
Chat
Inbox
Contacten
Instellingen


12:30
Ons Berichten
"Medicatielevering verlaat" is toegevoegd
aan de map "Niet vergeten"
Mappen
Berichten selecteren
Huisarts Joke
Vandaag
Onderzoeksresultaten Gerrit van Vliet
Beste verpleging, Bij deze wil ik graag de onder-
zoeksresultaten van de test van afgelopen vrij...
Gemeente
Gisteren
Nieuwe aanmelding dagbesteding
Beste meneer/mevrouw, Vanaf volgende week
vrijdag zou meneer de Groot graag beginnen bij...
Apotheek Lagelanden
19 Nov. 2019
Medicatielevering verlaat
Beste verpleging, Bij deze wil ik jullie op de
hoogte stellen van een verlate medicatielering...
Administratie
19 Nov. 2019
Afscheidsfeest Jacco Paassen
Beste collega's, Helaas zal Jacco Paassen vanaf
1 dec- ember niet meer werkzaam zijn bij onze...
Caren van der Heijden
18 Nov. 2019
Notulen teamvergadering 16/11
Dag collega's, Bij deze de notulen van afgelopen
team- vergadering. Als iemand nog op- of aan...
Chat
Inbox
Contacten
Instellingen

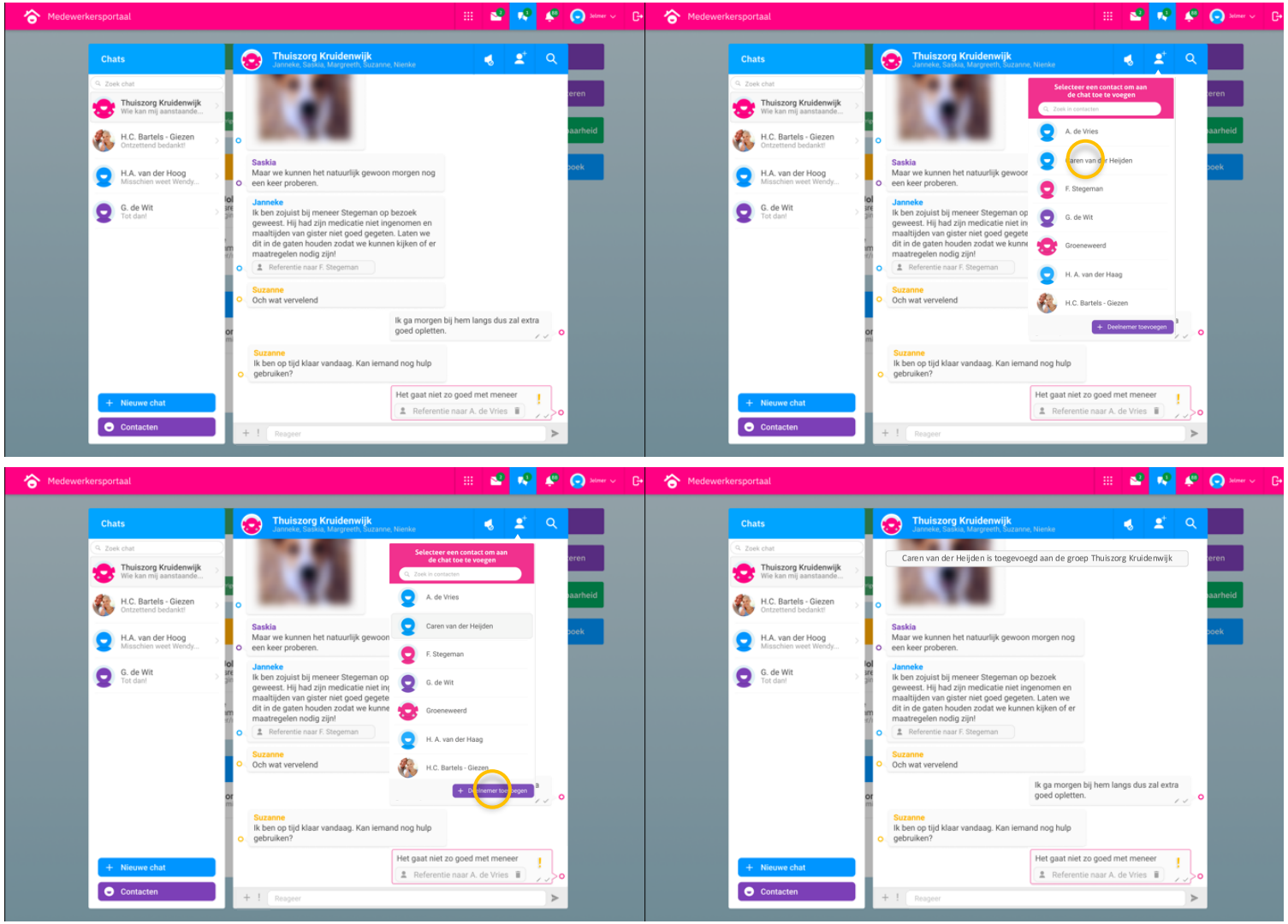
E.2 Desktop flows

Flow 1: Send a chat message to the chat group Thuiszorg Kruidenwijk with the text "Things are not so well for mister". Refer to client A. de Vries in this message, and mark it as important. *(Secure chat, urgent messages, references)*

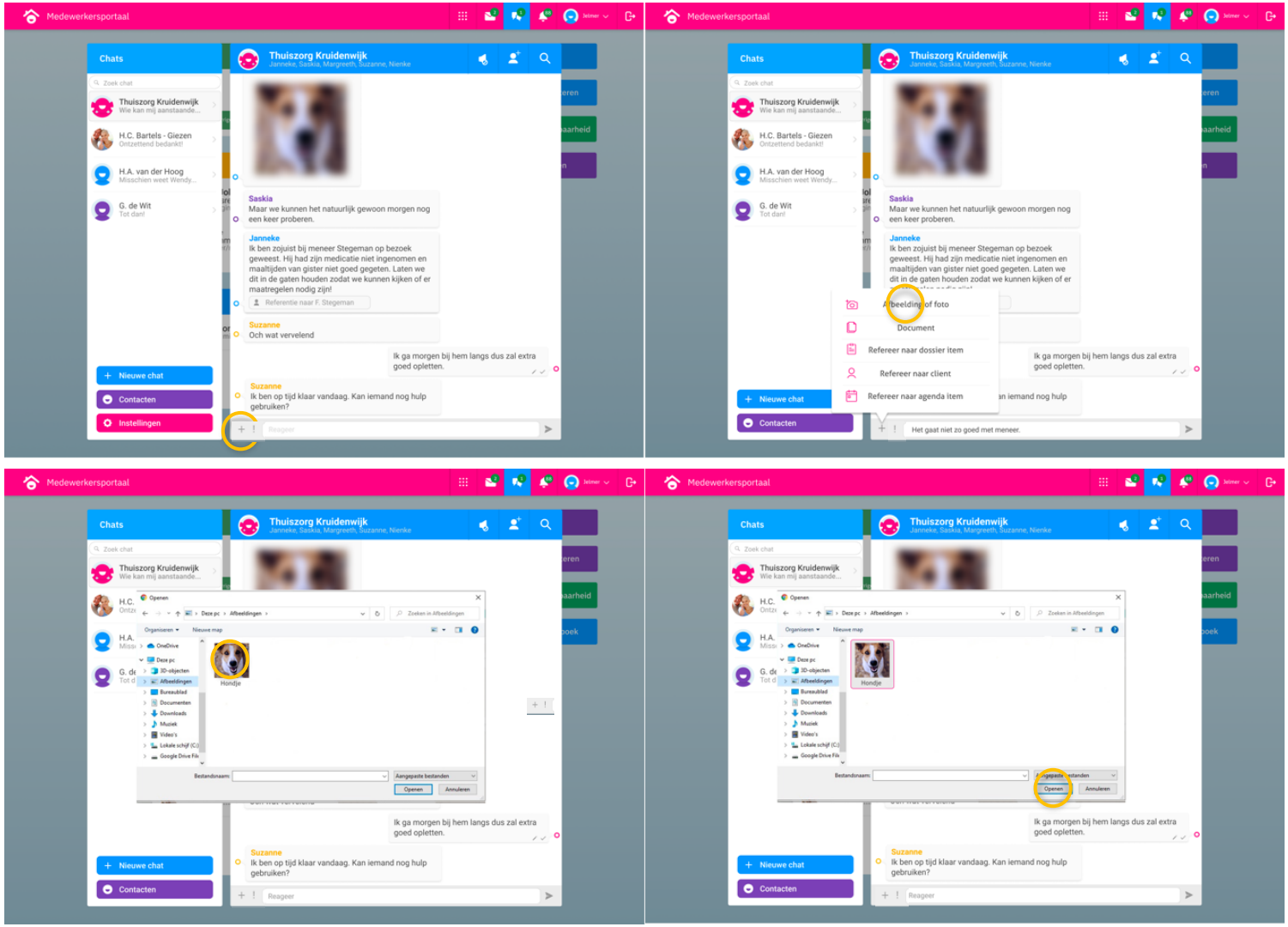


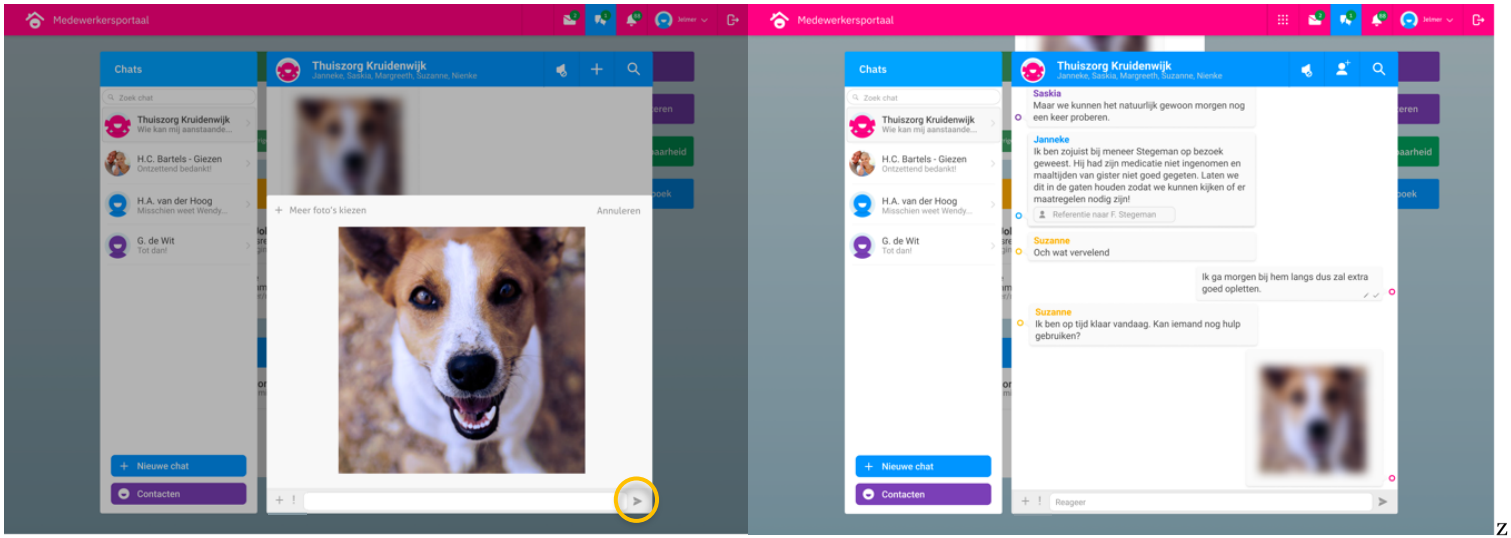

Medewerkersportaal
Chats
Thuiszorg Kruidenwijk
Janneke, Saskia, Margreeth, Suzanne, Nienke
Selecteer een cliënt om naar te refereren
Zoek in cliënten
A. de Vries
H.C. Bartels - Giezen
M. Kleinlugtenbelt
V. van Dongelen
P. A. Overdinkel
F. Stegeman
Nieuwe chat
Contacten
Het gaat niet zo goed met meneer.
Saskia
Maar we kunnen het natuurlijk gewoon morgen nog een keer proberen.
Janneke
Ik ben zojuist bij meneer Stegeman op bezoek geweest. Hij had zijn medicatie niet ingenomen en maaltijden van gister niet goed gegeten. Laten we dit in de gaten houden zodat we kunnen kijken of er maatregelen nodig zijn!
Referentie naar F. Stegeman
Suzanne
Och wat vervelend
Ik ga morgen bij hem langs dus zal extra goed opletten.
Ik ben op tijd klaar vandaag. Kan iemand nog hulp gebruiken?
Referentie naar A. de Vries
Reageer

Flow 2: Add Caren van der Heijden to the chat group Thuiszorg Kruidenwijk. *(Add someone to an existing chat)*

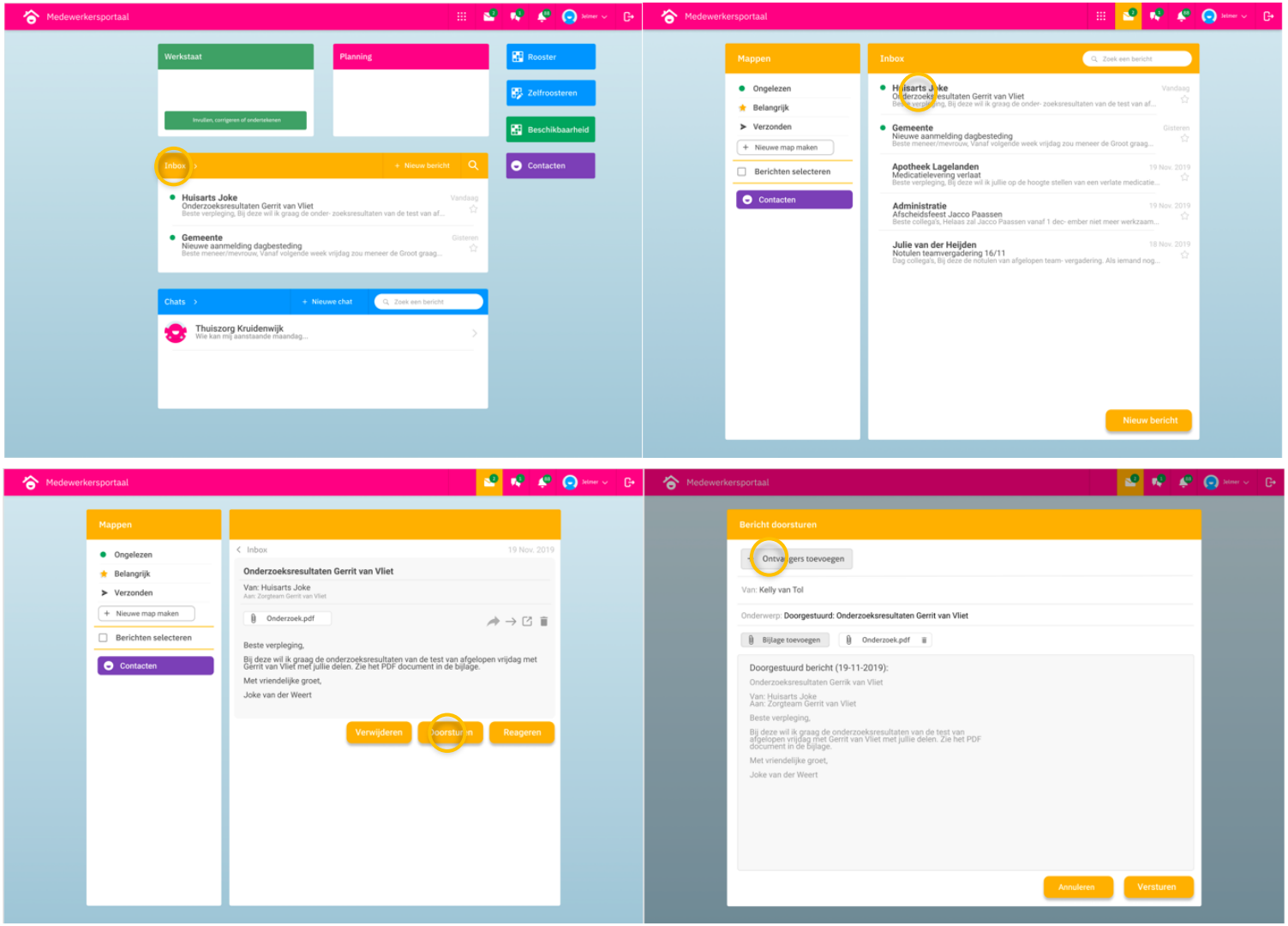


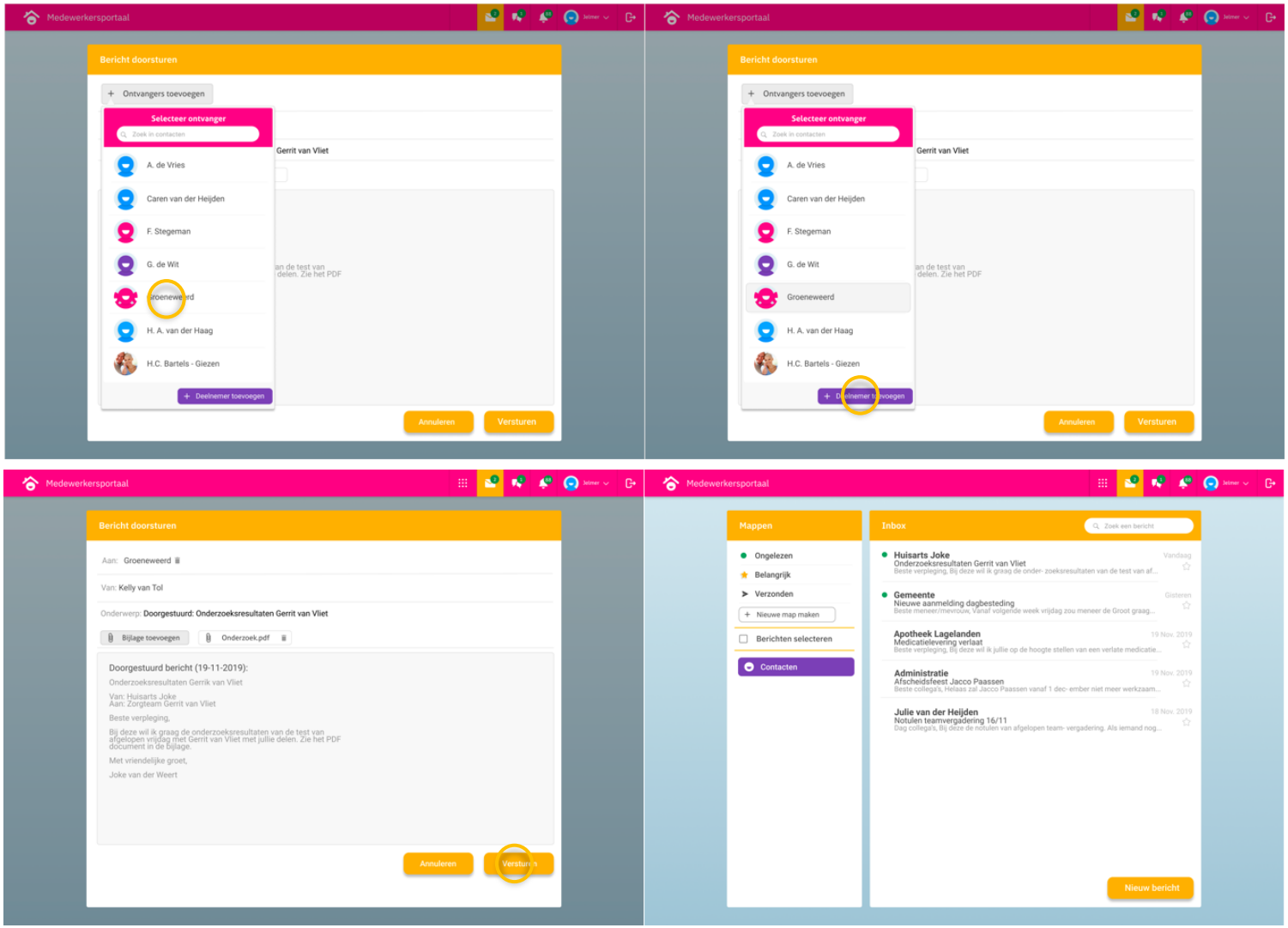
Flow 3: Send your mest recently made picture to the chatgroup Thuiszorg Kruidenwijk. *(Send attachments (chat))*



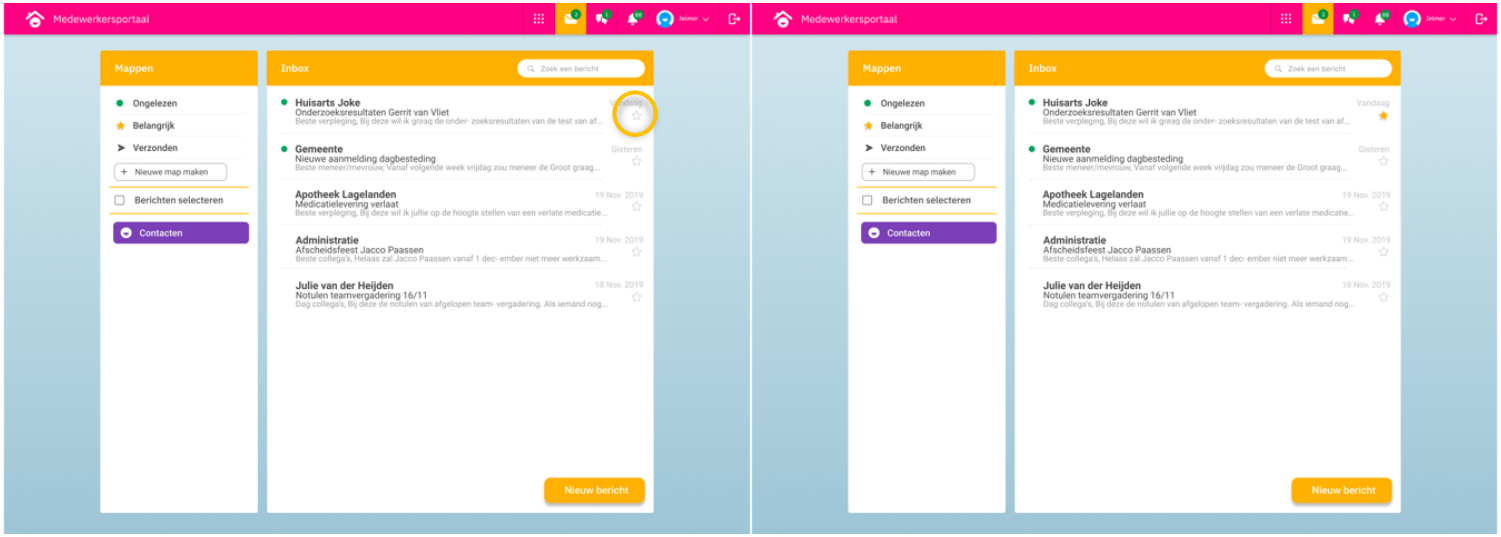

Medewerkersportaal
Chats
Thuiszorg Kruidenwijk
Janneke, Saskia, Margreeth, Suzanne, Nienke
Zoek chat
Thuiszorg Kruidenwijk
Wie kan mij aanstaande...
H.C. Bartels - Giezen
Ontzettend bedankt!
H.A. van der Hoog
Misschien weet Wendy...
G. de Wit
Tot dan!
Nieuwe chat
Contacten
Meer foto's kiezen
Annuleren
Saskia
Maar we kunnen het natuurlijk gewoon morgen nog een keer proberen.
Janneke
Ik ben zojuist bij meneer Stegeman op bezoek geweest. Hij had zijn medicatie niet ingenomen en maaltijden van gister niet goed gegeten. Laten we dit in de gaten houden zodat we kunnen kijken of er maatregelen nodig zijn!
Referentie naar F. Stegeman
Suzanne
Och wat vervelend
Ik ga morgen bij hem langs dus zal extra goed opletten.
Suzanne
Ik ben op tijd klaar vandaag. Kan iemand nog hulp gebruiken?
Reageer

Flow 4: Forward the message "Onderzoeksresultaten Gerrit van Vliet" to all people in the group "Groeneweerd". *(Forward messages, communication external parties)*




Medewerkersportaal
Bericht doorsturen
Ontvangers toevoegen
Selecteer ontvanger
Zoek in contacten
A. de Vries
Caren van der Heijden
F. Stegeman
G. de Wit
Groeneweerd
H. A. van der Haag
H.C. Bartels - Giezen
Deelnemer toevoegen
Gerrit van Vliet
Annuleren
Versturen
Aan: Groeneweerd
Van: Kelly van Tol
Onderwerp: Doorgestuurd: Onderzoeksresultaten Gerrit van Vliet
Bijlage toevoegen
Onderzoek.pdf
Doorgestuurd bericht (19-11-2019):
Onderzoeksresultaten Gerrik van Vliet
Van: Huisarts Joke
Aan: Zorgteam Gerrit van Vliet
Beste verpleging,
Met vriendelijke groet,
Joke van der Weert
Mappen
Ongelezen
Belangrijk
Verzonden
Nieuwe map maken
Berichten selecteren
Contacten
Inbox
Huisarts Joke
Onderzoeksresultaten Gerrit van Vliet
Gemeente
Nieuwe aanmelding dagbesteding
Apotheek Lagelanden
Medicatielevering verlaat
Administratie
Afscheidsfeest Jacco Paassen
Julie van der Heijden
Notulen teamvergadering 16/11
Nieuw bericht

Flow 5: Mark the message "Onderzoeksresultaten Gerrit van Vliet" as important. *(Organise inbox option 1)*



F. Evaluation users

F.1. Consent form evaluation

Before participating in the evaluation session, all participants filled a consent form.

Beste meneer/mevrouw,

Hartelijk dank voor uw bereidheid om deel te nemen aan dit onderzoek. Dit is een onderzoek van de Universiteit Twente in samenwerking met Nedap Healthcare in de vorm van een gebruiksvriendlijkheidstest. De applicatie die getest wordt is een eerste versie voor het nieuwe Ons Berichten. Dit is geen werkende applicatie: Alle informatie in de applicatie, zoals de berichten, contacten en cliënten, zijn bedacht voor deze test.

U wordt gevraagd om enkele opdrachten uit te voeren binnen deze applicatie, en de onderzoeker zal observeren hoe u dit doet. Een voorbeeld opdracht kan zijn: “Stuur het bericht met het onderwerp “Hallo allemaal” door naar Jan van Dijk”. Verder wordt u gevraagd om hardop uit te spreken wat u denkt tijdens het uitvoeren van deze opdrachten. Om dit later terug te kunnen luisteren en uit te schrijven wordt de audio tijdens dit onderzoek opgenomen. Ook zal een schermopname gemaakt worden, om achteraf uw gedrag tijdens het gebruik van de applicatie te kunnen beschrijven.

Achteraf wordt u gevraagd een korte vragenlijst in te vullen over uw mening over de applicatie. Op deze manier hopen wij verder te komen met het verbeteren van Ons Berichten om zo goed mogelijk op uw behoeftes in te spelen en een veilige en complete manier van communiceren aan te bieden.

Met deze vragenlijst zullen wij u ook vragen om uw deskundigheid, de sector waarin u werkt, en of u intra- of extramuraal werkt. Naast deze informatie en de audio en schermopname zal er geen informatie over u bewaard worden. Na het uitschrijven zullen de audio en schermopname verwijderd worden, en blijven alleen de onderzoeksresultaten over. Deze informatie zal dus niet tot u herleidbaar zijn: Het onderzoek is volledig anoniem.

Deelnemen aan dit onderzoek duurt ongeveer 30 minuten. Gegevens worden volledig anoniem en op veilige wijze verwerkt. Deelname aan het onderzoek is vrijwillig, wat betekent dat u op elk gewenst moment kunt stoppen.

Indien u vragen heeft over dit onderzoek of graag meer informatie wilt ontvangen, kunt u contact opnemen met Kelly van Tol, email: k.m.vantol@student.utwente.nl
Voor klachten kunt u bij het secretariaat van de ethische commissie van de faculteit voor elektrotechniek, wiskunde en informatica van de Universiteit Twente terecht: P.O. Box 217, 7500 AE Enschede (NL), telefoon: +31 (0)53 489 6719; email: ethics-comm-ewi@utwente.nl).

Vink alstublieft aan wat voor u van toepassing is:

- ☐ Ik heb de kans gekregen vragen te stellen en deze zijn allemaal naar mijn tevredenheid beantwoord
- ☐ Ik begrijp dat mijn deelname vrijwillig is en dat ik op elk moment zonder genoemde reden mijn deelname kan annuleren zonder dat mijn wettelijke rechten hierdoor beïnvloed raken
- ☐ Ik stem ermee in dat de observaties tijdens het onderzoek en wat ik tijdens het onderzoek heb gezegd gebruikt kan worden voor dit onderzoek
- ☐ Ik geef toestemming dat dit onderzoek wordt opgenomen (audio)
- ☐ Ik geef toestemming dat dit onderzoek wordt opgenomen (schermopname)
- ☐ Ik stem ermee in deel te nemen aan dit onderzoek

Naam deelnemer	Datum	Handtekening

Naam onderzoeker	Datum	Handtekening

F.2. Usability test instructions

Voor deze test is het belangrijk dat je je inbeeld dat je als verpleger werkt. Alle taken en namen in deze test zijn bedacht voor de test en zijn niet op de werkelijkheid gebaseerd. De applicatie die getest wordt is nog niet volledig werkend, en sommige acties zullen dan ook niet mogelijk zijn. Soms zal de applicatie iets automatisch voor je invullen: Dit hoort bij de test.

De evaluatie begint hier.

Je werkt in een zorginstelling genaamd Groeneweerd. Hier woont onder andere Gerrit van Vliet. Je hebt contact gehad met de huisarts van Gerrit van Vliet over een onderzoek wat bij hem is gedaan. De huisarts heeft de resultaten van dit onderzoek per mail opgestuurd. Deze resultaten wil je graag met alle collega's die bij Groeneweerd werken delen.

Taak 1:
Stuur het bericht "Onderzoeksresultaten Gerrit van Vliet" door naar alle mensen in de groep "Groeneweerd".

Je wilt later nog naar deze mail kijken. Daarom markeer je de mail als belangrijk.

Taak 2:
Markeer het mailbericht "Onderzoeksresultaten Gerrit van Vliet" als belangrijk.

Je werkt ook in de thuiszorg. U heeft net zorg verleend aan meneer de Vries bij hem thuis. Aangezien meneer de Vries erg onrustig was wil je met je team delen dat het niet zo goed met hem gaat. Het is belangrijk dat je team dit snel leest, en dus markeer je het bericht als belangrijk voor je het verstuurt.

Taak 3:
Stuur een chatbericht naar de chatgroep Thuiszorg Kruidenwijk met de tekst "Het gaat niet zo goed met meneer.". Refereer in dit chatbericht naar de cliënt A. de Vries en markeer dit bericht als belangrijk.

Vandaag heeft Caren van der Heijden haar eerste werkdag binnen jullie team. Het is belangrijk dat ook zij dit bericht leest.

Taak 4:
Voeg Caren van der Heijden toe aan de chatgroep Thuiszorg Kruidenwijk.

Het is een nieuwe dag. Je weet dat een paar van je teamgenoten, net als jij, gek zijn op honden. Je komt net bij een cliënt vandaan en hebt daar een leuke foto van de hond van haar dochter gemaakt.

Taak 5:
Stuur je meest recent gemaakte foto naar de chatgroep Thuiszorg Kruidenwijk.

Mevrouw Bartels – Giezen is al een tijdje zorgbehoevend, maar kan zelf nog erg goed communiceren, ook digitaal. Om de planning van haar zorg praktisch te kunnen bespreken is een groep met mevrouw, de betrokken zorgmedewerkers, en haar mantelzorger handig.

Taak 6: Maak een groep aan met de naam "Zorgteam Bartels". Voeg aan deze groep, naast mevrouw H.C. Bartels – Giezen, al je contacten die een connectie hebben met mevrouw H.C. Bartels – Giezen toe.

Op 19 november heb je bericht gekregen van de apotheek over een verlate medicatielevering. Al heb je nu geen tijd om hiermee bezig te gaan, je bedenkt je dat je dit bericht absoluut niet mag vergeten. Daarom creëer je een nieuwe map in je inbox, genaamd “Niet vergeten”, en plaats je het bericht hier in.

Taak 7: Creëer een nieuwe map in je inbox met de naam “Niet vergeten”. Verplaats het bericht “Medicatielevering verlaat” van de apotheek naar deze map.

De evaluatie eindigt hier.