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Digital Communication: The Newcomer in Family Medicine - GP and Nurse Experiences Working with Automated Patient Interviews and an Asynchronous Chat

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ABSTRACT

Objectives: To explore staff experiences of working with a digital communication platform implemented throughout several primary health care centers (PHCCs) in Sweden.

Design: A descriptive qualitative approach using focus group interviews. Qualitative content analysis was used to code, categorize, and finally abstract data into one comprehensive theme.

Setting: Three PHCCs across Sweden, in both rural and urban settings.

Participants: Mixed groups of primary care physicians and nurses.

Results: Six categories emerged: “Fears and Benefits of Digital Communication”, “Altered Practice Workflow”, “Accepting the Digital Society”, “Safe and Secure for Patients”, “Doesn't Suit Everyone and Everything”, and “An Incomplete System”. These were abstracted into one comprehensive theme: “Digital Communication: The Newcomer in Family Medicine”.

Conclusions: Family medicine staff were ambivalent concerning the use of digital communication but, after a period of adjustment, it became a useful communication tool especially when combined with continuity of care. Staff acknowledged limitations with regard to use by inappropriate patient populations, information overload and misinterpretation of text by both staff and patients.

Abstract word count: 165

STRENGTHS AND LIMITATIONS OF THIS STUDY

- This is the first study exploring both physician and nurse experiences of digital communication in the primary care setting.
- Theoretical saturation and high participant engagement allowed for thick descriptions and transferability of our findings to other contexts.
- Limitations include lack of multiple coders and a potential bias toward physician perspectives as the interviewers were both physicians.

INTRODUCTION

The patient interview and physical examination are central to family medicine consultations. In Sweden, patients are increasingly using digital communication to access primary care.[1] However, limited evidence for e-health has been described as a problem.[2]

Heterogeneity between digital communication tools is high thus making it difficult to draw general conclusions about the usefulness of such tools. Some use synchronous video communication, while others provide an asynchronous "chat-based" tool. Automated patient interviewing software is also used to gather key information prior to consultations.

Swedish health care holds a high international standard,[3] but low continuity and poor accessibility to primary care contribute to low patient satisfaction.[4] Whether digital communication can address or aggravate these challenges is currently unknown. Little is known about staff experience working with such technology. Potential benefits may never be realized if staff experiences become a barrier to implementation.

A Norwegian study recently found that general practitioners (GPs) generally had positive experiences with using digital communication.[5] Meanwhile, UK studies found GPs felt such communication benefited patients and saved timed, but also raised concerns about security, increased workloads, and poor integration into clinical practice.[6 7]

None of the above studies evaluated nurse perspectives. As nurses have a crucial role in primary care,[8] understanding their experiences of digital communication is crucial. Indeed, a Swedish study found nurses experienced increased workloads, a damaged patient-provider relationship and lack of user-support.[9]

Since September 2018 a digital communication platform (developed by Doctrin AB, referred to as 'the platform' in this paper) has been implemented across several primary health care centers (PHCCs) in Sweden as the first point of contact prior to booking physical visits. Patients access an automated patient interviewing software on their computer, tablet or smartphone and can freely write their ideas, concerns, and expectations as is common in family medicine consultations.[10] They then answer a query-specific questionnaire, with answers presented to the healthcare provider (usually a nurse), who can ask additional questions via asynchronous chat-based communication if needed. Queries can be forwarded to a GP or other staff if required.

This qualitative study aimed to explore family medicine staff experiences of working with the platform by answering the following research question:

How do family medicine physicians and nurses experience the implementation and use of digital communication in the form of automated patient interviewing software and chat-based patient-provider communication?

METHODS

Qualitative Approach and Research Paradigm

This study deemed an interpretivist paradigm suitable for exploring the phenomena of staff experience working with digital communication.[11] Such an approach is adopted by the qualitative content analysis methodology as presented by Graneheim and Lundman.[12] Focus group interviews, commonly used to study attitudes and needs of medical staff,[13] were thus chosen as the data-collection method. As the GPs and nurses form pre-existing groups working together as a team during the focus group interviews, it allows "naturalistic" exchanges during data collection. This may give a deeper understanding of the target phenomenon. Open discussions allow participants to debate the studied phenomenon from a personal point of view and facilitate expression of beliefs and attitudes left undeveloped in an individual deep interview.

Context

Three voluntary PHCCs using the platform were chosen to provide a mix of urban and rural settings. For each PHCC, a focus group interview with an even distribution of GPs and nurses was planned, with the goal of recruiting a minimum of six participants per group.

Ethical Considerations

The study was approved by the Swedish Ethical Review Authority (reference number 2019-01516). Each participant gave written consent to participate in the focus group interview.

Patient and Public Involvement

Patients or the public were not involved in this study.

Data Availability Statement

Interview transcripts and coding data is available upon request.

Data Collection

Interviews were conducted between June 5th and June 12th 2019 with a moderator (VMN) introducing topics with open-ended interview-guide questions developed from the research question (appendix 1), facilitating the discussion with follow-up questions and summaries to verify interpretations. The interview guide was iteratively modified in response to evolving study findings. For data triangulation, an interview assistant (AE) observed and registered non-verbal communication but also aided the moderator in facilitating the discussion. Demographic data and quantitative data on months of experience working with the platform were also collected from all interview participants with a short questionnaire. Interviews were audio recorded (Olympus VN-8700PC digital voice recorder) and transcribed verbatim.

Data Analysis

Analysis was conducted in Swedish in NVivo 12. Relevant quotes for this paper were translated into English. The first author (AE) read and re-read the transcripts while listening to the audio recording for transcript correction and data familiarization. Meaning units were identified, condensed, and coded by the first author. Examples of the coding process are given in table 1. Codes were grouped into manifest categories and sub-categories. Regular peer debriefing occurred with two other authors (VMN and BBB)

for discussion and reflection at all levels of analysis, discussing appropriateness of meaning units, coding, and categorization. Once consensus was reached regarding categories, all three authors involved in the analysis abstracted the categories to an overarching latent theme. The manuscript was drafted using SRQR reporting guidelines.[14]

Table 1: Examples of meaning units, condensed meaning units and codes

Meaning unit	Condensed Meaning Unit	Code
"…if it has any medical consequences, it's too soon to tell, there's too few, a too small sample"	*Too small sample to know medical consequences*	*Medical consequences unknown*
"…and to be able to consult colleagues and the doctors and such… I see that as positive, compared to using the phone"	*Easier to consult colleagues compared to the phone*	*Enables colleague consultation*

RESULTS

Study Unit Characteristics

We recruited a total of 9 GPs and 10 nurses across our three focus groups, with four to ten participants per group. Characteristics of PHCC participants are summarized in table 2.

Table 2: Staff and PHCC characteristics.

	Location	Patients managed	Number of Staff (as cited)	Age Group	Number of Females	Mean Years with License (range)	Mean Months in Platform (range)
PHCC 1	Urban	9 000	3 Nurses (Nurse 1-3)	20-50	3	4.3 (3-5)	2.7 (2-3)
			1 GP (GP 1)	50-60	1	18 (18-18)	4 (4-4)
PHCC 2	Urban	27 000	2 Nurses (Nurse 4-5)	20-40	2	6 (1-11)	3 (3-3)
			3 GPs (GP 2-4)	40-50	1	10 (9-11)	4 (1-6)
PHCC 3	Rural	8 000	5 Nurses (Nurse 6-10)	30-60	4	17.4 (1-31)	3.5 (2-4)
			5 GPs (GP 5-9)	30-60	4	15.2 (3-23)	3.6 (3-4)

During analysis, 43 subcategories emerged, grouped into six categories, abstracted into one comprehensive theme: "*Digital communication as a newcomer in family medicine".* Categories are illustrated in the hierarchy chart displayed in table 3. Below each category is described in detail, with subcategories embedded in the text in *italics*.

Table 3: Categories and subcategories.

Category	Subcategory
Fears and Benefits of Digital Communication	Ambivalence towards the benefits of digital communication
	Advantage in providing first-hand information
	Reduce human error
	Affect the patient-provider relationship
	Comprehensive questionnaire but overly informative symptom report
	Value through the asynchronous chat
	Varying need to ask follow-up questions
	Thoughts on visual communication
	Loss of communication nuances
	Misuse by patients
	Uncertainty regarding the future
	Risks from difficulties assessing symptom severity
Altered Practice Workflow	Involuntary responsibility for irrelevant information
	Problems managing extended queries
	Less stressful working environment compared to other forms of communication
	Automated repetitive routines
	More focused queries
	Faster and easier patient communication
	Nurses managed most queries
	Multiple parallel queries stressful
	Adapted routines over time
	Shorter digital visits
	Confusion due to many systems
	Unpredictable patient volumes
	Easier to consult colleagues and gather information before answering
Accepting the Digital Society	Existing communication technology
	Adaption is necessary
	Worried before the start
	A desire to stay digital
	Perceived better over time
Safe and Secure for the Patient	Fast response times expected by patients
	Better sorting of patient queries
	Improved access
	Reduce infection risk
	Used by unexpected patient groups
	A feeling of security among patients
	Frequent visitors were managed better
	Improved continuity mattered
Doesn't Suit Everyone and Everything	Doesn't suit all patients
	Not all queries felt suitable for digital communication
	Digital communication as a partial solution
An Incomplete System	Adaption to local prerequisites
	Missing features & technical limitations

Fears and Benefits of Digital Communication

All groups expressed an *ambivalence towards the benefits of digital communication*, with some participants feeling curious and excited about using new technology, while others felt that the platform had many benefits but also many drawbacks.

Nurses from the two urban PHCCs found that the automated patient interview had an *advantage in providing first-hand information* from the patient, which they felt was thought-through, thus allowing patients to fully express their concerns without interruption.

> *"And it's really their words. It's not our interpretation of their words. That's also… it becomes more certain, I think." – Nurse 3*

Questionnaires *reduced human error* as relevant questions were always asked, without individual stress or other externalities affecting the consultation. The ability to reflect over messages before sending them was perceived as beneficial managing overly emotional discussions. On the contrary, staff highlighted that some patients experience the chat as robotic, speculating that this could *affect the patient-provider relationship*.

Staff highlighted that the automated patient interview was a *comprehensive questionnaire but overly informative symptom report*. The presented information was perceived as useful, covering important differential diagnoses. However, staff experienced difficulties considering all of the provided information in the decision-making process. Many perceived that the *questionnaire determined the quality of medical history.* The most valuable information came from the first three free-text questions about patient ideas, concerns, and expectations.

> *"…it's about having just enough information in those questionnaires so that one can digest it… there is a balance… between too much and too little information too, so that it stays relevant…" – GP 2*

The platform was perceived to provide a unique *value through the asynchronous chat,* as it allowed for a unique means of communication distinct from traditional means.

> *"One aspect is the automated patient interview tool and the other is the asynchronous communication. So those two things are new… I almost think that the asynchronous communication is the biggest benefit. I do." – GP 4*

Staff experienced a *varying need to ask follow-up questions* via chat or telephone in cases where patients skipped a question or reported alarming symptoms. Staff generally felt comfortable with adjusting the level of communication between chat-based and telephone-based or booking a physical visit if needed.

Several *thoughts on visual communication* also emerged**.** Sending images was perceived to be useful, providing a unique benefit over telephone consultations, especially for dermatological queries. The platform didn't include synchronous video consultations, but these were speculatively perceived as less beneficial, as the possibility to reflect over what was communicated wouldn't exist.
All groups felt that communicating via text led to some *loss of communication nuance*. While facial expressions and body language were already absent in telephone consultations, cues like tonality were further removed when moving to text-based communication. Staff felt that these cues, in certain situations, provided important "between the lines" context for interpretation of reported symptoms.

> *"That's probably why… fully AI-run systems refer fifteen percent to the emergency department… Because if one interprets peoples' words literally, then the whole health care system crashes." – GP 4*

Patient interpretations of symptoms were perceived to not always be in-line with clinician interpretations. Misunderstood questions weren't reformulated by the automated patient interview as would otherwise be possible in a live conversation.

> *"What does 'dizziness' mean? … There are many terms that mess things up. Because we're talking about different things, a certain symptom is one thing for the patient and another for me… so it's hard to just ask specific questions in a questionnaire like that." – GP 2*

Staff from PHCC 2 also highlighted *risks from difficulties assessing symptom severity*. Most often, staff experienced symptoms to be less severe than reported when asking follow-up questions. GPs feared trivializing patient symptoms over time. Such risks were perceived lower with telephone consultations where severity was more confidently assessed. Consequently, some GPs expressed asking more follow-up questions via digital communication compared to telephone consultations.

> *"Yes, because I'm thinking if you look at the group presenting with anxiety and depression, for example, they get a lot of questions and then many of them specifically report suicidality or such, and… when one calls them, it isn't at all like they have written." – Nurse 4*

The human ability to scrutinize reported information when consulting patients was deemed as central to the consultation process, but the automated patient interview was perceived to lack this ability.

"In a conversation… one consciously ignores some things… Here it's 'on print'… that they have 'numbness in half of their body'… which looks a little worse than if they say it in a context where it is completely obvious that they don't… The 'human filter', it vanishes." – GP 4

Apart from inaccuracies in reported symptom severity, staff also experienced frustrations over *involuntary responsibility for irrelevant information*. Including obsolete chronic symptoms or symptoms indicative of potentially severe disease

"'Do you have abdominal pain?' Yes… they have had abdominal pain for fifty years. But we don't need to talk about that today. I would never ask the question in a normal conversation… or an obvious tension headache, but… visual impairment, asymmetrical pupil size… like 'Aha, maybe we should order an ambulance instead?!'" – GP 3

This resulted in divergent agendas between GPs and patients where GPs focused on addressing irrelevant but potentially urgent symptoms, while patients expect to get their primary less urgent concern addressed.

"…it's not the questions I want the answer to, but which I have to assess… and it's extremely annoying… and now there's also a pop-up… saying that I am responsible for all the information I'm getting… Then I feel [the platform] limits me… that it takes longer than if I had done it another way." – GP 3

All three PHCCs expressed challenges related to platform *misuse by patients,* including patients skipping questions, not reading staff responses, taking hours to answer follow-up questions, or failing to confirm suggested appointments.

PHCC 1 and PHCC 3 had relatively few patients using the platform, while PHCC 2 used the platform extensively. All participants expressed an *uncertainty regarding the future* of the platform, feeling it was too early to evaluate long-term risks and consequences of its use.

Altered Practice Workflow

The platform was perceived to contribute to a *less stressful working environment compared to other forms of communication,* including prior digital communication systems and telephone consultations. Varying scheduling routines were implemented across PHCCs, adding variation to the workday. In some cases, certain rooms were dedicated to staff working with the platform, with staff appreciating a less noisy environment.

Initially *unpredictable patient volumes* and *confusion due to many systems* (medical record, the

platform, and other digital systems) were difficult for staff to manage, but they *adapted routines over time.*

> *"First it was a bit easy to make mistakes…if one had maybe five ongoing queries and maybe two girls around the same age or so to speak, it was easy to write to the wrong patient. […] until one develops a routine." – Nurse 1*

Miscommunication prevention, adjusting staffing at other workstations, scheduling adjustments, and stress management strategies were examples of ongoing adjustments. Staff generally felt that they handled digital queries faster and better over time.

Generally, it seemed that *nurses managed most queries* in the platform. Staff from PHCC 2 estimating that around 30% of queries were forwarded to GPs for further evaluation. Nurses did, however, find *multiple parallel queries stressful,* especially when combined with physical visits and telephone consultations.

> *" One has to get used to it, sort of like working at the emergency department, where one has twenty patients at the same time, like, and each gradually gets finished, and some get finished quickly and other take a little longer" – Nurse 3*

All PHCCs experienced *faster and easier patient communication* in terms of appointment booking, information sharing and no longer having to redial patients not answering their phones. The chat-format made it *easier to consult colleagues and gather information before answering* patient queries.

Staff also experienced *automated repetitive routines,* including questions asked and documentation, copied and pasted into the medical record. Staff at PHCC 3 experienced *more focused queries.*

> *"…visits are better prepared and that's both good and bad. For example… someone seeking care for mental illness, who has already filled in rating scales etc., one enters the conversation at a different point. It's not like, 'Good day, what are you here for?'. Instead you have a lot of information before, when one starts the conversation… if it has any medical consequences is too soon to tell…" – GP 9*

Staff thus experienced *shorter digital visits,* especially for follow-ups, perceived to free up time for physical visits when needed. However, there were *problems managing extended queries* when patients took hours to respond. By the end of the day, potentially urgent symptoms may thus have been left unaddressed. PHCC 3 managed this with a standardized message, informing patients to seek out-of-hours clinics for urgent symptoms.

Accepting the Digital Society

Some staff were *worried before the start* but there was a general perception that *adaption is necessary,* and digitalization wasn't perceived as a choice. Parallels were drawn to implementation of telephone communication in family medicine, and pressures to use existing means of communication.

> *"… if you have an entire panel who speaks English, then it's reasonable that we also speak English… we can't close our eyes to the fact that people communicate this way. We can't say 'we don't use phones, we use messages in bottles'… We have to adapt…" – GP 4*

The platform utilized *existing communication technology* that was familiar to both staff and patients. Patients using the platform were perceived as being different from those seeking traditional care, with *fast response times expected by patients,* similar to a commercial customer support chat. Despite the challenges of adapting to the digital era, there was a general sense that the platform was *perceived better over time.*

> *"When it came we were a bit scared that it would be a lot… that we wouldn't be able to handle it, but today I feel that we are all pretty positive and that we more easily can communicate with patients and it will only get easier" – Nurse 7*

In fact, all practices expressed *a desire to stay digital,* with two PHCCs incentivizing patients to use the platform by offering shorter waiting time for appointments or automatically redirecting certain patients from the phone.

Safe and Secure for the Patient

The platform was perceived to contribute to *better sorting of patient queries* by giving an overview of incoming presenting symptoms and effective symptom reporting for triage to the adequate level of care. Reduced crowding was also perceived to *reduce infection risk.* There was a general perception of *improved access* to care as patients no longer needed to wait for staff to pick up the phone that led to *a feeling of security among patients.*

> *"Many appreciate that hundred-percent availability which it really provides. [Patients] can write and will get through… that's very reassuring" – GP 2*

Staff were also surprised that the platform was occasionally *used by unexpected patient groups,* including elderly individuals and patients with socioeconomic difficulties.

> *"It was a patient who otherwise has a very strained life. I was very surprised that she could use it, but it's worked well for her… a single mother with three small children… working full time and finds phone calls from the practice difficult during working hours… So we can send her a text, or chat with her and manage things when it works for her… She thought it was great." – GP 1*

While the platform was initially viewed as a triage tool, it became increasingly clear to staff that *improved continuity mattered* most, giving PHCCs a unique advantage over private "digital only" family medicine providers. Following stable chronic conditions, SSRI treatments and dermatological diagnoses were some examples of platform use for improved continuity. *Frequent visitors were managed better* using the platform, with follow-ups via chat instead of physically. Staff were uncertain, however, whether the platform had substantially reduced physical visits in general.

> *"…I perceive that for my patients, mostly the sickest or most worried ones, it's a huge reassurance and very personal. When they can chat with me and I can say like 'We don't need to book a new appointment'… 'Take it easy and be in touch. It may take a day before I answer, but I will answer.'… then they have a face associated to the person writing… then one can sometimes even crack a joke in the chat" – GP 4*

Doesn't Suit Everyone and Everything

All PHCCs acknowledged that digital communication *doesn't suit all patients.* Although some technically literate elderly patients used the platform, others were less confident often resulting in phone calls being made to clarify the issue. PHCC 2 mentioned that patients redirected to the platform via telephone could express dissatisfaction.

Not all queries felt suitable for digital communication, with unknown patients with mental illness being a common unsuitable situation, while simpler queries were more efficiently managed digitally.

> *"Many queries are pretty simple… 'I want to renew a prescription', 'what did my tests show?', 'why is there such a long waiting time'. In these situations, one isn't dependent on any finessed nuances…" – GP 9*

GPs envisioned *digital communication as a partial solution* to the challenges faced by family medicine, serving as an additional help to existing ways of working. Few queries were managed completely digitally, but rather "digi-physically" as digital communication could on many occasions contribute to overall management of a patient, followed by an occasional physical examination.

An Incomplete System

Staff pointed out several *missing features and technical limitations* of using the platform, including lack of integration into the electronic medical record, integration with artificial intelligence for decision-support and automatic language translation.

> *"God, I can't wait until one can use it in other languages. That would be completely amazing." – Nurse 3*

While the platform was somewhat flexible, further *adaption to local prerequisites* was desired. Staff, acknowledged, however, that optimal local adaptation probably only could be achieved if each PHCC developed their own platform.

DISCUSSION

Main Findings and Theme

The six categories were incorporated into the theme: *"Digital Communication: The Newcomer in Family Medicine"*. One might envision staff experience of working with digital communication to that of receiving a new son- or daughter-in-law, with the family representing the primary care system. Such a newcomer may be perceived to bring both risks and benefits to the family, while altering family dynamics. A son in-law, for example, may be perceived as safe and secure by one's daughter (in this metaphor representing the patients). At the same time, the newcomer may not agree with everyone in the family, and both parties may need to develop new qualities to accept each other long-term.

Staff perceived that digital communication offered many benefits, especially due to the asynchronous nature of the platform, but also needed to adapt to limitations in terms of use by inappropriate patient populations, information overload, and misinterpretation of text by both staff and patients.

Strengths

Several factors add to the trustworthiness of our findings. Firstly, credibility increased by prolonged engagement, peer debriefing and triangulation. The two interviewers had experience with using digital communication in primary care, understanding the topic and optimally facilitating discussions; there was a mutual understanding of the context the participants worked with. Regular peer debriefing from coding to categorization added to study credibility. Investigator triangulation with a third researcher without a background in digital communication added an alternative perspective on the data for a richer interpretation. Data triangulation with non-verbal observations further added credibility. Highly engaged interview participants allowed for thorough descriptions of our goal phenomenon, adding transferability of our findings to similar contexts.

Only one of our 43 subcategories emerged from the final interview, suggesting that "theoretical saturation" was reached.[15] However, we cannot exclude that further interviews would yield a different final perspective.

Limitations

Results should be interpreted with consideration to several limitations. Due to limited resources, we were unable to conduct secondary coding. We didn't conduct member checks which limits credibility. Lack of an audit trail also limits confirmability and consistency. Some participants tended to focus on the platform rather than our goal phenomenon. Finally, as interviewers were both GPs, participant engagement and interpretation of results may have been skewed in favor of GP over nurse perspectives.

General Discussion

Our findings conceptualize digital communication as both an alternate means of information exchange (a transactional process) as well as a means of developing and maintaining doctor-patient relationships (a transformational process). This is in-line with the two dominating paradigms in the communication literature.[16] These perspectives must be interpreted in the existing social context where digital communication is increasingly used and expected. Additionally, implementing digital communication had effects beyond patient communication, i.e. on practice organization and working environment.

The platform has recently been evaluated in a survey study finding that staff experienced improved triage, high patient satisfaction, issues of care supply to specific patient populations, and issues with managing IT-systems.[17] Our results add depth to these findings, as well as focusing primarily on staff experiences of digital communication beyond the platform itself.

Unlike Banks et. al[6] and Cowie et. al,[7] staff in this study didn't experience poor integration into clinical practice, and only nurses experienced a transient increase in workload before adapting to the new workflow. However, GPs in our study only received queries previously triaged by nurses, likely limiting consequences to GP workload. Findings in the study may be specific to the studied platform.

CONCLUSIONS

Family medicine staff experience a period of adjustment to integration of digital communication in a time when such communication is extensively used and expected by patients. Despite concerns about inappropriate use and difficulties interpreting text, digital communication has found a role as a useful means of communication, especially when combined with continuity of care. It seems that family medicine has a newcomer that is here to stay.

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Appendix 1: Interview Guide

Information to participants

Those of you who are present at this interview have worked with digital communication in [the platform]. The purpose of today's focus group interview is to explore your experiences with digital communication. I will ask a number of questions to open up for discussion, but you are free to speak about how you feel. No answer is right or wrong.

(Questions below are asked in case discussions spontaneously end. Spontaneous participant thoughts are prioritized above answers to questions below)

- Can you describe how things have worked with digital communication?
    - Examples regarding when it has worked well?
    - Examples regarding when it has not worked well?
- How did you react when you found out you would start working with digital communication?
- How was the process of starting with digital communication? How did you experience it?
- How has digital communication affected your way of working?
- What is good and bad about digital communication?
- Do you think one can improve digital communication in any way?
- Do you experience that digital communication has affected patient contact? In what way?
    - Examples regarding when it has worked well?
    - Examples regarding when it has not worked well?
- How do you perceive patients are affected by digital communication?
- How do you feel about the future of digital communication?
- How has your daily work been affected by digital communication?
    - Can you give examples where you think it's had a positive or negative effect?
- What medical consequences do you feel that digital communication has?
  (Examples if participants don't think of anything: influence on prescribing behavior, sick notes, psychiatric assessments, patient safety)
- What do you think about the report generated by the automated patient history software?
- How has digital communication affected your working environment?

Reporting checklist for qualitative study.

Based on the SRQR guidelines.

Instructions to authors

Complete this checklist by entering the page numbers from your manuscript where readers will find each of the items listed below.

Your article may not currently address all the items on the checklist. Please modify your text to include the missing information. If you are certain that an item does not apply, please write "n/a" and provide a short explanation.

Upload your completed checklist as an extra file when you submit to a journal.

In your methods section, say that you used the SRQR reporting guidelines, and cite them as:

O'Brien BC, Harris IB, Beckman TJ, Reed DA, Cook DA. Standards for reporting qualitative research: a synthesis of recommendations. Acad Med. 2014;89(9):1245-1251.

		Reporting Item	Page Number
	#1	Concise description of the nature and topic of the study identifying the study as qualitative or indicating the approach (e.g. ethnography, grounded theory) or data collection methods (e.g. interview, focus group) is recommended	**2**
	#2	Summary of the key elements of the study using the abstract format of the intended publication; typically includes background, purpose, methods, results and conclusions	**2**
Problem formulation	#3	Description and signifcance of the problem / phenomenon studied: review of relevant theory and empirical work; problem statement	**3**
Purpose or research question	#4	Purpose of the study and specific objectives or questions	**3**
Qualitative approach and research paradigm	#5	Qualitative approach (e.g. ethnography, grounded theory, case study, phenomenolgy, narrative research) and	**4**

		guiding theory if appropriate; identifying the research paradigm (e.g. postpositivist, constructivist / interpretivist) is also recommended; rationale. The rationale should briefly discuss the justification for choosing that theory, approach, method or technique rather than other options available; the assumptions and limitations implicit in those choices and how those choices influence study conclusions and transferability. As appropriate the rationale for several items might be discussed together.	
Researcher characteristics and reflexivity	#6	Researchers' characteristics that may influence the research, including personal attributes, qualifications / experience, relationship with participants, assumptions and / or presuppositions; potential or actual interaction between researchers' characteristics and the research questions, approach, methods, results and / or transferability	**14**
Context	#7	Setting / site and salient contextual factors; rationale	**4**
Sampling strategy	#8	How and why research participants, documents, or events were selected; criteria for deciding when no further sampling was necessary (e.g. sampling saturation); rationale	**4**
Ethical issues pertaining to human subjects	#9	Documentation of approval by an appropriate ethics review board and participant consent, or explanation for lack thereof; other confidentiality and data security issues	**4**
Data collection methods	#10	Types of data collected; details of data collection procedures including (as appropriate) start and stop dates of data collection and analysis, iterative process, triangulation of sources / methods, and modification of procedures in response to evolving study findings; rationale	**4**
Data collection instruments and technologies	#11	Description of instruments (e.g. interview guides, questionnaires) and devices (e.g. audio recorders) used for data collection; if / how the instruments(s) changed over the course of the study	**4**
Units of study	#12	Number and relevant characteristics of participants, documents, or events included in the study; level of	**5**

		participation (could be reported in results)	
Data processing	#13	Methods for processing data prior to and during analysis, including transcription, data entry, data management and security, verification of data integrity, data coding, and anonymisation / deidentification of excerpts	**4**
Data analysis	#14	Process by which inferences, themes, etc. were identified and developed, including the researchers involved in data analysis; usually references a specific paradigm or approach; rationale	**4-5**
Techniques to enhance trustworthiness	#15	Techniques to enhance trustworthiness and credibility of data analysis (e.g. member checking, audit trail, triangulation); rationale	**13**
Syntheses and interpretation	#16	Main findings (e.g. interpretations, inferences, and themes); might include development of a theory or model, or integration with prior research or theory	**5-13**
Links to empirical data	#17	Evidence (e.g. quotes, field notes, text excerpts, photographs) to substantiate analytic findings	**3, 14**
Intergration with prior work, implications, transferability and contribution(s) to the field	#18	Short summary of main findings; explanation of how findings and conclusions connect to, support, elaborate on, or challenge conclusions of earlier scholarship; discussion of scope of application / generalizability; identification of unique contributions(s) to scholarship in a discipline or field	**2, 13-14**
Limitations	#19	Trustworthiness and limitations of findings	**13-14**
Conflicts of interest	#20	Potential sources of influence of perceived influence on study conduct and conclusions; how these were managed	**14**
Funding	#21	Sources of funding and other support; role of funders in data collection, interpretation and reporting	**14**

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Experiences of digital communication with automated patient interviews and asynchronous chat in Swedish primary care - a qualitative study

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ABSTRACT

Objectives: To explore staff experiences of working with a digital communication platform implemented throughout several primary health care centers in Sweden.

Design: A descriptive qualitative approach using focus group interviews. Qualitative content analysis was used to code, categorize, and thematize data.

Setting: Primary health care centers across Sweden, in both rural and urban settings.

Participants: A total of three mixed focus groups, comprising 19 general practitioners and nurses with experience using a specific digital communication platform.

Results: Five categories emerged: “Fears and Benefits of Digital Communication”, “Altered Practice Workflow”, “Accepting the Digital Society”, “Safe and Secure for Patients”, and “Doesn't Suit Everyone and Everything”. These were abstracted into two comprehensive themes: “Adjusting to a novel medium of communication” and “Digitally filtered primary care”, describing how staff experienced integrating the software as a useful tool for certain clinical contexts while managing communication challenges associated with written communication.

Conclusions: Family medicine staff were ambivalent concerning the use of digital communication but, after a period of adjustment, it was seen as a useful communication tool especially when combined with continuity of care. Staff acknowledged limitations regarding use by inappropriate patient populations, information overload and misinterpretation of text by both staff and patients.

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STRENGTHS AND LIMITATIONS OF THIS STUDY

- This is the first focus group study describing both physicians’ and nurses’ experiences of two-way digital communication between patients and providers in primary care settings.
- Theoretical saturation and high participant engagement allowed for rich descriptions and transferability of our findings to other contexts.
- Limitations include lack of multiple coders and a potential bias toward physician perspectives as the interviewers were both physicians.

INTRODUCTION

The patient interview and physical examination are central to family medicine consultations. In Sweden, patients are increasingly using digital communication to access primary care.[1] Swedish health care holds a high international standard,[2] but low continuity and poor accessibility to primary care contribute to low patient satisfaction.[3] Whether digital communication can address or aggravate these challenges is currently unknown.[4] Furthermore, staffs' low technical literacy and resistance to change may be common barriers to implementation,[5] limiting potential benefits of such technology from being realized.

Heterogeneity between digital communication tools is high, making it difficult to draw general conclusions about their usefulness. Some use synchronous video communication, while others are asynchronous "chat-based". Different variations of automated patient interviewing software can also be used to gather key information prior to consultations.

The current study evaluates a digital communication platform (developed by Doctrin AB, referred to as 'the platform' in this paper) implemented across several primary health care centers (PHCCs) in Sweden for use as an alternative point of access to primary care. Patients choose among a pre-specified list of queries and access an automated patient interviewing software on their computer, tablet or smartphone, freely writing their ideas, concerns, and expectations as is common in family medicine consultations.[6] They then answer a query-specific questionnaire, including the possibility to attach images, with answers presented to the healthcare provider (usually a nurse) who can proceed to communicate via asynchronous chat-based two-way communication. GPs or other staff can join the chat if required. If a query cannot be concluded via digital communication, the patient is scheduled for a relevant physical appointment.

A Norwegian study recently found that general practitioners (GPs) generally had positive experiences with using digital communication.[7] Meanwhile, UK studies found GPs felt such communication benefited patients and saved time, but also raised concerns about security, increased workloads, and poor integration into clinical practice.[8, 9]

None of the above studies evaluated two-way digital communication systems, where both patient and provider can send digital messages. Such communication has been studied in the context of specific diseases [10-12] or mobile phone text messaging without an adapted platform software.[13]

Furthermore, leveraging reports summarizing patient ideas, concerns, and expectations prior to digital communication may be important for staff to more effectively help patients without additional workloads.[8] Therefore this qualitative study aimed to answer the following research question:

How do family medicine physicians and nurses experience the implementation and use of digital communication in the form of automated patient interviewing software and chat-based patient-provider communication?

METHODS

Qualitative Approach and Research Paradigm

This study deemed an interpretivist paradigm suitable for understanding the phenomena of staff experience working with digital communication.[14] Focus group interviews, commonly used to study attitudes and needs of medical staff,[15] were thus chosen as the data-collection method. As the GPs and nurses form pre-existing groups working together as a team during the focus group interviews, it allows "naturalistic" exchanges during data collection. This may give a deeper understanding of the target phenomenon. Open discussions allow participants to debate the studied phenomenon from a personal point of view and facilitate expression of beliefs and attitudes left undeveloped in an individual deep interview.

Context

Three PHCCs were purposefully sampled from a wide range of national PHCCs using the platform. Samples were chosen to provide a mix of urban and rural settings, as well as smaller and larger panel sizes. In each sampled PHCC, all GPs and nurses with experience of using the platform were invited to participate, with the goal of recruiting a minimum of six participants per group with an even distribution of GPs and nurses.

Ethical Considerations

The study was approved by the Swedish Ethical Review Authority (reference number 2019-01516). Participants gave written consent to participate in the focus group interview.

Patient and Public Involvement

Patients or the public were not involved in this study.

Data Availability Statement

Interview transcripts and coding data is available upon request.

Data Collection

Interviews were conducted between June 5th and June 12th 2019 with a moderator (VMN) introducing topics with open-ended interview-guide questions (appendix 1), facilitating the discussion with follow-up questions and summaries to verify interpretations. The interview guide was iteratively modified in response to evolving study findings. For data triangulation, an interview assistant (AE) observed and registered non-verbal communication but also aided the moderator in facilitating the discussion. Demographic data and quantitative data on months of experience working with the platform were also collected from all interview participants with a short questionnaire. Interviews were audio recorded (Olympus VN-8700PC) and transcribed verbatim.

Data Analysis

Qualitative content analysis as presented by Graneheim and Lundman[16] was used as it is a suitable inductive approach for describing human experience while also allowing for triangulation of analysis by reserachers without contact with studied persons.[17] Analysis was conducted in Swedish with NVivo 12. Relevant quotes were translated into English. The first author (AE) coded the dataset (examples given in table 1), with regular discussions with two other authors (VMN and BBB) at all levels of analysis.

All three authors where involved in thematization. The manuscript was drafted using SRQR reporting guidelines.[18]

Table 1: Examples of meaning units, condensed meaning units and codes

Meaning unit	Condensed Meaning Unit	Code
"…if it has any medical consequences, it's too soon to tell, there's too few, a too small sample"	*Too small sample to know medical consequences*	*Medical consequences unknown*
"…and to be able to consult colleagues and the doctors and such… I see that as positive, compared to using the phone"	*Easier to consult colleagues compared to the phone*	*Enables colleague consultation*

RESULTS

Study Unit Characteristics

Characteristics of PHCC participants and the interviews are summarized in table 2.

Table 2: PHCC, staff, and interview characteristics.

	Interview Duration (min)	Location	Patients managed	Number of Staff (as cited)	Age Group	Number of Females	Mean Years with License (range)	Mean Months in Platform (range)
PHCC 1	49	Urban	9 000	3 Nurses (Nurse 1-3)	20-50	3	4.3 (3-5)	2.7 (2-3)
				1 GP (GP 1)	50-60	1	18 (18-18)	4 (4-4)
PHCC 2	43	Urban	27 000	2 Nurses (Nurse 4-5)	20-40	2	6 (1-11)	3 (3-3)
				3 GPs (GP 2-4)	40-50	1	10 (9-11)	4 (1-6)
PHCC 3	39	Rural	8 000	5 Nurses (Nurse 6-10)	30-60	4	17.4 (1-31)	3.5 (2-4)
				5 GPs (GP 5-9)	30-60	4	15.2 (3-23)	3.6 (3-4)

During analysis, 14 subcategories emerged, grouped into five categories, abstracted into two themes: "Adjusting to a novel medium of communication" and "Digitally filtered primary care" (table 3). Below, each category is described in detail.

Table 3: Themes, categories, and subcategories.

Theme	Category	Sub-Category
Adjusting to a	**Altered Practice**	Streamlined communication

novel medium of communication	**Workflow**	Improved inter-disciplinary cooperation
		Unpredictable workload
	Accepting the Digital Society	Expectations to be digital
		Improved digital experience over time
	Safe and Secure for the Patient	Improved management of certain patient groups
		Accessible continuity
Digitally filtered primary care	**Doesn't Suit Everyone and Everything**	Not suitable for all patient queries
		Digital communication as a partial solution
		An incomplete system
	Fears and Benefits of Digital Communication	Incomplete information transfer
		Ambivalence and uncertainty
		Superhuman capacity
		Affects the patient-provider relationship

Fears and Benefits of Digital Communication

Participants expressed an ambivalence towards the use of digital communication. Some felt curious and excited, while others expressed skepticism to the usefulness of such technology. PHCC 1 and PHCC 3 had relatively few patients using the platform, while PHCC 2 used the platform extensively. All participants felt it was too early to evaluate long-term risks and consequences of its use.

Nurses from the two urban PHCCs felt that the platform allowed patients to fully express their concerns without interruption, as some text presented by the automated patient interview was directly written by the patient.

> *"And it's really their words. It's not our interpretation of their words. That's also… it becomes more certain, I think." – Nurse 3*

Staff perceived an advantage of using software to ensure that relevant questions were always asked, without individual stress or other externalities affecting the consultation. The ability to reflect over messages before sending them was perceived as beneficial, especially for emotionally loaded discussions. On the contrary, staff highlighted that some patients experienced the chat as "robotic", speculating that this could affect the patient-provider relationship.

Several participants mentioned that the automated patient interview allowed for acquisition of patient history data beyond what would otherwise be feasible during a regular phone call. While the presented information was perceived as useful, covering important differential diagnoses, staff felt overwhelmed for clinical decision-making. There seemed to be a reluctance towards over-information, with GPs from PHCC 2 concluding that the most valuable information came from the first three free-text questions about patient ideas, concerns, and expectations.

> *"…it's about having just enough information in those questionnaires so that one can digest it… there is a balance… between too much and too little information too, so that it stays relevant…" – GP 2*

The platform was perceived to provide a unique value through the asynchronous chat, as clinical decisions could be communicated with several short messages without excessive conversation. Sending images was perceived to be useful, providing a unique benefit over telephone consultations, especially for dermatological queries. The platform did not include synchronous video consultations at the time, but these were speculatively perceived as less beneficial, as they were thought to too similar to telephone consultations.

> *"One aspect is the automated patient interview tool and the other is the asynchronous communication. So those two things are new… I almost think that the asynchronous communication is the biggest benefit. I do." – GP 4*

All groups felt that communicating via text led to some loss of communication nuance. One GP repeatedly emphasized the shortcomings of written communication, giving the impression of being particularly cautious about widespread use of this new technology. While facial expressions and body language were already absent in telephone consultations, cues like tonality were further removed when moving to text-based communication. Staff felt that these cues, in certain situations, provided important "between the lines" context for interpretation of reported symptoms.

> *"That's probably why… fully AI-run systems refer fifteen percent to the emergency department… Because if one interprets peoples' words literally, then the whole health care system crashes." – GP 4*

Patient interpretations of symptoms were perceived to not always be in-line with clinician interpretations. Misunderstood questions were not reformulated by the automated patient interview as would otherwise be possible in a live conversation.

> *"What does 'dizziness' mean? … There are many terms that mess things up. Because we're talking about different things, a certain symptom is one thing for the patient and another for me… so it's hard to just ask specific questions in a questionnaire like that." – GP 2*

Most often, staff experienced symptoms to be less severe than reported when asking follow-up questions. GPs feared trivializing patient symptoms over time. Such risks were perceived lower with telephone consultations where severity was more confidently assessed. Consequently, some GPs felt that they tended to ask more follow-up questions via the platform compared to telephone consultations.

> *"Yes, because I'm thinking if you look at the group presenting with anxiety and depression, for example, they get a lot of questions and then many of them specifically report suicidality or such, and… when one calls them, it isn't at all like they have written." – Nurse 4*

The human ability to scrutinize reported information when consulting patients was deemed as central to the consultation process, but the automated patient interview was perceived to lack this ability.

> *"In a conversation… one consciously ignores some things… Here it's 'on print'… that they have 'numbness in half of their body'… which looks a little worse than if they say it in a context where it is completely obvious that they don't… The 'human filter', it vanishes." – GP 4*

Staff also expressed frustrations over being involuntary responsible for irrelevant symptoms reported by the platform, including obsolete chronic symptoms or symptoms indicative of potentially severe disease.

> *"'Do you have abdominal pain?' Yes… they have had abdominal pain for fifty years. But we don't need to talk about that today. I would never ask the question in a normal conversation… or an obvious tension headache, but… visual impairment, asymmetrical pupil size… like 'Aha, maybe we should order an ambulance instead?!'" – GP 3*

This resulted in divergent agendas between GPs and patients where GPs focused on addressing irrelevant but potentially urgent symptoms, while patients expect to get their primary less urgent concern addressed.

> *"…it's not the questions I want the answer to, but which I have to assess… and it's extremely annoying… and now there's also a pop-up… saying that I am responsible*

for all the information I'm getting… Then I feel [the platform] limits me… that it takes longer than if I had done it another way." – GP 3

Frustrations were also expressed regarding patients skipping questions, not reading staff responses, taking hours to answer follow-up questions, or failing to confirm suggested appointments.

Altered Practice Workflow

In all PHCCs, nurses initially managed most queries in the platform. Staff from PHCC 2 estimated that around 30% of queries were forwarded to GPs for further evaluation. Initially several nurses experienced stress of using the platform in addition to keeping track of electronic health records and other digital systems, as well as managing multiple parallel queries, especially when combined with physical visits and telephone consultations.

"First it was a bit easy to make mistakes…if one had maybe five ongoing queries and maybe two girls around the same age or so to speak, it was easy to write to the wrong patient. […] until one develops a routine." – Nurse 1

However, staff generally felt that they handled digital queries faster and better over time. Miscommunication prevention, adjusting staffing at other workstations, scheduling adjustments, and stress management strategies were examples of ongoing adjustments. The platform was then perceived as adding variation to the workday. There was a general sense that staff were content with the current state of affairs after a relatively hectic initial implementation of the new technology. Some PHCCs assigned rooms for work with the platform, with staff appreciating a less noisy environment.

All groups experienced shorter and more streamlined consultations, with easier appointment booking, information sharing, and expressed reluctance of no longer having to redial patients not answering their phones.

"…visits are better prepared and that's both good and bad. For example… someone seeking care for mental illness, who has already filled in rating scales etc., one enters the conversation at a different point. It's not like, 'Good day, what are you here for?'. Instead you have a lot of information before, when one starts the conversation… if it has any medical consequences is too soon to tell…" – GP 9

Many felt that the chat-format made it easier to consult colleagues and gather information before answering certain patient queries, improving the inter-disciplinary collaboration and the perceived working environment.

Challenges still remained, as staff expressed that certain patients took several hours to respond. By the end of the day, potentially urgent symptoms may thus have been left unaddressed. PHCC 3 managed this with a standardized message, informing patients to seek out-of-hours clinics for urgent symptoms.

Accepting the Digital Society

There was a general perception that digitalization was not a choice. Parallels were drawn to implementation of telephone communication in family medicine, and pressures to use existing means of communication.

> *"… if you have an entire panel who speaks English, then it's reasonable that we also speak English… we can't close our eyes to the fact that people communicate this way. We can't say 'we don't use phones, we use messages in bottles'… We have to adapt…" – GP 4*

Patients using the platform were perceived as being different from those seeking traditional care, with patients expecting fast responses, similar to a commercial customer support chat. Despite the challenges of adapting to the digital era, there was a general sense that the platform was perceived better over time.

> *"When it came we were a bit scared that it would be a lot… that we wouldn't be able to handle it, but today I feel that we are all pretty positive and that we more easily can communicate with patients and it will only get easier"*
> *– Nurse 7*

In fact, all practices expressed a desire to stay digital, with two PHCCs incentivizing patients to use the platform by offering shorter waiting time for appointments or automatically redirecting certain patients from the phone.

Safe and Secure for the Patient

The platform was perceived to aid in triage by giving an overview of incoming presenting symptoms and reported symptoms. There was a general perception of improved access to care as staff felt that patients more quickly could engage in dialogue with nurses compared with telephone visits.

> *"Many appreciate that hundred-percent availability which it really provides. [Patients] can write and will get through… that's very reassuring" – GP 2*

Staff were also surprised that the platform was occasionally used by elderly individuals and patients with socioeconomic difficulties.

> *"It was a patient who otherwise has a very strained life. I was very surprised that she could use it, but it's worked well for her… a single mother with three small children… working full time and finds phone calls from the practice difficult during working hours… So we can send her a text, or chat with her and manage things when it works for her… She thought it was great." – GP 1*

PHCC 2 experienced a transition from initially viewing the platform as a triage tool to a tool for improving continuity of care, giving the PHCC a unique advantage over private "digital only" family medicine providers. One GP felt that his frequent visitors could be managed more effectively with chat follow-ups. Following stable chronic conditions, SSRI treatments and dermatological diagnoses were other examples of platform use for improved continuity. Staff were uncertain, however, whether the platform had substantially reduced physical visits in general.

> *"…I perceive that for my patients, mostly the sickest or most worried ones, it's a huge reassurance and very personal. When they can chat with me and I can say like 'We don't need to book a new appointment'… 'Take it easy and be in touch. It may take a day before I answer, but I will answer.'… then they have a face associated to the person writing… then one can sometimes even crack a joke in the chat" – GP 4*

Doesn't Suit Everyone and Everything

All groups acknowledged that digital communication didn't suit all patient queries. Although some technically literate elderly patients used the platform, staff felt others were less confident often resulting in phone calls being made to clarify the issue. Staff generally felt the patients with simple queries were manageable in the platform, while complex queries or cases of low continuity were situations where the platform was perceived as less useful. In multiple instances, staff explained that queries which required prolonged dialogue via text often resulted in a phone call as this was perceived as a more effective way of managing and concluding such queries.

A number of technical improvements were lifted to adapt the platform to local prerequisites.

> *"Many queries are pretty simple… 'I want to renew a prescription', 'what did my tests show?', 'why is there such a long waiting time'. In these situations, one isn't dependent on any finessed nuances…" – GP 9*

GPs envisioned digital communication as an additional tool to existing ways of working. Few queries were managed completely digitally, but rather "digi-physically" as digital communication could on many occasions contribute to overall management of a patient, followed by an occasional physical examination. Classification into digital or physical care was thus seen as a false dichotomy, as transitioning between modes of communication often was perceived as useful depending on the clinical situation.

DISCUSSION

Main Findings

PHCC staff initially experienced implementation of the platform as both uncertain and exciting. Over time, views of the platform seemed to shift from a foreign entity with a specific purpose to an integrated part of practice complementing other modes of patient communication. Challenges remained, but there was a general sense that staff wished to remain digital.

Themes

The theme "adjusting to a novel medium of communication" highlights how staff experienced having to accept and integrate asynchronous communication into practice, but also experiencing value in management of certain patients as well as improved continuity.

The theme "digitally filtered primary care" highlights that staff experienced patient data presented both in overwhelming detail in terms of symptom reports, but also with loss of communication nuances which created an uncertainty in the management of some patients.

General Discussion

Our findings conceptualize digital communication as both an alternate means of information exchange (a transactional process) as well as a means of developing and maintaining doctor-patient relationships (a transformational process), two dominating paradigms in the communication literature.[19] Additionally, implementing digital communication had effects beyond patient communication, i.e. on practice organization and working environment.

Qualitative research on primary care staff experiences of implementing automated patient interview software combined with two-way asynchronous digital communication is limited. Johansson and colleagues recently presented survey data on nurse experiences of a pilot version of the platform.[20]

Like our study, they found that nurses experienced improved triage, high patient satisfaction, issues of care supply to specific patient populations, and issues with managing IT-systems.[20] Our results add depth to these findings, as well as focusing primarily on staff experiences of digital communication beyond the platform itself.

In a separate publication, Johansson et al interviewed GPs after two months of using the same pilot platform.[21] Similar to our study, GPs expressed that the patients' self-reported medical history and asynchronous communication had a unique benefit, that visits were well prepared and that collegial collaboration increased. Furthermore, the GPs experienced that symptom severity was difficult to assess, that working with multiple IT-systems was cumbersome, and that not all queries were suitable. Our study adds staff experiences past two months of using the fully developed version of the platform, where staff express wishing to stay digital and further integrate the platform into practice.

Unlike our study, other studies have found that GPs experienced digital communication as poorly integrated into clinical practice, adding to increaesing workloads.[8, 9] These were platforms were without two-way communication and patient-centered questionnaires, and queries weren't triaged by nurses prior to reaching GPs, indicating that our findigs are context-specific.

Our finding are consistent with a Cochrane review concluding that health workers felt that two-way text based communication can facillitate the patient-provider relationship, but that specific situations still warrant face-to-face consultations.[13]

The finding that two-way digital communication focuses queries while letting patients better express their concerns is consistent with studies on nurses in the context of prostate cancer management.[10]

The risk of misunderstandings given two-way written digital communication has also been expressed by clinicians in the context of managing diabetes[11] and young people with long term conditions.[12] The last study also concluded that digital communication is best implemented when there is an existing patient-provider relationship of trust.[12] Continuity of care thus remains a central component of a highly functioning primary care system.[22]

Strengths

Several factors add to the trustworthiness of our findings. Firstly, credibility increased by prolonged engagement, peer debriefing and triangulation. The two interviewers had experience with using digital communication in primary care, creating a mutual understanding of the context the participants worked with. Peer debriefing from coding to categorization and data triangulation with non-verbal observations added credibility. Investigator triangulation with a third researcher without a background in digital communication added an alternative perspective on the data for a richer interpretation. Highly engaged participants allowed for thorough descriptions of our goal phenomenon, adding transferability of our findings to similar contexts. Purposefully sampled PHCCs from both rural and urban settings added generalizability to our findings.

No new subcategories emerged from the final focus group, suggesting that "theoretical saturation" was reached.[23] However, we cannot exclude that further focus groups would yield a different final perspective.

Limitations

Due to limited resources, we were unable to conduct secondary coding. We didn't conduct member checks which limits credibility. Lack of an audit trail also limits confirmability and consistency. This was a small study with three PHCCs and thus the experiences described may not represent those of most staff using the platform. The technology is new, and presumably currently adopted by PHCCs interested in using it.[24]

Mixing GPs and nurses may have influenced the results as GPs in some focus groups were perceived to answer more readily than nurses. However, mixing groups also allowed for instant exploration of experiences shared by both professions. Finally, as interviewers were both GPs, participant engagement and interpretation of results may have been skewed in favor of GP over nurse perspectives.

CONCLUSIONS

Family medicine staff experience a period of adjustment to integration of digital communication in a time when such communication is extensively used and expected by patients. Despite concerns about inappropriate use and difficulties interpreting text, staff experience digital communication as a potentially useful choice of communication in certain contexts, especially when combined with continuity of care. Future research should explore which specific clinical contexts are best suited for digital communication.

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Appendix 1: Interview Guide

Information to participants

Those of you who are present at this interview have worked with digital communication in [the platform]. The purpose of today's focus group interview is to explore your experiences with digital communication. I will ask a number of questions to open up for discussion, but you are free to speak about how you feel. No answer is right or wrong.

(Questions below are asked in case discussions spontaneously end. Spontaneous participant thoughts are prioritized above answers to questions below)

- Can you describe how things have worked with digital communication?
    - Examples regarding when it has worked well?
    - Examples regarding when it has not worked well?
- How did you react when you found out you would start working with digital communication?
- How was the process of starting with digital communication? How did you experience it?
- How has digital communication affected your way of working?
- What is good and bad about digital communication?
- Do you think one can improve digital communication in any way?
- Do you experience that digital communication has affected patient contact? In what way?
    - Examples regarding when it has worked well?
    - Examples regarding when it has not worked well?
- How do you perceive patients are affected by digital communication?
- How do you feel about the future of digital communication?
- How has your daily work been affected by digital communication?
    - Can you give examples where you think it's had a positive or negative effect?
- What medical consequences do you feel that digital communication has?
  (Examples if participants don't think of anything: influence on prescribing behavior, sick notes, psychiatric assessments, patient safety)
- What do you think about the report generated by the automated patient history software?
- How has digital communication affected your working environment?

Reporting checklist for qualitative study.

Based on the SRQR guidelines.

Instructions to authors

Complete this checklist by entering the page numbers from your manuscript where readers will find each of the items listed below.

Your article may not currently address all the items on the checklist. Please modify your text to include the missing information. If you are certain that an item does not apply, please write "n/a" and provide a short explanation.

Upload your completed checklist as an extra file when you submit to a journal.

In your methods section, say that you used the SRQR reporting guidelines, and cite them as:

O'Brien BC, Harris IB, Beckman TJ, Reed DA, Cook DA. Standards for reporting qualitative research: a synthesis of recommendations. Acad Med. 2014;89(9):1245-1251.

		Reporting Item	Page Number
	#1	Concise description of the nature and topic of the study identifying the study as qualitative or indicating the approach (e.g. ethnography, grounded theory) or data collection methods (e.g. interview, focus group) is recommended	**2**
	#2	Summary of the key elements of the study using the abstract format of the intended publication; typically includes background, purpose, methods, results and conclusions	**2**
Problem formulation	#3	Description and signifcance of the problem / phenomenon studied: review of relevant theory and empirical work; problem statement	**3**
Purpose or research question	#4	Purpose of the study and specific objectives or questions	**3**
Qualitative approach and research paradigm	#5	Qualitative approach (e.g. ethnography, grounded theory, case study, phenomenolgy, narrative research) and	**4**

		guiding theory if appropriate; identifying the research paradigm (e.g. postpositivist, constructivist / interpretivist) is also recommended; rationale. The rationale should briefly discuss the justification for choosing that theory, approach, method or technique rather than other options available; the assumptions and limitations implicit in those choices and how those choices influence study conclusions and transferability. As appropriate the rationale for several items might be discussed together.	
Researcher characteristics and reflexivity	#6	Researchers' characteristics that may influence the research, including personal attributes, qualifications / experience, relationship with participants, assumptions and / or presuppositions; potential or actual interaction between researchers' characteristics and the research questions, approach, methods, results and / or transferability	**14**
Context	#7	Setting / site and salient contextual factors; rationale	**4**
Sampling strategy	#8	How and why research participants, documents, or events were selected; criteria for deciding when no further sampling was necessary (e.g. sampling saturation); rationale	**4**
Ethical issues pertaining to human subjects	#9	Documentation of approval by an appropriate ethics review board and participant consent, or explanation for lack thereof; other confidentiality and data security issues	**4**
Data collection methods	#10	Types of data collected; details of data collection procedures including (as appropriate) start and stop dates of data collection and analysis, iterative process, triangulation of sources / methods, and modification of procedures in response to evolving study findings; rationale	**4**
Data collection instruments and technologies	#11	Description of instruments (e.g. interview guides, questionnaires) and devices (e.g. audio recorders) used for data collection; if / how the instruments(s) changed over the course of the study	**4**
Units of study	#12	Number and relevant characteristics of participants, documents, or events included in the study; level of	**5**

		participation (could be reported in results)	
Data processing	#13	Methods for processing data prior to and during analysis, including transcription, data entry, data management and security, verification of data integrity, data coding, and anonymisation / deidentification of excerpts	**4**
Data analysis	#14	Process by which inferences, themes, etc. were identified and developed, including the researchers involved in data analysis; usually references a specific paradigm or approach; rationale	**4-5**
Techniques to enhance trustworthiness	#15	Techniques to enhance trustworthiness and credibility of data analysis (e.g. member checking, audit trail, triangulation); rationale	**13**
Syntheses and interpretation	#16	Main findings (e.g. interpretations, inferences, and themes); might include development of a theory or model, or integration with prior research or theory	**5-13**
Links to empirical data	#17	Evidence (e.g. quotes, field notes, text excerpts, photographs) to substantiate analytic findings	**3, 14**
Intergration with prior work, implications, transferability and contribution(s) to the field	#18	Short summary of main findings; explanation of how findings and conclusions connect to, support, elaborate on, or challenge conclusions of earlier scholarship; discussion of scope of application / generalizability; identification of unique contributions(s) to scholarship in a discipline or field	**2, 13-14**
Limitations	#19	Trustworthiness and limitations of findings	**13-14**
Conflicts of interest	#20	Potential sources of influence of perceived influence on study conduct and conclusions; how these were managed	**14**
Funding	#21	Sources of funding and other support; role of funders in data collection, interpretation and reporting	**14**