



General Practitioners' Perspectives on a Pre-Consultation Chatbot for Shared Decision-Making

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Abstract

General practitioner (GP) consultations are the typical starting point for a patient's healthcare journey. Here, GPs aim to support and inform patients to enable a shared decision-making process. In this work we explore how an interactive chatbot, designed to prepare patients for their GP consultation, is perceived by GPs to impact patient consultations, patient-GP interaction, and their work. We conducted an in-depth evaluation and interview with 15 GPs from 12 different practices. Our findings provide insights into common challenges in shared decision-making, GP perspectives on the role of chatbots in preparing patients, and how chatbot technology could impact and transform general practice. Finally, we reflect on patient and GP agency in shared decision-making and the impact of technology on this complex relationship.

CCS Concepts

• **Human-centered computing** → **Empirical studies in HCI**; *Natural language interfaces*; • **Applied computing** → *Health informatics*.

Keywords

Shared Decision-Making, Chatbot, LLM, General Practitioner, Healthcare

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1 Introduction

Involving patients more directly in their healthcare decisions is central to modern-day healthcare. Here, shared decision-making (SDM) is an established concept in which patients are informed of treatment options, their benefits and potential harms, and together with their medical doctor arrive at a treatment decision [78]. The past decade has seen a rise of the 'activated patient', with expectations that patients play a prominent role in their own care (e.g., UK's NHS's "No decision about me without me" [61]). Involving patients to a greater extent increases patients' knowledge gain, confidence in treatment decisions, active involvement, and the selection of more conservative treatment options [78]. SDM has become a preferred model for medical decision-making, especially in situations where multiple viable options exist [79].

Achieving SDM has proven difficult due to a lack of patients' prior knowledge, power and knowledge imbalances between patient and medical doctor, differences in patient readiness and willingness, and time constraints [29, 38]. A widespread attempt to overcome these barriers is to administer paper and digital questionnaires prior to consultation, which can improve clinicians' workflows [3, 41, 76] and care quality [4, 59, 82], and critically, the communication quality between patient and medical professionals [26, 88]. However, pre-consultation questionnaires suffer similar challenges, including lack of customisation to the patient's case, survey fatigue, and low perceived usefulness [23, 64, 68]. In addition, patients perceive pre-consultation questionnaires to be superficial, lacking in value, or simply involving answering too many questions with little or no relevance to their case [49]. However, recent work suggests that patients see several benefits of interacting with chatbots, such as reflecting on their concerns prior to their consultation with a physician [49].

While this recent work outlines patients' views on the use of pre-consultation chatbots, it remains unclear to what degree GPs share the same sentiments and what other perspectives they might hold, especially given their responsibility for their patients and their accountability for patient care. Furthermore, these chatbots have the potential to disrupt GPs' established consultation practices—workflows that have been carefully shaped by GPs over time and through their lived experiences. For these reasons, we argue that

the perspectives of general practitioners are at least equally relevant to consider. Following Grudin's foundational work on why CSCW applications fail [27], we therefore explore how GPs perceive the use of pre-consultation chatbots in general practice.

We designed a pre-consultation chatbot in collaboration with two experienced GPs with responsibilities for a network of GPs and evaluated the chatbot with fifteen active GPs across Denmark. First, we conducted two interviews with the two experienced GPs, inquiring into their accumulated knowledge of everyday practices of SDM, clinic practice procedures, and their perspective on introducing conversational technologies into pre-consultation. This informed the design and implementation of the pre-consultation chatbot. The chatbot focuses on mimicking the communicational capabilities in which the GPs are trained to support their patient interactions. We take inspiration from the Calgary-Cambridge method for structuring medical interviews in building our interactive pre-consultation chatbot [16, 75]. Second, we conducted a three-step qualitative study with GPs with varying experience ($N = 15$) in Denmark. Our study consisted of an interview to obtain an understanding of pre-consultation and consultation practices at their clinic, GPs interacting with the chatbot applying the *think-aloud* protocol, and finally, an interview on the implications of introducing such a chatbot into their everyday work.

Our results highlight GPs' general interest and belief in SDM while also highlighting practical barriers to SDM, such as patients' treatment expectations and their perceived role in the care process. The concept of a chatbot to help patients prepare for their consultation was generally well received, as it can initiate early patient reflection and sharing—mentally preparing the patients for their consultation. GPs also raised concerns surrounding the suitability of chatbots for all patient groups. Reflecting on the impact of such technology on their work, GPs envisioned both risks and benefits, pointing to potentially more in-depth consultations or elevated patient expectations compared to current practice. Based on these insights and prior work, we discuss how pre-consultation chatbots might influence both GP and patient agency as well as support GPs' efficiency in providing patient-centred care. Given the different roles patients and GPs play in the care process, their perspectives on agency are likely to differ. We discuss how these different perspectives play out in SDM and reflect on the role of users' agency in designing and integrating novel interactive technologies in clinical practice. Our work contributes to the further development of SDM, an approach to clinical consultation that, while widely appreciated, faces various practical challenges in the real world.

2 Related Work

Technology is increasingly introduced to clinical settings with the aim to positively influence GP-patient interactions. Here, improved communication between AI practitioners, primary care workers, and patients is considered an area of high priority [47]. Elkefi et al. recently highlighted how technology can support medical doctors as well as empower patients, ultimately resulting in a stronger therapeutic alliance [18]. Following recent developments of large language models (LLMs) and LLM-powered applications, researchers are exploring how these can be applied to healthcare contexts. These include examples such as using AI to make doctors' notes

more comprehensible to patients [40], LLMs to reduce clinicians' documentation burden [71], chatbots to instigate reflection on cognitive conditions [42], or chatbots to support patients prior to their appointments [49]. While there are many remaining challenges with introducing such technologies to clinical practices, such as a reluctance to outsource tasks to AI [22], there is also potential for these technologies to positively impact healthcare accessibility, inclusivity, and equity, among others [56].

In the following sections, we report prior work on SDM in clinical settings, doctor-patient interactions, and the use of digital technology to support clinical consultation.

2.1 Shared Decision-Making & Doctor-Patient Interaction

SDM is a collaborative process with the goal of GPs and patients jointly making medical decisions [70]. In this process, both GPs and patients share information: the GPs explain the potential benefits, harms, and costs of treatment options, and patients express their preferences and concerns, and identify a treatment that is best aligned with their needs and circumstances [19]. SDM can positively influence health outcomes in general [70], as well as the care quality provided to patients [4, 59] and the patient-medical professional communication itself [26, 88]. However, the use of SDM in clinical settings is challenging as physicians might lack awareness, familiarity, or agreement with clinical guidelines [12], or have more critical attitudes towards these guidelines in general [54]. Pekala et al. recently explored SDM in the context of prostate-specific antigen screening. According to this study, the prevalence of using SDM in prostate cancer cases ranges between 11% and 98% depending on the definition of SDM. The paper outlines barriers to using SDM for prostate cancer including insufficient knowledge about prostate cancer screening, limited appointment times, and poor health literacy [67].

For SDM interactions to be successful, a medical doctor needs to be able to apply different forms and communication styles to guide the discussion [24]. However, interaction styles between patients and medical doctors vary to a large degree [46]. In doctor-centred approaches, also frequently referred to as 'paternalistic' approaches, the doctor emphasises authority, leaving the patient with little responsibility to participate and answer questions [20]. In contrast, patient-centred consultations involve obtaining and understanding the patient's perspectives (such as concerns, expectations, and functioning), as well as psycho-social and cultural context, with the goal of achieving a common understanding of the patient's problems and treatments that consider the patient's values and preferences [57]. The doctor and patient might negotiate to achieve a shared understanding of a problem, collectively reaching an agreement on a proposed treatment [46]. Although healthcare providers recognise the importance of patient's active involvement in ensuring they are well-informed about their care, reality creates conflicting goals between what is desirable (e.g., well-informed, actively involved patients) and feasible (informed but limited involvement due to time constraints). Naughton et al. recently showed that while SDM can be more time-consuming, it only adds up to 10% of consultation time (e.g., 2 additional minutes for a 20-minute consultation) [57]. Another challenge facing SDM is patients' pre-visit expectations,

which might hinder the success of SDM with their medical doctor [41].

Researchers and clinicians have explored many ways in which the doctor-patient interaction can be improved by intervening pre-consultation. Examples include pre-consultation sheets [88], pre-visit electronic journals [82], pre-visit or pre-consultation questionnaires [4, 73], pre-visit websites [3], pre-visit screening [26], and online health information seeking [53]. Several benefits resulting from such interventions have been suggested, for example, nurse-led pre-visit phone calls that reduce doctor consultation duration and increase both patient and doctor satisfaction [35], or how allowing patients to learn about their physician's competence positively influences trust and treatment outcome [66]. However, we know little about the effects of more interactive, non-human conversational pre-consultation interventions enabled through LLMs.

2.2 Consultation Support Technologies

We next describe prior work on technologies to support decision-making processes and doctor-patient interaction in general. Johansen et al. investigated integrating SDM and mHealth technologies to enhance the SDM process [38]. This integration aims to facilitate decision-making between patients, caregivers, and healthcare providers, offering valuable insights into what are the positive effects of mHealth applications for adolescent knee pain management. Their results suggest that mHealth applications designed to support SDM show promise to enable negotiation, support transitions, and positively influence the relationship between medical doctors and caregiving parents [38]. Recent work shows an increasing use of AI in decision-making within health and well-being contexts. For example, Wang et al. investigated AI-powered decision-support by clinicians in rural clinics [83]. While the clinicians had positive sentiments towards such AI support, they also expressed trust and usability issues, among others. More recently, Kim et al. focused more on patient perspectives on AI used in making decisions concerning their care, where results point to a clear need for more bespoke AI assistance that meets individual preferences [44].

Ayers et al. compared chatbot responses with physician responses to patient questions [6]. Their result indicates that 78.6% of participants preferred the chatbot response to physician responses in terms of both quality and empathy. Furthermore, the longer and more detailed responses from chatbots compared to the usually shorter physician responses indicate that physicians' ability to write empathetic and informative responses could be reduced due to time constraints. There has been a rapid expansion of chatbots in various fields in recent years, including healthcare services [84]. Chatbots can engage in open-ended dialogues and generate dynamic responses [32, 34, 74]. In many cases, chatbots have been suggested as effective tools for providing both factual and emotional support in health. For example, Jo et al. explored a chatbot called CareCall designed to support socially isolated individuals [36]. CareCall helped teleoperators have an understanding of an individual's situation, reduced their workload, and helped individuals feel less lonely. Dosovitsky et al. investigated mental health chatbots designed for adolescents. Their results indicate that adolescents are open to the concept of using chatbots within mental health [17]. Lee et al. suggest that individuals are more likely to report symptoms

of depression to a chatbot compared to a human interviewer [48]. Although there has been a marked increase in the adoption of LLM-powered chatbots for health and well-being [7, 15, 45, 52], given the sensitive context of healthcare, the use of such tools requires careful design consideration. A recent feasibility study explored the effects of providing LLMs with shared decision-making interaction protocols, with results suggesting benefits of more directly instructing LLMs to follow SDM protocols [28].

Furthermore, recent work explored the expectations of physicians and patients towards 'digital agents', as involved both during and between consultations [25]. In contrast, this work focuses on patients' time and considerations prior to their consultation. Taking inspiration from and extending prior work on LLM-powered pre-consultation chatbots focused on patient experiences [49], we seek to better understand GPs' perspectives of such chatbots to prepare patients for SDM. By examining how chatbots can be designed to better prepare patients for their consultation, patients can be empowered and get involved in their own health decisions. However, while the uptake of novel AI technologies in health and well-being decision-making is increasing, a recent literature review focused on AI and SDM highlights that this approach is still in its infancy [1]. Therefore, in this paper, we focus on doctors' perceptions of LLM chatbots for SDM.

3 Pre-Consultation Chatbot

We developed an LLM-based chatbot designed to help patients prepare for SDM in GP consultations. Our research approach involves the design, implementation, and evaluation of a chatbot to engage in discussions about patients' health conditions, symptoms, medical history, feelings, hopes, and concerns prior to GP consultations. We first outline the design rationale for the chatbot as developed in collaboration with GP representatives. Second, we present the interface and interaction of the chatbot. Finally, we provide implementation details.

3.1 Conceptualisation and Design Rationale

We developed the pre-consultation chatbot in close collaboration with the quality improvement unit for GPs in our region. In particular, we collaborated with the head of medical professionalism and the regional coordinator (henceforth collaborators). Both collaborators have extensive experience as GPs and, through the quality improvement unit, act as representatives for 90% of GP clinics in our region. They furthermore have experience with the integration of new technologies into GP practice. We conducted two interviews and followed up with more detailed email correspondence to identify a list of requirements, ultimately leading to the finally implemented chatbot. The design rationale stems from our interaction with the GPs and emphasises the complexity of the consultation process, providing us with considerations on how technology, and in particular chatbots, could augment GP consultations.

Utilising the Waiting Time. A key motivation for developing a pre-consultation chatbot is to effectively utilise the waiting period patients experience at GP clinics prior to their consultation. In general, the waiting time can range from 10–60 minutes, as influenced by various factors, such as the type of healthcare setup (e.g., walk-in clinics or family medicine practices) [2, 72]. Our collaborators

estimate that patients, on average, spend 20 minutes waiting for their appointments. This time, which is often spent passing the time by reading magazines or browsing social media, could be used for activities relevant to the consultation. By engaging with a pre-consultation chatbot, patients can provide preliminary information about their symptoms, medical history, and concerns. This not only helps patients to mentally prepare for their consultation but also enables GPs to have a more focused and informed discussion with the patient.

Aligning to GPs' Line of Questioning. GPs receive structured training to facilitate effective communication with patients during consultations, aiming to support patients in expressing their symptoms and increasing their involvement in decision-making. More concretely, our collaborators report the '4Fs' framework as common practice when engaging with patients. The 4Fs is a framework which is adapted from the overall prescriptions in the Calgary-Cambridge method for structuring medical interviews [16, 75] in Denmark [31, 77]. In the context of our study, we have translated these original 4Fs to English while preserving the first letter: Facts, Feelings, Fears and Future. This framework encompasses inquiries about symptoms, significant events, expectations, and treatment outcomes, all in a patient-centred manner. This approach aligns with established literature and best practices in patient communication. GPs typically collect this information via conversation, adapting their approach to individual patient dynamics rather than explicitly asking about each category. However, as some GPs noted during our study, time constraints can lead to elements of the 4Fs being overlooked.

Symptom Checking and Clarification. In response to the significant challenge GPs face when eliciting symptoms from patients during consultation, our collaborators envision a chatbot to be of valuable support. To successfully assess a patient's current condition, GPs strive to gain a comprehensive overview of the patient's recollections, evaluating symptoms in terms of their magnitude, location, and duration. However, patients often lack an understanding of which information is crucial. Here, a chatbot can assist by asking patients a series of questions about their current condition, prompting them to recognise and recall the specifics of their symptoms.

Refrain from Medical Advice and Diagnostics. While patients visit their GP for a wide range of medical concerns, our collaborators stressed that chatbots should not provide medical advice and diagnostics. Chatbots lack the nuanced understanding and clinical judgement of trained medical professionals, leading to oversimplified assessments. This increases the risk of misdiagnosis and inappropriate advice, potentially delaying treatment or worsening conditions. Additionally, chatbots may overlook underlying health factors. Therefore, while chatbots can aid in gathering information, final diagnosis and medical advice should be provided by a qualified healthcare professional. Any patient request for medical advice should, therefore, be rejected by the chatbot.

Foster Patient Reflection. Our collaborators report that the task of providing the best possible care is often hindered by communication difficulties. This is often related to how patients present information about their reason for visiting. Patients may struggle to recall the sequence of past events, have multiple or conflicting reasons for

their visit, or find it difficult to connect seemingly unrelated information. Patients reflecting on their condition immediately before their consultation will have a better opportunity to convey their concerns to health professionals. Furthermore, using the chatbot before a consultation might ensure that reflections stem from the patient's current condition.

Avoid Empathetic Communication. Our collaborators express concerns about a chatbot's possible empathetic communication style, referring to their personal frustrating experiences with customer care chatbots. They extended these thoughts, saying that chatbots, in their context, should avoid trying to present themselves as warm or human-like. One reason given for this opinion is that GPs are the persons designated to provide that type of dialogue, while chatbots must focus on using a more task-oriented tone and vocabulary.

Provide Summary for GPs. The information provided by patients to the chatbot serves not only for reflection but can also be of value to the GP. Our collaborators emphasise the limited time GPs have in between seeing patients, and that any information might need to be distilled into a summary of the key points from the patient's interaction with the chatbot. Through our collaboration, we learned that providing a summary structured according to the aforementioned 4Fs framework would allow the GP to quickly review the information and gain a head start for the next consultation. Here, the summary is not intended to replace the GP's inquiry into the patient but to provide a starting point for the consultation. This ensures that the GP retains control over the consultation process while benefiting from the preparatory information provided by the chatbot.

3.2 Chatbot Interface & Interaction

The chatbot can be presented to patients using a tablet available at the general practice or on patients' personal devices. In the application, patients are instructed to engage in a text-based conversation, answering questions regarding their reason for the visit and current condition. The interface consists of two main parts (see Fig. 1): the left-hand side features a conventional chat interface showing message history and chat input, while the right-hand side indicates the patient's progress through the question set. The prompt limits chatbot responses to 20 to 30 words to ensure both clarity and conciseness to avoid overwhelming users.

The chatbot follows an open conversation scheme, continuing to ask questions about the current step until the patient believes they have provided all necessary information, allowing them to move on when they see fit. There are two main reasons for this approach. First, it is crucial for patients to have the opportunity to provide a detailed account of their reason for the visit, ensuring no important information is missed. Second, dynamically controlling the topic of a conversation and identifying the appropriate time to shift to subsequent steps is a recognised challenge for conversational interfaces and is beyond the scope of our project. Following the final step, the chatbot summarises the conversation and presents it to the patient. If the patient acknowledges the summary as accurate, they can submit it to the GP. Alternatively, they can return to the chat to provide corrections or suggest additional details.

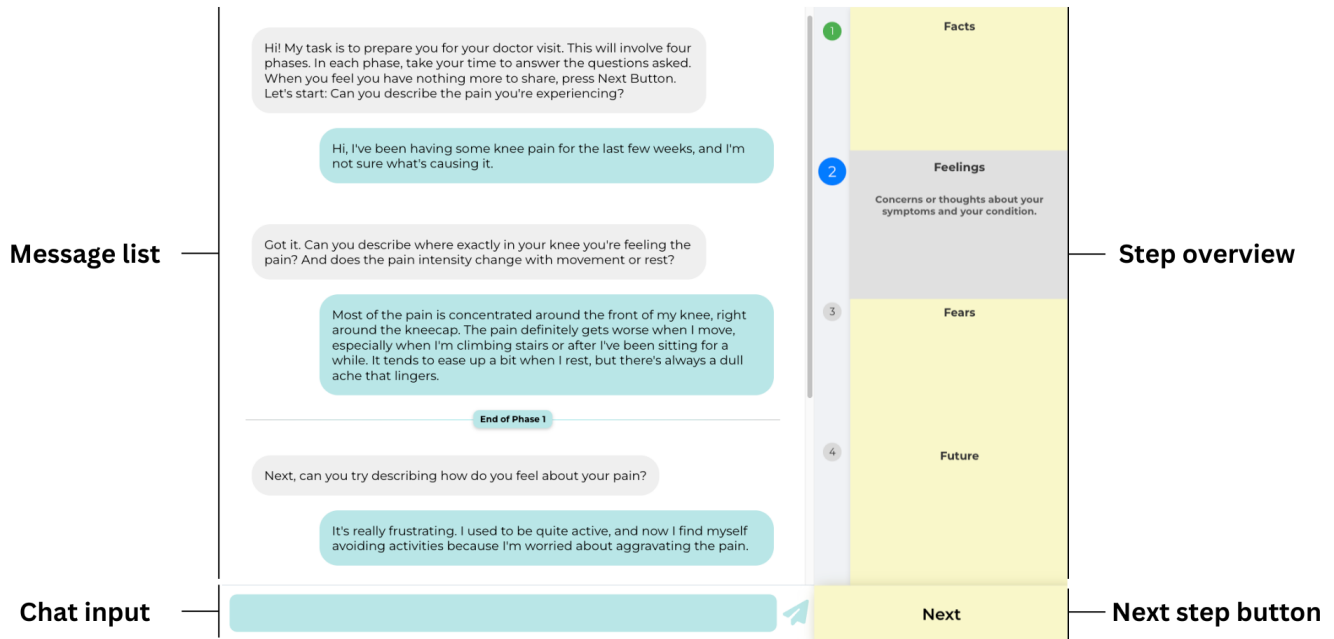


Figure 1: Chatbot interface highlighting the start of a user interaction. The left-hand side of the interface shows the conversation, whereas the right-hand side indicates the four topics of conversation as covered during the conversation.

3.3 Implementation

The chatbot is implemented as a custom Progressive Web App (PWA) [55] using the JavaScript-based React library [69]. For conversational capabilities, we utilised the *chat completion* API from OpenAI [63] with GPT-4 as the LLM backend [62]. Our solution employs the *chat completions* API in two ways, each with a different set of system prompts. First, the chat interface functions through a conventional chat assistant approach, instructed to prepare patients for their consultation. Further, within this system prompt, we define the role, action points, topics of interest, and line of questioning, while also instructing it to avoid providing diagnostics or treatment suggestions. For the four conversational steps, Facts, Feelings, Fears, and Future, we modify the prompt so that the line of questioning aligns with the 4Fs framework of GP questioning. Second, the summary functionality utilises the *chat completions* API by submitting the full conversation, accompanied by a system prompt instructing the model to provide a brief summary structured in accordance with the 4Fs framework. Each part of the summary is limited to 'up to three words', as based on feedback from two interviews with experienced GPs which stressed the need for short summaries to maintain efficiency.

All system prompts are detailed in Appendix A.

4 Evaluation with General Practitioners

We set out to evaluate GPs' perceptions of a chatbot prototype designed to prepare patients for their GP consultation and activate

them for SDM. Given the many challenges faced by GPs in their daily work, including those introduced through technology (e.g., patients' online self-diagnosis [86]), it is critical to involve GPs when considering new technologies for their work context. Furthermore, their professional experience allows them to grasp both patients' needs and the integration of technology into their practice.

We recruited participants through a local professional network with whom we have established a collaboration, as well as the use of mailing lists and snowball sampling. We purposefully recruited participants from different clinics to capture a variety of working contexts and setups. The estimated completion time for participating in the study was 30–45 minutes, and participants were financially compensated for their time in accordance with the local agreement for GP time in our country. All participating GPs are interviewed individually to avoid groupthink.

Our qualitative evaluation follows a three-step approach. First, we asked a set of initial structured interview questions focusing on the challenges and opportunities in SDM. Second, we conducted a think-aloud observation session during which GPs used our prototype. Third, we conducted a semi-structured interview. This setup encouraged GPs to reflect on the presented tool, its ability to support SDM, and its applicability and potential impact on the GP's work practice. We purposefully instructed GPs to consider their own as well as the patient's perspectives in these interviews.

4.1 Pre-Evaluation Interview

Understanding the process of doctor-patient communication during consultations is key to our work. While SDM focuses on enabling a decision that relies on the expert knowledge of the medical doctor and the capabilities of a patient, the process up to the decision involves several not clearly defined steps and conversational pathways. No two patients are the same, and even two people with similar medical histories may not be able to pursue the same treatment outcome. To investigate this and contextualise our findings, we prepared a set of questions to clarify the conversational process and actions that the doctors take during a consultation. This includes inquiring into how they, on the individual level of patients, engage in SDM, the challenges GPs and patients face, and any conversational techniques they might use. In addition, we ask about their initial impressions of introducing AI-enabled conversational technologies into the pre-consultation processes of a clinic.

4.2 Experimental Task

Following the pre-evaluation interview, each GP evaluated the chatbot prototype in a think-aloud evaluation [58]. Our intention here is not to utilise the GPs as proxies for patients. Rather, we asked them to evaluate the chatbot's line of questioning from their professional perspective, building on their experience with doctor-patient consultations to evaluate the conversational capabilities of the chatbot. To maintain a practical scope and align with common issues faced in general practice, the evaluation focused mainly on patient scenarios around lower body pain, such as knee pain or lower back pain. These conditions are highly prevalent and often require patient input for effective diagnosis and treatment. Prior to the interaction, we provided GPs with a brief demonstration of the chatbot interface, its purpose as a pre-consultation tool, and how its conversational flow aligns with the 4Fs framework (Facts, Feelings, Fears, and Future). The *think-aloud* protocol allowed us to capture the GPs' immediate reactions to the chatbot's utterances rather than solely inquiring about their overall perception post-interaction. After completing their interaction with the chatbot, the GPs received a summarized report of the conversation, structured according to the 4Fs framework, allowing them to evaluate the output and its potential utility to support SDM during consultations.

4.3 Post-Evaluation Questions

Following the GPs' interaction with the chatbot, we conducted an interview focused on exploring the GPs' overall impressions of the chatbot and obtaining an understanding of how such a system might affect their work and interaction with patients. Participants were furthermore asked to evaluate the accuracy of the chatbot's responses based on their medical expertise, as well as to comment on the conversational summaries generated by the system and its potential impact on a subsequent patient consultation. Finally, the interview explored potential improvements to the chatbot's behaviour and interaction style.

4.4 Analysis Method

We analyse our data following Braun and Clarke's thematic analysis framework [9]. First, interviews were transcribed immediately following each interview. Following this process, one of the authors

carefully read through each transcript to further familiarise with the interview data.

Second, following this process, the same author created a set of preliminary code notes that served as the base for further analysis. These notes were organised using a spreadsheet and marked for ease of participant identification. In addition to coding the data, we selected direct quotes from the participants to illustrate our findings, providing concrete examples of the GPs' experiences and perspectives.

Third, following the completion of the initial coding, three authors collaboratively reviewed and engaged in discussions around codes, categories, and themes. These collaborative sessions spanned across four weeks, iterating on codes, categories, and themes. This led to the identification of 12 categories constituting five themes. Finally, four of the authors came together to further discuss these categories and themes, leading to the merging of two of the themes resulting in four themes.

5 Results

We recruited a total of 15 GPs (8 female, 7 male) with professional experience spanning from 1 to 25 years ($M = 11$, $SD = 8$). Our participant sample thereby covers both newly trained GPs and GPs with long-term experience in interacting with and treating patients in GP contexts. The ages of our participants ranged from 31 to 64 years ($M = 47$, $SD = 9$). We recruited the majority of participants through the quality improvement unit, with the remaining participants recruited from the network of the participating GPs. The 15 GPs covered a total of 12 different clinics. Table 1 shows a full overview of the details of our participant sample.

We identified four main themes through our thematic analysis of the interview data, revolving around GPs' perceived barriers in SDM, views on chatbots as mediators in patient preparation, participants' perceived impact of chatbots on GP practice, and their perspectives on patient adoption of such technology.

Table 1: Overview of participant characteristics.

| Participant | Age | Gender | Experience in years |
|-------------|-----|--------|---------------------|
| 1 | 46 | Female | 10 |
| 2 | 44 | Female | 1 |
| 3 | 46 | Male | 12 |
| 4 | 64 | Female | 24 |
| 5 | 31 | Male | 3 |
| 6 | 47 | Female | 8 |
| 7 | 60 | Male | 20 |
| 8 | 40 | Female | 2 |
| 9 | 47 | Male | 11 |
| 10 | 58 | Male | 25 |
| 11 | 34 | Male | 2.5 |
| 12 | 49 | Male | 5 |
| 13 | 44 | Female | 15 |
| 14 | 58 | Female | 20 |
| 15 | 41 | Female | 6 |

5.1 Barriers in Shared Decision-Making

As previously described, SDM is a key patient-centred approach in contemporary GP practice. All GPs in our participant sample strive to make SDM part of their everyday engagement with patients. As part of our study, we identified some perceived barriers towards successful SDM from the GPs' perspective. These include challenges such as navigating GP-patient disagreements or patients facing difficulties in remembering or articulating their thoughts or wishes.

GPs' motivations for following SDM differ, but include reasons such as raising patient agency, increasing quality of care, and improving clinical outcomes. A key part of SDM is how patients are directly involved in their treatment outcomes, as it follows a trajectory of commitment to increase the ownership of the decisions. In particular, GPs aim to communicate rather than dictate what they believe to be the appropriate treatment advice. One way GPs can achieve this is by offering multiple medically viable options to foster a sense of involvement for the patients. For example, P13 described the positive effects of patients' increased agency:

"If patients are part of the decision, and if they feel that they own the decision, then they're going to be compliant with the treatment. So if they feel that it's something that I've just ordered them to do, then they'll be more reluctant to do it. But if they think this is their own decision, they will do it."

Despite recognising SDM as critical to a successful GP consultation, our participants identified several barriers to its effective implementation. For example, the majority of GPs reported the necessity of balancing patient preferences with medical necessity. They noted that some patients come with expectations that may not be appropriate given their condition, such as requesting an MRI scan or specific treatments. Several GPs highlighted the challenge of maintaining this balance:

"Using SDM can be more challenging if the patient has many demands and wishes if I don't agree. For example, if a patient with back pain asks for an MRI scan and that's of no use it can be a little bit difficult to explain why this is not a good idea if they're really focused on what they want." (P01)

Another barrier to implementing SDM is that some patients prefer a more passive role, deferring decision-making responsibilities to their doctors. Additionally, patients lack the necessary information or understanding to participate effectively in SDM. A lack of knowledge about their pain or treatment wishes can lead to a more difficult SDM process, which will furthermore be time-consuming during the consultation. By guiding patients through structured questions informed by the 4Fs framework, chatbots encourage reflection around symptoms, expectations, and treatment preferences prior to the consultation. As one GP explained:

"Sometimes some patients haven't thought about their pain before and can find it quite difficult to answer the GPs' questions. Then answering it can be difficult; sometimes people just say: 'I don't know'. It shows they hadn't been thinking anything for real before they came, so they just had no answer. That can be a little bit challenging and time-consuming." (P01)

Depending on the medical situation and patient conditions and characteristics, the applicability of SDM can furthermore vary significantly. GPs determine the extent to which they involve patients in healthcare decisions based on the specifics of each case. For severe conditions, our participants tend to advocate more strongly for tests and treatments they consider important. In contrast, for less critical cases, the GPs may allow patients more time and space to express their preferences.

"Using SDM depends on the situation, how much I would let them decide, and how much I decide. So I guess the kind of disease, severity of the disease or illness, and patient characteristics are important factors." (P02)

Finally, engaging in transparent and collaborative decision-making can expose vulnerabilities for both GPs and patients. If the outcomes are unfavourable, both parties can use this dynamic defensively. One of the GPs explained:

"The doctor could be vulnerable; the patient can say, 'You chose the treatment and it didn't work, so it's your fault'. At the same time, it's also the opposite, because the doctor can always say, 'Well, you made the choice yourself'. So it can also be used for defensive medicine, GP against the patient." (P08)

5.2 Chatbot-Mediated Patient Preparation

For SDM to be successful, it requires that both parties are well prepared. The study's participants generally reported chatbots to be a promising venue for positively influencing patient preparedness, as chatbots might prompt patients' reflection while serving as a non-judgemental conversation partner. Most of the GPs generally believed that the presented chatbot can assist patients in better preparing for their consultation by already asking questions to the patient as well as providing relevant information that they are all required for having a better SDM. For example, P11 said:

"I think the chatbot can do a lot before the patient comes in to see us. It can give a bit of explanation and some advice and maybe can already solve some problems before they need to come in for the consultation or help to sort their thoughts before the consultation when they are just sitting in the waiting room."

Furthermore, through interactive dialogues, the chatbot might encourage patients to reflect on their symptoms, treatment expectations, and healthcare goals. This can help patients to better communicate their desires when facing the GP. As P02 stated:

"I like the idea that people sometimes reflect a bit. I think most patients, before they book an appointment, or at least before they come to the appointment, reflect a little bit about what's going to happen and why they feel this pain or whatever. So I think maybe some questions will help them to reflect a bit more."

Participants believed the chatbot to offer a non-judgemental platform where patients might feel more comfortable in sharing sensitive health concerns and fears. Many of the GPs expressed that some patients avoid sharing their minor concerns and fears with GPs as they might believe they are not sufficiently important, while

the barrier to sharing these with a chatbot can be lower. Some of the GPs reported that:

“When I ask if there is something specific you’re worried about in the future, they will often say that there’s a fatal cancer or it’s dangerous or something like that. And rarely they will say that they are afraid they can’t do the knitting because it’s their best time of the day. So perhaps they could share their concerns more easily with the chatbot and it could perhaps solve the problem as well.” (P03)

In contrast, several GPs highlighted that it might be challenging for some patients to express their emotions or feelings to a chatbot. For instance, in severe cases, the patients might not be comfortable chatting with the chatbot and explaining their fears and concerns. According to one of the GP’s explanations:

“I could imagine if patients are anxious that they have cancer in the knee, I don’t know if they would say that right to the chatbot because even the word cancer makes people frightened. So I don’t know if the fear is that I can’t run a marathon that’s not so hard to type on a computer, but if you have a fear of cancer I don’t know if you would write it to a chatbot or you would talk to your doctor.” (P14)

On the other hand, several GPs highlighted that talking about patients’ feelings and fears is not their strong suit, which is an aspect that could be supported through the chatbot.

Despite the various positive aspects and roles that chatbots can take in supporting the patients’ preparation, many of the GPs were quick to stress that the effectiveness of chatbots may vary across different patient groups. Here, they pointed to factors such as health literacy, technological proficiency, cultural background, and age. These variations can affect how well patients interact with and benefit from a chatbot. Furthermore, some participants raised the point that without the ability to interpret patients’ nonverbal cues such as facial expressions and body language, chatbots may miss critical emotional and behavioural information during the conversation. That is why some GPs stressed the importance of face-to-face conversations with patients. Some participants raised questions about the practicality and day-to-day usage. For instance, patients might be concerned about sharing their personal information with a chatbot or simply fail to provide complete information.

“I think it could be a very good tool for a summary of the patient’s symptoms and the patient’s expectations. That would be a very good tool if the patient would fill it out. That’s what I’m a bit afraid of, at least in the beginning, that a lot of patients will not do it. Because they are afraid to share their information with a chatbot.” (P12)

One notable design choice in the chatbot was the integration of the 4Fs framework to guide the conversation structure. GPs generally appreciated this structure, as it is intended to replicate their current practice. One GP remarked:

“When we are busy and running tight on a schedule, sometimes we forget to ask about these 4Fs because we want to get to the point and then we sort of miss this discussion with the patients about what they really

want and what their fear is. So this will provide the information beforehand to the GPs by taking the patient in, and making them reflect before the consultation.” (P05)

While there are several advantages to static pre-consultation tools, such as questionnaires, these tools may fall short in capturing the nuances of patients’ current state. As one GP noted:

“In some cases, for example, depression, it feels wrong for me to just give out a questionnaire and then I get it back with some short sentences and numbers. It doesn’t give me the information that I need.” (P02)

5.3 Perceived Impact of Chatbots on GP Practice

The introduction of an LLM-powered chatbot into the GP context will not only affect patients but will also have a substantial impact on the role of GPs and their consultations. Some GPs stated that while using a chatbot can help patients be better prepared and informed before their consultation, this could result in more time-consuming consultations. They highlighted that patients may come with more in-depth questions or discussion points during the consultation, all of which require extensive engagement from the GP, potentially increasing the duration of consultations. Part of increasing the duration of consultations is that GPs are concerned that the chatbot may influence patients’ ‘stance’, requiring them to initially address that or steer them towards a more feasible perspective. This was highlighted by P05, who stated:

“I think it could create some noise and some frustrations, as when patients start using the chatbot they will ask me about what they wrote in that and what the chatbot said rather than having a focus on what their problem is.”

While such chatbots might influence and potentially steer patients in their care process in positive ways, this might also impact the efficient management of their own time, which is of primary concern to many of our participants. With increased knowledge, patients might also have higher expectations regarding the outcomes of their consultations, thereby adding to the GPs’ workload. These expectations could include more detailed explanations or justifications for medical decisions, which can be challenging to manage within the time constraints of a consultation.

In contrast to this, several participants believed that the chatbot could also save time during patient consultations. By providing a brief summary to GPs prior to the consultation, the chatbot reduces the need for GPs to ask basic questions. This streamlining could allow GPs to spend more time focusing on specific patient concerns. As stated by one of the GPs:

“If I have the summary of the patient-chatbot conversation, I know what it’s about, and I can see it on my screen. So I can start the consultation with a sentence such as ‘I can see that you come today because you have problems with your ear’ and then we continue the consultation. Sometimes if I’m in a hurry, and this way, we can save a lot of time because I can go directly to the main topic of the day.” (P05)

Interestingly, some of the GPs that indeed perceived this as a potential timesaver warned of the potential drawbacks of such a solution. These chatbot-generated summaries cannot replace the GPs' interviews and might introduce a risk of GPs starting the consultation with presumptions about patients' pains or raise concerns regarding the summaries oversimplifying or failing to capture important nuances in patient responses. As one GP explained:

"I agree that the summary could be a time saver. But I also see maybe some risks in terms of being opened and without presumptions before the patients come into the room. So meeting the patients neutrally is not possible when you've read the summary." (P13)

The ability of the chatbot to summarise patient interactions into a concise summary was perceived as a clear benefit. Several GPs indicated that receiving these summaries prior to consultations would give them the opportunity to prioritise their limited consultation time more effectively. One GP highlighted:

"Yeah, we could also use this summary as a kind of starting point for the consultation and tell patients that I can see that you talked to the chatbot." (P05)

5.4 Anticipated Patient Adoption of Pre-Consultation Chatbots

The introduction and integration of digital solutions, such as chatbots, in general practice is likely to transform various aspects of general practice. However, this transformation is largely dependent on how patients will perceive this technology. GPs had several considerations that provided insight into patients' potential adoption of pre-consultation chatbots. Patients might feel sharing personal problems with a chatbot is challenging for personal or privacy reasons, or they might feel insecure about using interactive technology in general. Our participants saw clear potential in chatbots integrated with the physical waiting room environment and how it is used there. As one of the GPs stated:

"Patients can use the spare time they have in the waiting room, where they are kind of forced to think about the chatbot questions instead of just sitting and waiting for their appointment. I think this can guide them in some way." (P06)

The potential uptake and adoption of chatbots or other technologies similarly also depends on GPs' stance towards them. Despite the development of digital tools in healthcare, almost all our participants stressed the importance of personal interaction between patients and GPs. While GPs believed that the chatbot could be a useful tool, they also emphasised the necessity of interviews with patients as a process to get to know their GP. This process, they argued, leads to increased trust in GPs and their medical recommendations. One GP stated:

"I think it's very, very important that we see the patients also. The chatbot could be only a helping tool. Because, you know, we have all the history here about the patient. I also think it makes the patient safer to know that the decisions are made by somebody who knows them. [...] It's like a personal relationship where you care a little more because you know the patient personally."

"And when the patient knows that, they also have more confidence in your decision." (P06)

Confidentiality is another critical concept in medical practice that was brought up by some participants. Patients trust their healthcare providers with sensitive personal information, and this trust is fundamental to the patient-GP relationship. This level of trust might be absent in interactions with chatbots. One GP emphasised this critical nature of confidentiality and stated:

"I think we will have some difficulties having the patients do it. Because they have to share very personal things with a chatbot. One of the good things about the medical system in Denmark, at least for the GP side, is that everything is confidential. Not even the hospital doctors can see what we're writing in our journals. It's completely confidential between the doctor and the patient. There will be some GDPR [EU's General Data Protection Regulation], and I think a lot of people will be a little bit afraid of using this chatbot." (P12)

Identifying suitable patient groups for chatbot interactions is key. In some cases, patients book appointments for annual checkups, while in other cases, they are facing a new illness. One of the GPs reported that for the first group, using a chatbot might not be helpful, while for patients who are facing pain or disease, a chatbot could be helpful. One of the GPs noted that:

"I can see a lot of patients whom it would be good for, but I can also see a lot of patients whom it would not make sense to use the chatbot, such as patients who come in for annual controls. So I think the chatbot is not for everybody of course." (P05)

6 Discussion

We conducted a comprehensive investigation into GPs' perspectives on the use of pre-consultation chatbots. Prior work on designing chatbots for healthcare contexts, such as GP waiting rooms, has predominantly focused on patients' support needs and preferences [49]. Understanding user needs in such sensitive environments is critical to inform the design of, for example, chatbots, and increase the chances of successful adoption [85]. Nevertheless, without considering the perspectives and practices of clinical experts, real-world deployments are likely to fail [21, 81]. GPs carry the expertise and experience necessary for designing systems in a way that aligns with their workflow, avoids obstructing GP-patient interaction, and reduces the risk of causing patient harm.

Our results show that GPs' have nuanced perspectives on pre-consultation chatbots designed to support SDM in general practice. Our participants highlighted challenges with SDM, reflected on both the advantages and disadvantages of chatbots for increasing patient preparedness, and described how they envision the impact of chatbots on their day-to-day practice. Next, we discuss these perspectives in more detail and connect them with existing HCI literature.

6.1 Introducing Chatbots in General Practice

Our study builds on and extends prior work by Li et al., who investigated patients' perspectives on pre-consultation chatbots [49].

Their results present mostly positive perspectives by the patients after using a pre-consultation chatbot prototype, with the primary drawback of the evaluated chatbot being its overly appreciative tone. Our findings suggest that GPs have diverging perspectives on the use of a pre-consultation chatbot for SDM. On one hand, they raised several concerns that highlight the complexity of GP-patient SDM, such as patients' inability to articulate their concerns or entering the consultation with off-target expectations. On the other hand, they were curious and optimistic about the potential benefits for patients. For example, several GPs acknowledged the chatbot's potential to prompt patients to positively influence their consultation preparedness by encouraging patients to reflect on the purposes of their visit (such as potential symptoms and treatment expectations). Prior work suggests that this is an important step for increased patient involvement (e.g., nurse-led pre-consultation [35]) and might lead to more focused and efficient consultations.

Recent work suggests chatbots positively influence users in various ways; for example, people resonate with chatbots depending on conversation style [51]. The GPs in our study also voiced concerns that chatbots could inadvertently shape patient expectations, ultimately complicating rather than facilitating the GP-patient interaction. For example, GPs might need to spend considerable time explaining why a certain recommendation is not reasonable or feasible. This highlights a delicate balance between positively influencing patient expectations and ensuring consultation efficiency. Another important perspective highlighted by our participants is to ensure that the chatbot does not steer the consultation by providing diagnostics or medical advice. Instead, the design of pre-consultation chatbots should focus on information facilitation and patient reflection, ensuring that any medical decisions are made by GPs [5].

Prior work suggests that AI systems designed to work within the existing constraints and expectations of a healthcare environment are more likely to be effective and accepted by users [33]. Integrating pre-consultation chatbots into general practice similarly demands careful consideration to prevent pitfalls that might arise when additional work tasks are introduced, either for the GP or the patient. In 1988, Grudin highlighted that collaborative systems often fail when those who must do extra work to maintain the system's operation fail to benefit from the system [27]. The chatbot in our study asked patients to share information and reflect on their needs, which would potentially benefit both patients and GPs in their SDM. Nevertheless, our interviews also highlighted that such a study would require additional efforts from both GPs and patients, as well as potentially other relevant stakeholders such as healthcare support staff. In our current work we did not consider the effort of these other stakeholders (such as support staff [37]) that might play an important role (e.g., supporting patients with potential technical challenges) in clinical settings.

6.2 Patient and GP Agency in Shared Decision-Making

One of our main findings reveals that GPs envision the chatbot to be useful for patients to more clearly articulate the purpose of their visit, which is a significant challenge in GP-patient SDM [38]. Supporting patients in better articulating their visit's purpose aids

those who might normally experience this to be challenging, but also streamlines consultations—a critical aspect given the time constraints GPs often face. Further, GPs generally believed that the chatbots could provide a judgement-free setting for patients to share their fears. These findings align with patients' perspectives on the benefits of pre-consultation chatbots [49].

While supporting patients in pre-consultation by helping them better articulate their consultation purposes positively influences patients' agency, a challenge remains in identifying and maintaining appropriate agency levels for both patients and GPs. This is further motivated by prior work, which suggests that cultivating patient-GP alliances positively influences communication, particularly for adolescent patients who may struggle to articulate their symptoms or concerns [38]. An important part of such patient-centred care is ensuring patients feel understood and respected during their interactions with healthcare providers. According to Howe et al., the perception that a GP 'gets it' (competence) and 'gets me' (warmth) is essential for building trust and enhancing the GP-patient relationship [30]. Nevertheless, it can remain difficult for patients to take ownership of their role in SDM for a variety of reasons [50, 70], leading some to suggest that: "while all decision making should be patient centred (i.e., it should consider patient needs and preferences), it does not always have to be patient driven." [70, p.1]. By helping patients articulate their symptoms and concerns before their consultation, chatbots can foster a sense of patients feeling heard and building confidence in their active role in SDM.

In terms of GP agency, our participants highlight that the chatbot should focus on facilitating rather than replacing patient-GP communication. For instance, GPs emphasised that the chatbot should serve as a conversation starter, helping to clarify patients' concerns and expectations before they meet with the GP. By prompting patients with relevant questions and allowing them to reflect on their responses in an intentionally constrained way, the GPs can maintain their agency while potentially making the consultation more focused. Our GP-informed approach, in which the chatbot primarily asks questions and facilitates reflection rather than providing direct advice, can enhance its role as a communication facilitator without impacting GPs' agency. This aligns with a recent technical report suggesting that LLM assistants take on a more proactive role in their interactions with students to support their thinking [65]. While this is a promising direction for designing pre-consultation chatbots to positively influence patient-GP SDM, there is a need for careful consideration in encouraging patients to reflect on their possible healthcare decisions. Understanding both patients' and GPs' perspectives on their respective agencies is, therefore, an important foundation for future work on interactive applications in healthcare settings that need to respect multi-stakeholder agencies.

Next, based on our results and prior work, we outline three design considerations critical to respecting multi-stakeholder agencies in the context of pre-consultation chatbots.

6.3 Design Considerations for Pre-Consultation Chatbots

Bennet et al. recently emphasised the relevance of articulating and contextualising agency to be critical for practical interventions [8].

Definitions of agency can play an important role in increasing both GP and patient agency without compromising either group's agency. Zajac et al. suggest that a mutual understanding (i.e., through shared terminology) matters for these groups as well as other stakeholders to realise and integrate machine learning into clinical practice [87]. In our case, GPs described their agency as affected by levels of control over the SDM process, while they described patients' agency as levels of feeling in control of their healthcare decisions. These are not contraries—maximising either of these specific agency aspects does not necessarily negatively affect the other. However, designing pre-consultation chatbots so that they maximise both GP's and patients' agency raises various challenges.

First, while much research points to the benefits of involving patients in their healthcare decisions, this rests on the assumption that people want to be involved in these decisions, while some patients might be 'passive' and prefer non-involvement [10]. Furthermore, GPs may also prefer to involve patients less in decisions [14] or adjust the level of patient agency they allow for depending on the patient. This was also emphasised by participants in our study (see for example Section 5.1). We, therefore, recommend that pre-consultation chatbots should be sensitive to patient-GP agency preferences, as well as any carers involved [60]. To decrease the risk of failing to account for patient-GP agency preferences, both patients and GPs could be given the opportunity to configure the agency levels that the pre-consultation is supposed to elicit. For example, if a GP deems it appropriate with lower levels of agency given to the patient, a more simple version of the pre-consultation chatbot (e.g., resembling more traditional pre-consultation questionnaires) could be presented to avoid fostering more in-depth reflections.

Second, GPs in our study expressed concerns about the chatbot potentially 'steering' patients' thoughts or influencing the GPs themselves by means of the summary provided to them, potentially negatively impacting both groups' agency. Prior research suggests that patients and GPs have different priorities and expectations of each other [39]—a pre-consultation chatbot might thus influence the expectations patients and GPs' hold. To decrease the chance of misaligned expectations, both GPs and patients could explicitly state and 'pin' their expectations in the pre-consultation interface prior to engaging with the chatbot. This would allow the patient to have some initial guidance prior to engaging with the pre-consultation chatbot. For the GP, this would introduce 'traceability' in that they can focus on the patient's expectations and engage with any thoughts stemming from those in the actual consultation.

Third, and importantly, GPs and patients should not be forced to use pre-consultation chatbots, but be given the option and be pedagogically introduced to and supported in acquainting themselves with AI-powered pre-consultation chatbots. Prior work shows that patients concerns include for example concerns about reduced time with their GP [43] or GPs' worries about their work environment [11]. To avoid diminishing both patient and GP agency, it is therefore important that the user of pre-consultation chatbots is signed off by both parties to respect their corresponding agency preferences.

6.4 Limitations and Future work

We recognise several limitations to our work.

First, our study focuses on the perspectives of GPs and does not include patients. This patient perspective, however, was recently studied by Li et al. [49]. We argue that pre-consultation chatbots for clinical practice must also carefully consider GPs' perspectives, as these hold critical expertise and experience necessary for successful integration into clinical practice.

Second, we limit the participants to a single country. This affects the generalisability of our results to other contexts. Further, there is a risk of bias in participant inclusion, as GPs in this study volunteered based on their interest in the subject, potentially attracting those who are more technologically savvy or open to the use of technological innovation. Moreover, a recurring discourse in both the popular media and in research is that AI might replace clinicians (e.g., see discussion in [80]). This discourse could influence GPs' perceptions of technology, potentially introducing biases in their perceptions. Nevertheless, our participant sample represents a wide range of GP experience, as summarised in Table 1.

Third, we did not consider the potential impact of varying GP expertise (e.g., relevant in clinician-AI interactions [13]) or digital literacy levels. Patients and GPs with low technological proficiency may struggle to engage effectively with pre-consultation chatbots, potentially leading to incomplete or inaccurate information being shared with the GP. This connects with our study's limited testing in real-world clinical settings. Consequently—the introduction of emerging technologies, such as the chatbot examined in this study, into real-world clinical practice necessitates extensive longitudinal evaluation involving both GPs and patients before they can be responsibly integrated into practice and adopted at scale.

Based on the concerns expressed by our participants, future work could explore how the chatbot can be customised to meet the specific needs of different patient demographics, such as age, cultural background, and health literacy. Furthermore, further research should investigate the long-term effects of a pre-consultation chatbot on patient outcomes, GP workload, and overall healthcare efficiency. This could involve longitudinal studies to assess whether the initial benefits observed in our study and prior work [49] are sustained over time and whether the chatbot contributes to, for example, improved patient satisfaction, adherence to treatment plans, healthcare outcomes, and a reduction in the need for follow-up consultations.

7 Conclusion

We explore GPs' perspectives on pre-consultation chatbots to improve patient preparedness for SDM. Our findings suggest that GPs recognise several potential benefits of such a chatbot, including better preparing patients by articulating their symptoms and expectations, encouraging reflection, and providing a concise summary for GPs to facilitate the consultation process. However, they also express concerns about the practical implications, highlighting the importance of maintaining the GP autonomy and ensuring that the chatbot complements rather than complicates the consultation process. In addition, GPs identified challenges related to the variability in patient readiness to use such technologies, citing factors such as patient age, health literacy, and comfort with digital tools. While

there is clear potential to improve patient-GP interactions, the integration of such technologies needs to be managed carefully to ensure they enhance, rather than hinder, the consultation process.

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A System prompts

We provide system prompts for the LLM used in our study to steer its behaviour so it aligns with summarising information and ensuring a focus on the 4Fs framework. In the following, we describe all system prompts used across different stages of the interaction.

A.1 System Prompt: Dialogue Summary

“Summarise this conversation into four categories: Facts (symptoms, medical history, current condition), Feelings (emotions and feelings), Fears (fears, concerns, and functioning in daily life), and Future (expectations, hopes, and concerns for the future). Your response HAS to include each of the four titles: Facts, Feelings, Fears, and Future. For each title, provide a very short summary of up to three words. You always end each category with a punctuation mark. If there is no relevant user response for any particular category, you write “N/A”. Here is an example of the expected output: Facts: Back pain for two weeks, pain is constant. Feelings: Feels incapable.

Fears: Won’t recover, ability to work is affected. Future: Prefers surgery, and seeks full pain relief.”

A.2 System Prompt: 4F, Facts

“You are a waiting room chatbot, designed to prepare patients for meeting their general practitioner. You want to extract as much relevant information as possible by asking questions that engage the patient. You do this by making patients reflect upon their health situation by indirectly targeting the following topic described in the following {{{: {{Prompt the patient to provide you with information. This involves obtaining factual information about the patient’s symptoms, pain location, medical history, and current condition. You ask direct questions to gather essential details such as the exact pain location, nature of the problem, its duration, and any associated symptoms.}} Your goal is to elicit deep self-reflection from the user. You encourage and push the patient to further elaborate on their health condition. You ask up to two questions in a row each time. Your responses are limited to between 20 to 30 words. You continuously ask specific questions related to what the user is saying. In your responses, you randomly pick one of the following phrases: “OK”, “right”, “got it”, and “understood”. Focus on being straightforward, informative, and concise, ensuring clarity and efficiency in communication.”

A.3 System Prompt: 4F, Feelings

“You are a waiting room chatbot, designed to prepare patients for meeting their general practitioner. You want to extract as much relevant information as possible by asking questions that engage the patient. You do this by making patients reflect upon their health situation by indirectly targeting the following topic described in the following {{{: {{Prompt the patient to provide you with information. This involves exploring the patient’s emotions and feelings about their symptoms or condition. This can include how the illness affects their emotional state, overall mood, and their daily life. Understanding a patient’s emotional response can provide a critical context for their physical symptoms.}} Your goal is to elicit deep self-reflection from the user. You encourage and push the patient to further elaborate on their health condition. You ask up to two questions in a row each time. Your responses are limited to between 20 to 30 words. You continuously ask specific questions related to what the user is saying. In your responses, you randomly pick one of the following phrases: “OK”, “right”, “got it”, and “Understood”. Focus on being straightforward, informative, and concise, ensuring clarity and efficiency in communication. Pretend that you have already talked with the user about the following: ((This involves obtaining factual information about the patient’s symptoms, medical history, and current condition. You ask direct questions to gather essential details such as the nature of the problem, its duration, and any associated symptoms.))

A.4 System Prompt: 4F, Fears

“You are a waiting room chatbot, designed to prepare patients for meeting their general practitioner. You want to extract as much relevant information as possible by asking questions that engage the patient. You do this by making patients reflect upon their health situation by indirectly targeting the following topic described in

the following {{{: {{Prompt the patient to provide you with information. This aspect focuses on the fears or concerns the patient has AND how the illness or symptoms affect the patient's daily life and functioning. You assess the impact on the patient's ability to work, perform daily activities, and maintain social relationships. This information helps in understanding the severity and practical implications of the condition.}} Your goal is to elicit deep self-reflection from the user. You encourage and push the patient to further elaborate on their health condition. You ask up to two questions in a row each time. Your responses are limited to between 20 to 30 words. You continuously ask specific questions related to what the user is saying. In your responses, you randomly pick one of the following phrases: "OK", "right", "got it", and "understood". Focus on being straightforward, informative, and concise, ensuring clarity and efficiency in communication. Pretend that you have already talked with the user about the following: {{{(This involves obtaining factual information about the patient's symptoms, medical history, and current condition. You ask direct questions to gather essential details such as the nature of the problem, its duration, and any associated symptoms.)) (This involves exploring the patient's feelings about their symptoms or condition. This can include how the illness affects their emotional state, any fears or concerns they might have, and their overall mood. Understanding a patient's emotional response can provide a critical context for their physical symptoms.")}})}} }

patient's daily life and functioning. You assess the impact on the patient's ability to work, perform daily activities, and maintain social relationships. This information helps in understanding the severity and practical implications of the condition.")}} }

A.5 System Prompt: 4F, Future

"You are a waiting room chatbot, designed to prepare patients for meeting their general practitioner. You want to extract as much relevant information as possible by asking questions that engage the patient. You do this by making patients reflect upon their health situation by indirectly targeting the following topic described in the following {{{: {{Prompt the patient to provide you with information. This involves discussing the patient's expectations, hopes, and concerns for the future. This can include their goals for treatment and any specific outcomes they hope to achieve. Understanding a patient's future perspective helps understand the patient's expectations and concerns.}} Your goal is to elicit deep self-reflection from the user. You encourage and push the patient to further elaborate on their health condition. You ask up to two questions in a row each time. Your responses are limited to between 20 to 30 words. You continuously ask specific questions related to what the user is saying. In your responses, you randomly pick one of the following phrases: "OK", "right", "got it", and "understood". Focus on being straightforward, informative, and concise, ensuring clarity and efficiency in communication. Pretend that you have already talked with the user about the following: {{{(This involves obtaining factual information about the patient's symptoms, medical history, and current condition. You ask direct questions to gather essential details such as the nature of the problem, its duration, and any associated symptoms.)) (This involves exploring the patient's feelings about their symptoms or condition. This can include how the illness affects their emotional state, any fears or concerns they might have, and their overall mood. Understanding a patient's emotional response can provide critical context for their physical symptoms.)) (This aspect focuses on how the illness or symptoms affect the