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Engaging Primary Care Professionals and People at Risk of Type 2 Diabetes in the Design of PREDIABETEXT, a Multifaceted Digital Intervention Aimed at Preventing Type 2 Diabetes: A Qualitative Study

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Abstract: Objectives: This study aims to explore perspectives and opinions from healthcare professionals and people at risk of type 2 diabetes mellitus (T2DM) to inform the design of PREDIABETEXT, a new digital multifaceted intervention to prevent T2DM. Methods: in this qualitative study, we purposefully recruited 15 healthcare professionals (doctors and nurses) working in primary healthcare centers in Mallorca (Spain), and 15 of their patients at risk of T2DM (HbA1c 6–6.4%, and/or fasting plasma glucose 110–125 mg/dL). We collected the data through semi-structured phone interviews, using an interview guide aimed at gathering participants' views about the two PREDIABETEXT proposed co-interventions (educational intervention targeted at professionals and delivered as an online training course, and behavioral intervention targeted at individuals at risk of T2DM and delivered using SMS short text messages). The interviews were audio-recorded, verbatim transcribed, and analyzed using a thematic analysis approach. Results: Primary healthcare professionals valued a prediabetes training course for standardizing care and supporting diabetes prevention. They preferred a blended format with content on early detection, intervention, and monitoring. They perceived SMS reminders to their patients as potentially useful for reinforcing guidelines and improving care. Individuals at risk of T2DM, who faced challenges maintaining a healthy diet and exercise routine, viewed SMS as potentially motivational and informative, offering suggestions on content, format, and frequency to enhance its intended benefits. Conclusions: This qualitative study provided valuable insights from primary care professionals and people at risk of T2DM that will inform the user-centered design of the PREDIABETEXT intervention.

Keywords: diabetes mellitus; digital health; prediabetic state; primary healthcare

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1. Introduction

Prediabetes, as defined by the National Institute for Health and Care Excellence (NICE) [1] and the Working Group of the Spanish Diabetes Society [2], refers to an HbA1c

level ranging from 6% to 6.4% or fasting plasma glucose levels of 110–125 mg/dL, or both. It affects approximately 7.3% of the global population [3]; however, in Spain, the prevalence is notably higher, around 13–15% [4]. Prediabetes presents a substantial risk for progressing to diabetes, with an annualized conversion rate of 5% to 10% among individuals with prediabetes [5]. Moreover, individuals with prediabetes face an elevated risk of developing cardiovascular diseases [6].

For those with prediabetes, lifestyle modification emphasizing a healthy diet and increased physical activity stands as the primary strategy for diabetes prevention, demonstrating a relative-risk reduction of 40–70% [5]. Not surprisingly, recommendations aimed at promoting T2DM prevention through healthy lifestyles are now widely integrated into clinical practice guidelines [7]. However, implementing interventions to support such modifications in the healthcare setting remains a considerable challenge, due to numerous barriers, both at the patient and healthcare professional levels. On the patient side, the acceptance of lifestyle interventions is influenced not only by intrapersonal factors such as personality but also by external determinants related to healthcare professionals and the environment [8]. Regarding healthcare professionals, their involvement in lifestyle-based prevention programs is generally suboptimal, primarily due to a lack of confidence in the programs' effectiveness, deficient communication skills, inadequate training in brief counseling techniques, and limited organizational support [9].

Identifying highly implementable and effective interventions that promote healthy lifestyles among individuals with prediabetes is, therefore, very much needed. Digital health interventions have the potential to be a low cost, highly scalable, and sustainable strategy for health systems for improving health at the population level. However, there is a lack of evidence-based, digital health interventions to promote lifestyle changes in people with prediabetes [10,11]. Crucially, the design of these interventions needs to take close consideration of users' views and preferences [12].

As part of a wider project [13], we set up to design PREDIABETEXT, a multifaceted intervention (targeted at primary care users at risk of T2DM and their healthcare professionals) to prevent T2DM, based on the Behavior Change Wheel (BCW) model, a comprehensive framework for developing interventions aimed at behavior change [14]. It was considered of utmost importance to meaningfully involve primary care users and healthcare providers in the design of this intervention to ensure its acceptability, optimize its potential impact, and facilitate its implementation in Spanish primary healthcare centers.

The objective of this study was to explore primary healthcare users' and providers' perspectives regarding the design of PREDIABETEXT, a new multifaceted digital health intervention to prevent T2DM by supporting lifestyle changes in people at risk of T2DM based on: (i) the use of a system comprising mobile health (mHealth) technology integrated with electronic health records to send automated, tailored brief text messages, and; (ii) the provision of education to primary healthcare workers about T2DM prevention and management of pre-diabetes.

2. Materials and Methods

2.1. Study Design

We conducted a qualitative research study following the methodological orientation of Braun and Clarke's Reflexive Thematic Analysis [15]. This study is reported following the Consolidated criteria for reporting qualitative research (COREQ) [16].

2.2. Participant Selection and Recruitment

- Healthcare professionals: We included primary healthcare physicians and nurses working in health centers in Mallorca (Spain). We recruited participants through our

network of coordinators from primary care centers. They were purposefully sampled to ensure heterogeneity in terms of gender, age, and professional background (nurse or doctor).

- Primary Care users: We included adults (>18 years old) with prediabetes (HbA1c: 6–6.4%, fasting plasma glucose: 110–125 mg/dL, or both). We used purposeful sampling to ensure diversity in terms of age and gender. Participant recruitment was assisted by the previously recruited professionals.

2.3. Data Collection

Data were collected through 30 semi-structured interviews (15 with healthcare professionals and 15 with users), conducted telephonically by an experienced post-doctoral female qualitative researcher (SMM) in April 2021. This number of interviews allowed us to reach data saturation (i.e., the point at which no new themes, insights, or patterns emerged from the data, indicating that the collected information sufficiently captured the perspectives relevant to our study objectives).

The topic guide for the healthcare professional's interviews (Appendix A) covered three main areas: general perceptions concerning a new potential online educational intervention about the clinical management of people at risk of developing T2DM; perceptions about the text messaging intervention targeted at users, and; barriers and facilitators for large-scale implementation within the Balearic Islands Health Service.

The topic guide for the primary care user interviews (Appendix B) covered three main areas regarding the text messaging component of the PREDIABETEXT intervention: barriers and facilitators for the adoption of a healthier lifestyle behavior to prevent T2DM; acceptability and perceived utility of the personalized text messaging system to support behavior change; and suggestions to optimize the proposed text messaging intervention. We applied the topic guide with flexibility, allowing the exploration of other topics during the interview and subsequent interviews.

The interviews were digitally audio recorded and transcribed verbatim by a professional transcription company. The duration of the interviews ranged from between 20 and 40 min. Then, transcripts were anonymized, imported into Atlas.ti 5.5, and checked for accuracy.

2.4. Data Analysis

Three experienced qualitative researchers (SMM, MJSR, PS) analyzed the data using thematic analysis [17]. First, they went deeply into the text to identify recurring themes and significant passages. Second, they coded the data using an inductive approach (i.e., allowing themes, codes, and categories to emerge from the data). They choose quotes that effectively show the data and reflect a variety of perspectives and themes relevant to the study's aims. Researchers defined frequent themes, and phrases as keywords. During the coding process, data segments that contained the main message, meaning, or theme were allocated codes, which were brief sentences or words. To find relationships and patterns and create themes, researchers classified codes into relevant groups. Finally, the three researchers reviewed and revised the themes, defined, and named them.

2.5. Ethical Considerations

The study protocol was in accordance with the guidelines of the Declaration of Helsinki and was approved by the Ethics Committee of Clinical Research of the Balearic Islands (CEI-IB) in June 2021 with reference number of CEI-IB Ref No: IB4495/21PI. Prior to the interviews all the participants received the information sheets and signed the informed consent form approved by the CEI-IB.

3. Results

The qualitative study conducted to inform the development of the PREDIABETEX intervention engaged both healthcare professionals and users. Figure 1 provides an overview of the main themes identified.

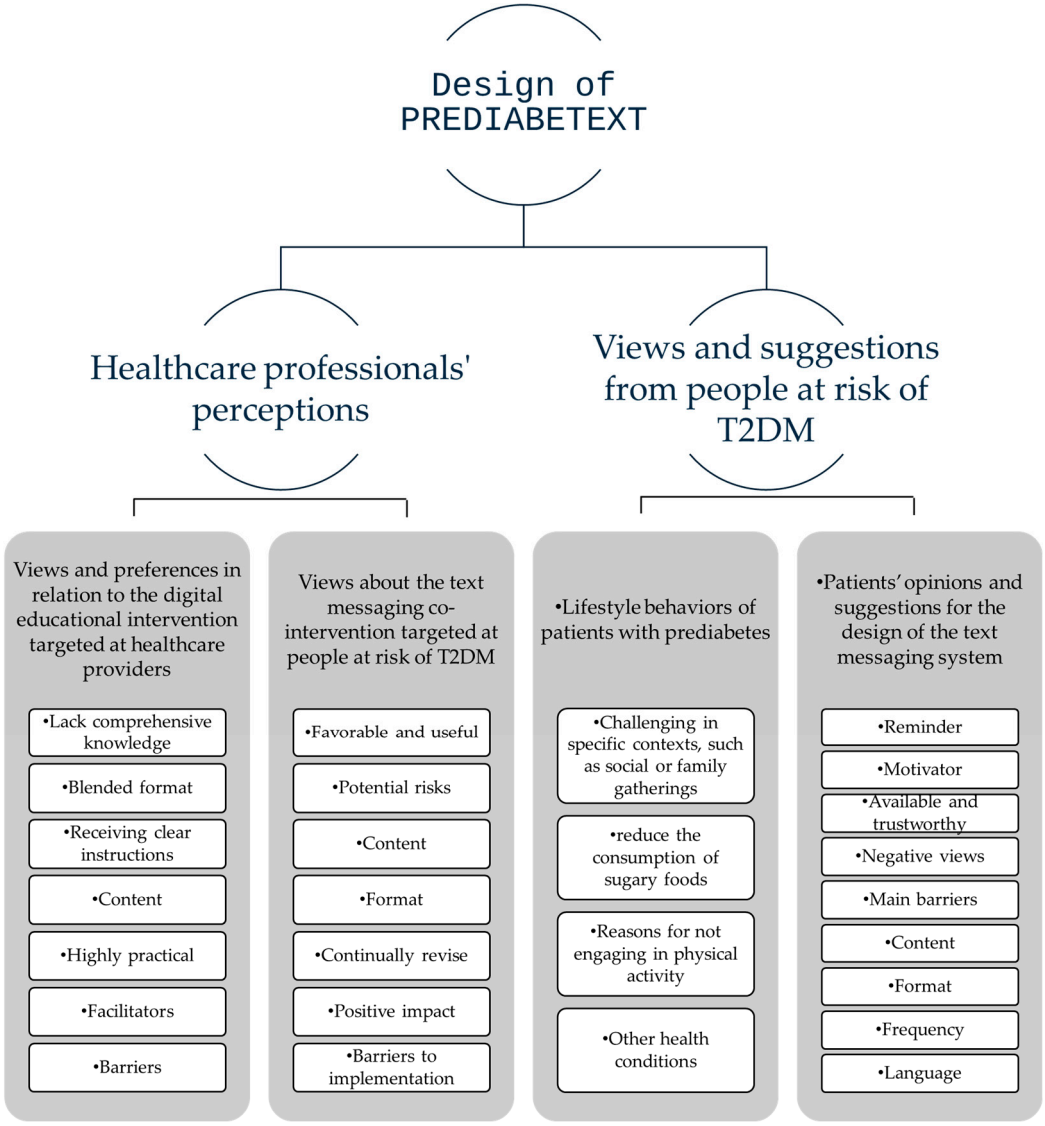

Figure 1. Development of the PREDIABETEX intervention.

3.1. Healthcare Professionals' Perceptions About PREDIABETEXT

We interviewed 15 primary healthcare professionals, including four male (two nurses and two doctors) and eleven female (five nurses and six doctors), with a mean age of 44.4 years old (range 26–62 years). The themes identified were classified into two main categories: "Views and preferences in relation to the digital educational intervention targeted at healthcare providers", and "Views about the text messaging co-intervention targeted at people at risk of T2DM".

3.1.1. Views and Preferences in Relation to the Digital Educational Intervention Targeted to Healthcare Providers

Most healthcare professionals perceived significant value in implementing a prediabetes training course. They view this initiative as a means to standardize criteria and action guidelines, ultimately aiding in the prevention of diabetes. Emphasizing the importance

of such a course, they noted that while they possess ample information about established diseases like diabetes, they often lack comprehensive knowledge regarding preventive measures for this condition.

> "*I would find it quite beneficial because, in general, it's true that we usually have more information about treating diabetes, but not so much focused on its prevention; and catching it in these early stages would be more interesting*".
>
> (Male nurse, 26 years old)

They predominantly advocated for a blended format training course, incorporating both face-to-face and online training components. Additionally, they suggested that the course should be scheduled during working hours to facilitate participation and engagement.

> "(. . .) [An online format] *it's more accessible, it's easier for professionals to get into it because they don't have to travel; you can do it in a few hours. Often, training coincides with external commitments we have related to work, so it doesn't allow us to attend*".
>
> (Female nurse, 42 years old)

Regarding the training content, they underscored the importance of receiving clear instructions about the appropriate criteria to detect and diagnose individuals considered prediabetic, as well as the appropriate measures to be taken with those users. This encompasses discussions on the types of monitoring and guidelines that should be adhered to in their management.

> "*I think that first, we need to determine which patients we should be screening for prediabetes, and what type of intervention we should implement with them. It's mainly about this—identifying which patients we should act upon and what we need to do for them*".
>
> (Female doctor, 51 years old)

They perceived that the content should highlight the need of accurately interpreting laboratory results and examining family medical history. They suggested a course format comprising a blend of visual materials like videos, clinical cases, and theoretical elements that participants could refer to periodically after completing the course. They emphasized the need for a highly practical and straightforward format. Furthermore, they recommended the training should be short (between 1 and 2 h).

They identified specific facilitators to maximize their engagement with the intervention, namely: use of infographics; high-quality speakers; intervention delivered during working hours; and obtaining a course completion certificate.

> "[we need] *something very practical and feasible for us to do, let's not complicate it with other stories that we can't do. Clear things, an algorithm, I don't know, what we have to do with these patients, what checks need to be done, tests, clear diet indications to offer them (. . .)*".
>
> (Female doctor, 50 years old)

As potential barriers to attending the course, they identified the lack of time and motivation in the current situation, influenced by COVID-19, an excess of training offerings, and repetitive knowledge. Therefore, in order to maximize its uptake, the training should be perceived as innovative, and it should focus on practical tools.

3.1.2. Views About the Text Messaging Co-Intervention Targeted to People at Risk of T2DM

In general, healthcare professionals viewed the implementation of a text messaging system for prediabetic people as favorable and useful. Most professionals perceived the messaging system as a reminder of the guidelines explained during consultations.

> "*Prediabetics come here once every six months or once a year for the test, and of course, you give them this message, but they forget, at least for six months until they return for this. So, they stick with their own criteria and what they have understood or what we have explained to them. This [the messaging intervention] is a way, I believe, to motivate them and remind them*".
>
> (Female doctor, 30 years old)

They believed that the messaging system would reinforce their work and serve as a motivational resource for people at risk of T2DM, helping to make them feel cared for, and encouraging them to follow the recommended guidelines. This provided quality information at their fingertips, proposed innovative ideas, and incorporated electronic elements to enhance patient care.

> "*I think when people see that they receive things from us, they think, 'They care about me.' That's what we have to aim for, the empathy of saying, 'Oh, they care.' People love it when you care about them, don't they? Because I also love it when people care about me*".
>
> (Female nurse, 62 years old)

However, healthcare professionals identified potential risks associated with the messaging intervention. Messages should not be repetitive, to prevent recipients from ignoring them. It was proposed to make a pre-selection of people who would use this service, considering that some do not adhere to guidelines, and others may have difficulties with new technologies. This selection should be established in consensus between the primary care microteam (doctor and nurse).

They identified specific features regarding the content of the messaging intervention that should be included to maximize its impact. They considered that messages should offer personalized information, especially regarding physical exercise based on age and the level of explanation. However, professionals also found it useful to include messages with generic information. There was a proposal to include recommendations about other diseases potential users may have (e.g., obesity), although it was acknowledged that the personalization process could be increasingly challenging.

In relation to the format of the intervention, healthcare professionals highlighted the importance of including graphical elements, not just text, to attract users' attention. The use of WhatsApp was suggested for this purpose, along with occasional calls, audio messages, or face-to-face meetings to maintain innovation in the format. Additionally, professionals believed it was crucial to continually revise the messages to fit the users' needs. One healthcare professional specifically emphasized the value of graphic materials for quick and visual engagement:

> "*I think that graphic material, infographics, things like that, are faster, more visual, and don't take much time*".
>
> (Male doctor, 47 years old)

Regarding its positive impact, healthcare professionals believed that the messaging intervention could prevent the onset of multiple diseases, not only diabetes but also other related conditions. This could reduce healthcare spending and promote ongoing patient education.

"*I think it's great because it surely works, and it is welcomed by patients. It could lead to a reduction in diabetes cases, which is ultimately what it's all about (. . .)*".

(Male nurse, 26 years old)

Concerning the content of the messages, professionals suggested they should focus on diet (clarification of concepts regarding the type of diet, quantities, or recommended foods), and body weight management. Additionally, it was deemed essential to include guidelines and recommendations about physical activity. Information about the consequences of developing diabetes should also be included.

Other desirable features were suggested: messages should be short, simple, and clear. Regarding the frequency of message delivery, the majority believed that messages should have been sent once a week to avoid overwhelming users but also to regularly reinforce certain concepts. Some also suggested that the frequency should be agreed with the users.

"*I think that always must be agreed with the patient: 'Do you want us to remind you at the end of the day to see if you've exercised or not?' For example, I'm thinking. Among other things, maybe it wouldn't be necessary every day, but I believe in negotiating this aspect with the patient*".

(Female nurse, 51 years old)

The main barrier to implementing the system was believed to be end-users not having a mobile phone or facing difficulties in handling it. Therefore, it was recommended to pre-select users by identifying their knowledge of phone usage. One of the interviewees pointed out that one of the potential difficulties could be the issue of data protection and confidentiality about the diseases they have.

3.2. Views and Suggestions from People at Risk of T2DM About PREDIABETEXT

We conducted 15 semi-structured interviews with primary care users at risk of T2DM, consisting of seven males and eight females, with a mean age of 58.6 years (range 47–74). We classified the different themes into two main categories: "*lifestyle behaviors of patients with prediabetes*", and "*opinions and improvement suggestions regarding the text messaging system*".

3.2.1. Lifestyle Behaviors of Patients with Prediabetes

Most participants were unaware about being at risk of developing T2DM, and they felt surprised about being questioned in relation to it. Following a healthy diet was perceived as particularly challenging in specific contexts, such as at social or family gatherings; as well as during weekends.

"*The diet, yeah, some weeks are tougher than others, especially on the weekends. It's like I let loose a bit psychologically on the weekends, you know? I'm like, "On the weekend, I can have a bit of, you know, pizza, and stuff like that*".

(Female, 51 years old)

A key challenge for participants was to reduce the consumption of sugary foods. They indicated they would appreciate receiving recommendations about healthy alternatives to replace the desire to consume sugary foods.

Although some of the participants felt that they were physically active, others expressed that they did not regularly engage in physical activity. Some participants perceived that, even when they did exercise, it was more out of necessity than enjoyment. Reasons for not engaging in physical activity were fatigue, lack of time, and boredom. Some mentioned that before the COVID-19 pandemic they used to exercise, but after the quarantine period, they have not returned to the same routine.

"*Since we've been dealing with this pandemic and all, because I've always been big on exercising: gymnastics, running, cycling, weights, you name it, always. And now, for a year and a half or two, I've completely stopped. I'm not doing anything*".

(Male, 47 years old)

Some participants pointed out that, apart from being at risk of developing diabetes, they also suffered from other health conditions. The need to take care of these additional health problems was an important motivation for them to improve lifestyle behavior.

3.2.2. Participants' Opinions and Suggestions for the Design of the Text Messaging System

The patients perceived the proposed text messaging system as potentially helpful due to three main reasons: (i) the system could serve them as a reminder of the guidelines and recommendations they received during their medical consultations, (ii) it could serve as a motivator to adhere to these guidelines, and (iii) the system would offer readily available and trustworthy information.

Some negative views were also voiced, mostly by those participants who did not feel at risk of developing the disease and by those who perceived text messages as an outdated technology. Two main barriers or difficulties to using the system were identified: people not using (or with a low level of use of) mobile phones; and the risk of messages being ignored or dismissed if they are too frequent or with repetitive information.

In relation to the content of the messages, participants expressed a desire for information on the most suitable eating habits, including the number of calories to consume, the frequency of meals, healthy snack options, healthy recipes, detailed diets, food combinations, or suggestions for healthy foods according to seasonal variations. They also proposed that the messages should inform about the risks associated with developing diabetes.

Concerning the format, SMS text messages were perceived as an appropriate vehicle, although some participants suggested complementing them with emails or WhatsApp messages, as this would allow for the inclusion of short videos, which were frequently demanded. Images, specific mobile applications, and face-to-face, group meetings were also suggested, albeit less frequently.

"*The videos are good because you can just watch them, listen, pay attention if they're interesting, and that's it. No need to read anymore*".

(Male, 69 years old)

The participants suggested that the messages should be short and specific. Most suggested that the messages should convey a positive tone, whereas some suggested framing potential consequences in a threatening manner for greater efficiency.

"*Like the warning on cigarette packs, showing the potential harm with harmful images. It creates a bit more awareness*".

(Female, 48 years old)

Participants expressed diverse opinions regarding the frequency of the messages. Some advocated for receiving one concise message daily, while others indicated that one message every two days or one to two messages per week would be enough. Regarding language, participants felt that users should have the option to choose between Spanish or Catalan (the two official languages in the Balearic Islands).

4. Discussion

This qualitative study explored the perspectives of healthcare professionals and primary care users at risk of type 2 diabetes on PREDIABETEXT, a digital intervention for T2DM prevention. Professionals emphasized the value of prediabetes training to standard-

ize care and endorsed SMS as a tool to reinforce guidelines. They suggested a blended learning format and tailored content. Primary care users highlighted barriers to healthy lifestyles but viewed SMS as motivating and informative. These insights will guide the user-centered design of PREDIABETEXT and similar interventions.

4.1. Comparison with Previous Literature

In our study, healthcare professionals highlighted the need for the online training to be short, focused on specific aspects of diabetes prevention, and delivered during working hours, as they identified the lack of time as a key potential barrier for its use. This is supported by a recent systematic review examining health workers' perceptions and experiences of using mHealth technologies to deliver primary healthcare services [18], which showed that professionals valued mHealth interventions as long as they were not time-consuming.

A previous qualitative systematic review examining healthcare professionals' perspectives on technology-assisted diabetes self-management education [19] concluded that healthcare professionals show high levels of acceptance toward technologies for diabetes self-management education. As in our study, previous research has also identified healthcare professionals-elicited barriers to mHealth interventions, namely older age, lower educational attainment, and lower levels of digital literacy [19]. Personalization of the intervention and the use of a patient-centered approach has also been advocated by health care professionals to facilitate optimal engagement [20].

Our findings align closely with those of a recent meta-synthesis of qualitative studies analyzing self-management experiences and perceptions of individuals with prediabetes [21]. The meta-synthesis highlighted that managing prediabetes poses significant challenges to patients' daily lives. To address these challenges, individuals require access to multiple sources of informational support and personalized guidance. It is essential to ensure that the information provided is diverse in content and tailored to the needs of different groups. Additionally, delivering information in various formats—beyond just pictures and videos—can enhance its accessibility and effectiveness [21].

4.2. Strengths and Limitations

To our knowledge, this is the first study that was carried out in Spain that assesses the primary healthcare users' and providers' perspectives and preferences about a multifaceted, digital intervention to prevent T2DM. An important strength of this study is its methodological rigor. The study meets the main trustworthiness criteria: credibility, dependability, transferability, and confirmability [22]. The analysis categories comply with the criteria of comprehensiveness, relevancy, and objectivity. However, certain limitations must be acknowledged. First, there is a potential for selection bias, as those who agreed to participate may have been more motivated or activated to adopt diabetes prevention strategies than those who chose not to participate. This could result in a skewed representation of perspectives, leaning toward a more favorable view of the intervention. This selection bias likely extends to healthcare professionals as well, as those who were more engaged or interested in the topic may have been more inclined to participate, potentially leading to a bias in their views as well. Second, the study was conducted during the COVID-19 pandemic, a period marked by significant disruption to healthcare systems, including the reorganization of services and an increased reliance on telemedicine. These changes could have influenced participants' views and engagement with diabetes prevention strategies, as well as their perceptions of digital health interventions. For instance, telemedicine may have increased participants' openness to digital solutions like PREDIABETEXT, or conversely, heightened their feelings of isolation and stress, affecting their responses.

While replicating this study in the post-pandemic period was not feasible within the study's timeline, it represents a valuable opportunity for future research. A comparative study conducted in a post-COVID context could yield insights into how perceptions and engagement with digital health interventions evolve as healthcare systems stabilize.

4.3. Implications for Practice and Research

The results obtained in this study will be used to guide specific aspects of the design and development of the PREDIABETEXT intervention (and potentially other similar mHealth interventions). This qualitative approach was crucial in identifying the specific needs and preferences of primary care users and providers within the unique context of the Balearic Islands Health Service, insights that cannot be derived solely from the existing literature. By directly engaging stakeholders, we ensured the intervention addresses practical challenges and integrates user-centered solutions to enhance acceptability and feasibility.

To minimize the burden on primary healthcare professionals, we will ensure that the interventions do not impose an increased workload. For the text messages to be perceived as trustworthy by end-users, we will ensure they are evidence-based and aligned with current clinical guidelines. Additionally, we will continue to involve nominated patients and healthcare providers in the co-creation of the intervention's components, including the development and refinement of the text message content.

This study highlights the importance of conducting qualitative research to adapt digital health interventions to specific healthcare settings and populations. Future research could expand this approach by testing the intervention's efficacy and acceptability in diverse settings and exploring its long-term sustainability.

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Institutional Review Board Statement: The study protocol was in accordance with the guidelines of the Declaration of Helsinki and was approved by the Ethics Committee of Clinical Research of the Balearic Islands (CEI-IB) in June 2021 with reference number of CEI-IB Ref No: IB4495/21PI.

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: Anonymized transcripts are available through the corresponding author upon request by email.

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Conflicts of Interest: The authors declare no conflicts of interest.

Appendix A. Topic Guide for the Healthcare Professional's Semi-Structured Interviews

INTRODUCTION
Summary of the Interview Plan (objectives, duration, rules)
Brief Project Overview

PROFESSIONAL EDUCATIONAL INTERVENTION

- What do you think about the idea of receiving a course on prediabetes? (Relevant, necessary, useful, etc.)
- What format of training would you prefer? (In-person -preferred schedule-, blended, online)
- How would you like to receive the content? (Videos, case studies, scientific articles, text documents, etc.)
- What topics do you consider important to include? (Epidemiology, diagnostic criteria, preventive measures -diet and physical activity-, pharmacology in prediabetes, behavior modification, others)
- What difficulties do you think might arise for the acceptance of this training?
- What elements could facilitate the acceptance of training on this topic?

ACCEPTABILITY AND PERCEIVED UTILITY OF AN INTERVENTION TO PROMOTE HEALTH LIFESTYLE BEHAVIOUR FOR PREDIABETES WITHIN THE PORTFOLIO OF SERVICES OF THE HEALTH SYSTEM OF THE BALEARIC ISLANDS

- Overall, what do you think about the idea of sending text messages to your patients to help them manage their lifestyles to prevent diabetes?
- What impact/response do you think these messages could have on your patients? What usefulness do you see in this type of intervention?
- What content do you think would be necessary to include in these messages? (Diet, exercise, others)
- PERSONALIZATION: Based on the information in medical records, how could we personalize (age, gender, socioeconomic status, physical activity questionnaire, predimed, postal code or Medea. . .), based on which variables could personalization be done?

BARRIERS AND FACILITATORS FOR THE IMPLEMENTATION AND INCORPORATION OF THE INTERVENTION WITHIN THE PORTFOLIO OF SERVICES OF THE HEALTH SYSTEM OF THE BALEARIC ISLANDS

- What possible impact could implement this service on a large scale have, as part of the IBSALUT service portfolio?
- What barriers or difficulties do you think could arise for the implementation of this service?
- Any other comments or suggestions that you think we should take into account when designing this messaging service?

Appendix B. Topic Guide for the Patient Interviews

INTRODUCTION
· Summary of the interview plan (objectives, duration, norms)
· Brief project presentation
BARRIERS AND FACILITATORS FOR PREVENTION OF TYPE 2 DIABETES

- What should you do to avoid having high blood sugar? (diet and physical activity should come out)
- Among these factors, which one do you find most difficult to follow?
- What things help you? What works best for you?
- Regarding recommendations about diet, what difficulties do you face in maintaining an appropriate diet to help control your condition? What helps you overcome or deal with these difficulties?
- Regarding physical exercise, what difficulties do you encounter in maintaining a level of physical activity that helps control your blood sugar? What helps you overcome or deal with these difficulties?

PERCEIVED ACCEPTABILITY AND UTILITY OF PERSONALIZED SMS MESSAGING SYSTEM TO AID IN BETTER SELF-MANAGEMENT OF YOUR CONDITION
[The interviewer briefly describes the proposed text messaging system.]

- In general, how do you feel about the idea of receiving text messages on your mobile phone with information that could help you manage your prediabetes?
- To what extent do you think it could be useful in your daily life as a tool to address some of the problems you mentioned earlier?
- Do you have access to a mobile phone? Do you foresee any issues in accessing the text messages we might send to your phone?

CONSIDERATIONS TO MAXIMIZE THE UTILITY AND ACCEPTABILITY OF THE PROPOSED SYSTEM
[The interviewer may present several examples of messages.] This messaging service is currently in the design phase. We would like to know any suggestions you might have to make it as useful as possible.

- In general, what aspects do you think we should consider when launching this service, so that it is most positively received by patients?
- Would you prefer to receive information in a format other than text messages (audio, images, or others)?
- What content do you think these messages should include?
- What are your preferences regarding:
- Language of the messages
- Frequency of the messages
- Level of personalization (e.g., patient's name)
- Ability for patients to personalize the type of message they receive (content, frequency, language, time of day received)
- Any other ideas or suggestions?

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