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# Care provider views on app-based treatment for female urinary incontinence: A mixed-methods study

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ABSTRACT

**Objective:** To explore the views and preferences of care providers on app use for the treatment of UI and to identify the anticipated barriers to, and facilitators of, implementation.

**Patients and Methods:** We performed an exploratory, two-phase, sequential mixed-methods study. In phase 1, the views of care providers were explored through five focus group sessions with care providers involved in UI: general practitioners (GPs), practice assistants (PAs), pelvic physical therapists (PPTs), and urologists and (uro)gynecologists (UGs). In phase 2, the identified themes and subthemes were quantified in an online survey distributed among different care providers matching these groups.

**Results:** In the focus group sessions, 30 female and two male care providers participated. Survey participants included 351 PAs and 76 PPTs (all females) next to 124 GPs and 183 UGs (70% females).

Caregivers generally considered UI treatment apps as having a supportive role, being less convinced about their advantages in the absence of a care provider. Whereas most PPTs (89%) and the majority of participants overall (56%) agreed that app use should be supervised, most GPs considered apps to be suitable alternatives for women who do not visit a care provider.

Additionally, caregivers required that the effectiveness of an app should be proven first, and that privacy and safety should be ensured. Contrasting with other research, lack of time and financial compensation were not considered important barriers to implementation. Although care providers shared a positive view of app use for UI treatment, most never to seldom referred their patients to existing tools.

**Conclusion:** Our results add to the existing knowledge about eHealth-related barriers and facilitators. These findings can be used to optimize implementation strategies for other apps and to enhance the uptake of app-based treatment for UI in The Netherlands.

## 1. Introduction

Mobile eHealth (mHealth) apps hold the promise of improving healthcare delivery and outcomes. App-based treatment for urinary incontinence (UI), for example, is an effective and cost-effective alternative to care as usual [1–4], but its implementation requires adaptations by professionals and patients alike. Knowing the views and preferences of key stakeholders, such as health care providers, can help to ensure success through early identification and adaptation to factors that may affect uptake [5,6]. However, not only has only one study evaluated the views and preferences of care providers toward eHealth use for UI care but this also suffered from important limitations.

Previous research has evaluated the opinions of health care providers toward eHealth apps for specific diseases or patient groups, including those with hypertension [7,8], chronic pain [9], and chronic illness [10]. Systematic reviews have generated extensive lists of barriers and facilitators thought to influence the adoption and implementation of eHealth services in clinical practice [11–13]. Barriers to implementation among care providers include limited knowledge of eHealth, lack of training, lack of time, lack of financial compensation, concerns around privacy and data security, and a lack of guidelines, protocols, or policies. Facilitators of eHealth service adoption include the perceived usability and benefit of an app for care providers and

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their patients, together with stakeholder involvement throughout the development and implementation process.

Current data on the views and preferences of health care providers regarding the barriers and facilitators associated with eHealth implementation have been reported across various subspecialties. However, this means that results do not always apply specifically to UI. To the best of our knowledge, only a qualitative study of 13 general practitioners (GPs) has aimed to clarify the attitudes of health care providers toward an internet-based intervention (pelvic floor muscle therapy for stress UI) [14]. Despite those GPs seeing clear advantages for patients, they were concerned about the lack of personal feedback when using eHealth as a standalone treatment. We are aware of no studies that have focused specifically on the attitudes of care providers regarding app-based UI treatment.

We aimed to explore the views and preferences of care providers on app use for the treatment of stress UI, urgency UI and mixed UI. Knowing these views and preferences would enable us to identify barriers to, and facilitators of, implementation of future apps for UI.

## 2. Patients and methods

### 2.1. Study design

We performed an exploratory sequential mixed-methods study in a two-phase design. Data from both phases were merged to provide in-depth answers to the overall research question [15–17] : "what are the views and preferences of care providers involved in UI-care on the use of a mobile application for the treatment of UI?".

### 2.2. Qualitative phase

In September and October 2017, we conducted five focus group sessions with care providers involved in UI care to explore their views on app use to treat UI: one session with (resident) GPs, one with general practice assistants (PAs), one with (resident) urologists and gynecologists (UGs), and two with pelvic physiotherapists (PPTs). Invitations were sent through email and social media.

The focus groups adopted the classic, most common approach, involving an interactive discussion of a topic by group participants and facilitators at one location [18,19]. In each group, an experienced independent moderator led the sessions using a semi-structured interview guide (Appendix 1), developed after reviewing current literature, including the results of our previous qualitative study among users of the URinControl app [20]. This app supports the self-management of stress UI, urgency and mixed UI.). The main themes comprised "experiences with current UI care", "experiences with eHealth", and "views on the use of eHealth and apps in UI treatment". This report focused on the views of care providers regarding app-based treatment for UI. The other outcomes will be reported separately.

Two researchers (NW, LH) were present during the sessions to make notes (e.g., noting details of non-verbal communication to supplement the recording). All participants received financial compensation of €50 for their time. Sessions were audio recorded and transcribed verbatim. Transcriptions were coded separately by two researchers (NW, LH), using NVivo (Scientific Software Development program, version 11), in two stages. First, NW and LH used a preliminary coding scheme based on the interview guide topics, adding any emerging codes to the scheme as they arose. Coding was checked for consensus after analyzing each transcript. Second, two researchers (NW, ER) performed focused coding in which they eliminated, combined, and subdivided the coding categories identified in the first stage [19,21]. Through constant comparison with the raw data, wider themes emerged connecting the codes [22]. Our final coding formed the foundation of the first pool of items included in the quantitative questionnaire.

### 2.3. Quantitative phase

Survey development was based on the six steps described in the Qualitative Methods tool created by the Dutch Institute for research in health care (NIVEL) [23].

The electronic questionnaire was built with Qualtrics survey software (Qualtrics Inc., v7546, Provo, UT) and included detailed study information. We assessed the questionnaire's face and content validity in a pilot (N = 23). Face validity was assessed by peer review, asking five independent researchers to comment on the length, readability, and clarity of the questionnaire, before making appropriate changes. Content validity was evaluated by focus group participants, whom we asked to comment on the relevance, comprehensiveness, and balance of the scale items [24]. Comments were discussed within the research group before making final adjustments to the questionnaire.

We used convenience sampling to recruit participants. A web link to the questionnaire was sent by email for distribution from national organizations representing each participating group. Additionally, a link to the questionnaire was distributed via newsletters, websites, Twitter, and LinkedIn. We explicitly asked focus group participants from the first study phase not to complete the online questionnaire. Responses were collected from March 27 through May 15, 2018.

Ethical approval was not needed for this study, according to Dutch law.

### 2.4. Data analysis

The target population for the survey comprised all GPs (n = 9070), PAs (n = 26,000), PPTs (n = 581), and urologists and gynecologists (n = 1296) in the Netherlands in 2018 (N = 36,947). A sample size calculation for the survey, based on a cohort of 36,947, a 95% confidence level, and a 5% error margin, indicated a sample requirement of 381 [25]. Survey data were exported to IBM SPSS version 26.0 (IBM Corp., Armonk, NY, USA) for analysis. Participant demographics are described, survey results are presented as percentages, and means and standard deviations (mean ± SD) are shown for the survey responses. The two strands of data are combined in a joint display to offer a broader insight into the themes [15,26], connecting qualitative data from the focus group sessions with quantitative data from the survey. In this way, the qualitative quotes help to illustrate the views of care providers within each subtheme, while the quantitative results describe the extent to which this subtheme was relevant to care providers in the Netherlands.

## 3. Results

### 3.1. Demographics and theme identification

Five focus group sessions were held comprising either 6 GPs (5 women), 7 PAs (all women), 8 PPTs (7 women), 6 PPTs (6 women), or 6 UGs (5 women) and lasing 72–109 min. Qualitative analysis initially generated 36 codes that we merged into 10 categories grouped under 3 themes, as detailed in Fig. 1. The content validity of the questionnaire was evaluated by 18 of the focus group participants (15 did not reply).

The final questionnaire included 11 questions about eHealth for UI, with 37 sub-questions that offered 5-point Likert response options. In total, 741 care providers (mean age, 45 ± 10.7 years) completed the questionnaire (Table 1), of whom 87% were female, 99% owned a smartphone, and 66% used health apps at least monthly in a work-related matter.

### 3.2. Theme: Apps in current UI care

Table 2 shows the joint display of the qualitative and quantitative results for this theme. The table shows the relevant questions and the mean Likert scores with example quotes, while the figure shows the distribution of Likert responses. Differences in care provider subgroups are shown by category in Table S1.

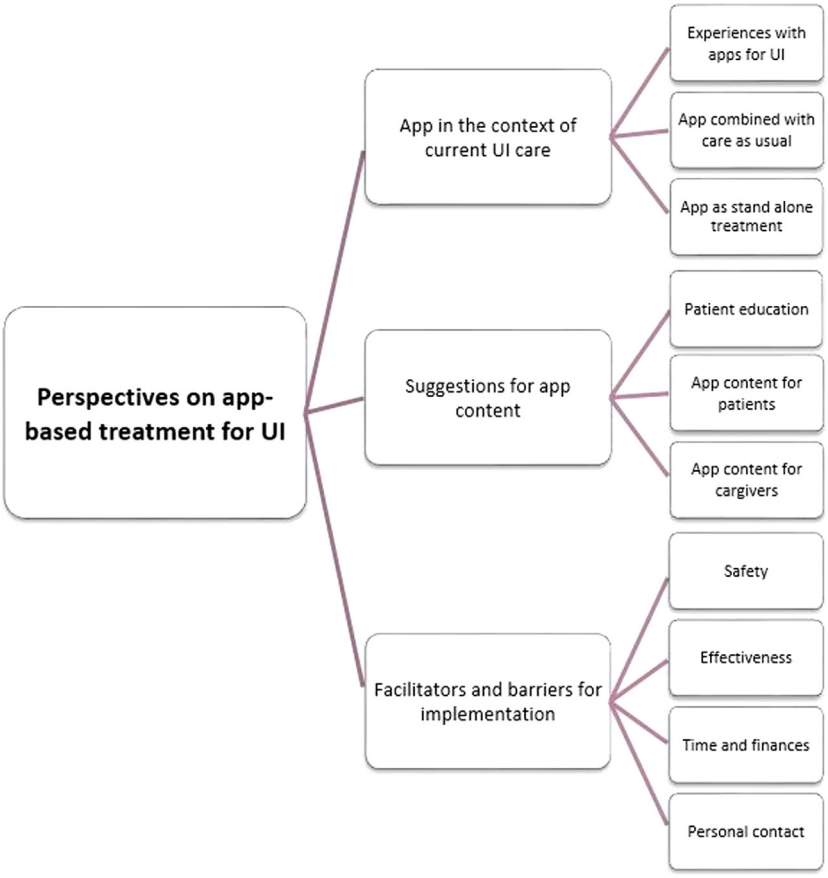



**Fig. 1.** Main themes and categories resulting from the focus group discussions, used in the survey among health care providers.

**Table 1**
Demographics of survey participants (N = 741).

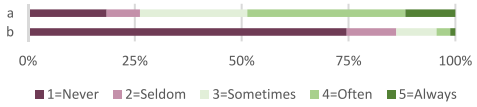
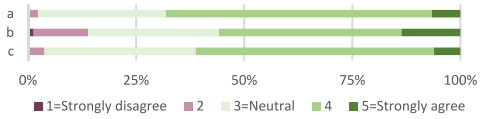
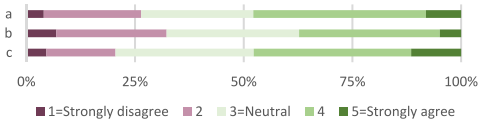
| | |
|---|---|
| Sex, n (%) | |
| Female | 644 (87) |
| Male | 97 (13) |
| Age, years, mean (SD) | 45 (10.7) |
| Profession, no. female (%) | |
| PA | *351 (48) (100)* |
| GP | *124 (17) (70)* |
| PPT | *76 (10) (100)* |
| UG | *183 (25) (69)* |
| Region of employment, n (%) | |
| North NL | 397 (54) |
| Middle NL | 205 (28) |
| South NL | 139 (19) |
| Owning a smartphone, n (%) | |
| Yes | 731 (99) |
| Use of health apps in private setting/clinical practice, n (%) | |
| PA | *215 (61)* |
| GP | *105 (80)* |
| PPT | *62 (82)* |
| UG | *131 (72)* |
| Total | 531 (69) |
| Ehealth usage ≥ 1× per month, work-related, n (%) | |
| Health apps | 465 (66) |
| Websites | 685 (92) |
| E-consultation | 260 (35) |

Abbreviations: GP, (resident) general practitioner; NL, the Netherlands; PA, practice assistant; PPT, Pelvic Physiotherapist; Q, Question; UG, (resident) urogynecologist/gynecologist.

### *3.2.1. Category: Experiences with apps for UI*

*Focus groups.* To varying extents, most participants were aware of the currently available pelvic floor apps. Some GPs and UGs had occasionally referred women to these apps, but they also felt that the apps were unsuitable for some women. Others only referred younger or pregnant women.

**Table 2**
Joint display of qualitative and quantitative results related to the theme: 'App in the context of current UI care'.

| Category | Focus group examples | Quantitative survey results, *Mean (SD)* |
|---|---|---|
| Experiences with apps for UI treatment | *"I often refer the younger patients to the pelvic physio app." (GP)* | **Q1 Do you refer to digital tools for UI?**<br>a. Online information 2.16 (1.28)<br>b. Referral to treatment apps for UI 1.45 (0.63)<br>  |
| App combined with care as usual | *"You have to check whether exercises are performed correctly. A PPT is better equipped to do that than an app." (PA)*<br><br>*"I would rather use it as part of the existing treatment, and use it to continue on your own after consulting a PPT. "(GP)* | **Q2 Please indicate the extent to which you agree with the following statements**<br>a. An app supports regular treatment. 3.72 (0.63)<br>b. An app for the treatment of UI should always be used under supervision of a care provider. 3.54 (0.92)<br>c. An app supports treatment adherence after initial care as usual. 3.63 (0.67)<br>  |
| App as stand alone treatment | *"If someone experience shame, then you can say that they can start with an app first." (PPT)*<br><br>*"You can advise them to do exercises by themselves [with the app] and if that has insufficient effect, they can still go to the physiotherapist." (UG)* | **Q3 Please indicate the extent to which you agree with the following statements**<br>a. An app is a sound alternative for women with UI who don't visit a care provider. 3.25 (1.02)<br>b. An app is a sound alternative for women who cannot afford treatment by a PPT. 3.03 (1.02)<br>c. A precondition for starting with app-only treatment. is at least one consult with a PPT. 3.34 (1.02)<br>  |

Abbreviations: GP, (resident) general practitioner; PA, practice assistant; PPT, Pelvic Physiotherapist; Q, Question; UG, (resident) urogynecologist/gynecologist.

* This question was not included in the survey for PAs due to a lack of relevance for this subgroup.

*Survey*. On average, care providers never (Likert 1) to seldom (Likert 2) referred patients to use treatment apps for UI, although PPTs differed somewhat in reporting that they sometimes referred to an app for UI (mean Likert 2.95 ± 1.13) (Table S1).

### 3.2.2. Category: App plus usual care

*Focus groups*. Most PAs, GPs, and UGs generally saw clear advantages of apps for UI treatment. They felt that apps could support short- and long-term adherence and offer efficient and easily accessible options to provide or support UI care for a large group of women. However, some PAs and GPs, and most PPTs, stated that some women would be unable to perform the exercises correctly in the absence of care provider evaluation, even fearing symptom enhancement in some cases. Therefore, some advised that apps should be used in addition to usual care rather than as an alternative.

*Survey*. Participants agreed that an app can support regular UI treatment, should always be used under care provider supervision, and can support adherence after supervised training. Subgroups differed in their opinion of care provider supervision for app-based treatment, with PPTs viewing this as more important (mean Likert 4.47 ± 0.62) than the other care providers (mean Likert 3.54 ± 0.92) (Table S1).

### 3.2.3. Category: App-only treatment

*Focus groups*. Two PAs and one UG felt that the app might help remove the taboo of UI. Some care providers stated that an app could be used as an alternative for women who do not visit their GP due to feelings of shame. One UG stated that she recommended it to women who could not afford treatment by a PPT, while a PPT suggested that consultation with them should be mandatory prior to app usage.

*Survey*. On average, respondents were neutral in their opinion of app usage as an alternative for women who do not visit a care provider (mean Likert 3.25 ± 1.02) or who cannot afford treatment by a PPT (mean Likert 3.03 ± 1.02).

## 3.3. Theme: suggestions for app content

Table 3 shows the joint display for this theme. There were no major differences between care provider subgroups.

### 3.3.1. Category: Patient education

*Focus groups*. Participants reported that patient information in an app should focus on pelvic floor anatomy, UI physiology, and when to see a care provider (i.e., red-flag symptoms).

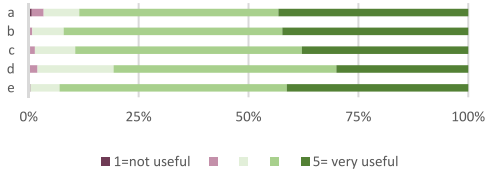
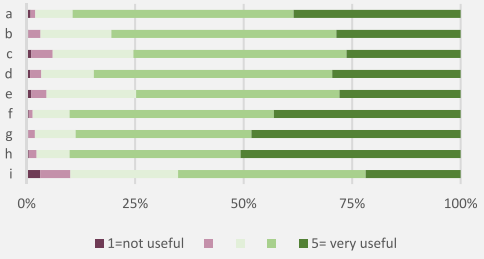
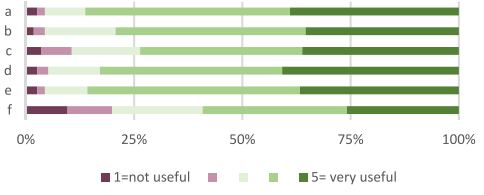
*Survey*. All respondents rated patient information as very useful (e.g., recognizing alarm symptoms, influencing lifestyle factors, treatment options, and relevant physiology).

### 3.3.2. Category: App content for patients and care providers

*Focus groups*. Aside from providing regular exercise reminders, participants thought that the app could help by providing insight in toilet behavior (e.g., micturition lists) and monitoring and displaying the change in complaints and adherence to exercise. They felt that these insights could be of value for both patients and caregivers.

*Survey*. Care providers rated all suggested app features very useful for patients and care providers (e.g., UI diagnosis, severity monitoring, and adherence monitoring).

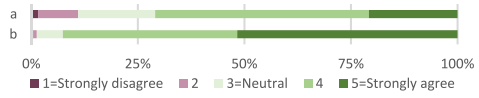
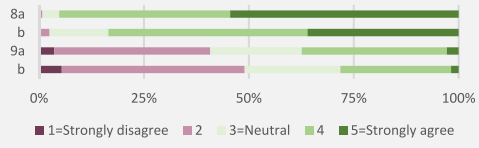
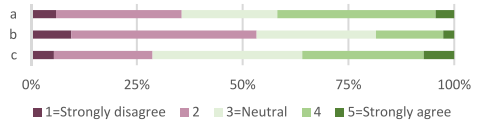
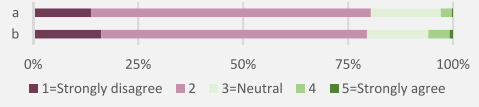
**Table 3**
Joint display of qualitative and quantitative results, related to the theme 'Suggestions for app-content'.

| Category | Focus group examples | Quantitative survey results, *Mean (SD)* | |
|---|---|---|---|
| Patient education | *"Red flags and alarm symptoms should definitely be in such an app. So that patients know: now I have to go to the doctor."(UG)*<br><br>*"It [app] should contain insight into physiology, just an explanation with many pictures." (PA)*<br><br>*"Women need to learn that urinary incontinence can also be related to other complaints such as flatulence or pain during sex." (PPT)* | **Q4 Please indicate the extent to which you rate the following topics useful for patients.** | Mean (SD) |
| | | a. Recognizing alarm symptoms | 4.28 (0.78) |
| | | b. Influencing lifestyle factors. | 4.32 (0.66) |
| | | c. Treatment options | 4.26 (0.69) |
| | | d. Physiology of bladder and pelvic floor | 4.09 (0.74) |
| | | e. Relation of UI with other complaints (e.g. painful intercourse constipation and back pain) | 4.33 (0.63) |
| | |  | |
| App content for patients | *"The patient fills in a digital questionnaire in advance and that should actually lead to the diagnosis.." (UG)*<br><br>*"Reminders to support adherence would be very nice." (PPT)*<br><br>*"You have to be able to adapt them [exercises] to the needs of the patient at that moment. "(PPT)*<br><br>*"I think it's important that you can see your own progress… That has a motivating effect." (UG)* | **Q5 Please indicate the extent to which you rate the following content options useful for patients** | Mean (SD) |
| | | a. Diagnosis type of UI. | 3.74 (0.98) |
| | | b. Pelvic floor exercise instructions | 4.38 (0.75) |
| | | c. Pelvic floor exercise reminders | 4.35 (0.74) |
| | | d. Personalization of exercises to fit needs of patient | 4.31 (0.71) |
| | | e. Monitoring treatment adherence. | 3.97 (0.85) |
| | | f. Monitoring severity of complaints. | 4.10 (0.76) |
| | | g. Monitoring fluid intake. | 3.95 (0.86) |
| | | h. Micturition list. | 4.05 (0.77) |
| | | i. Level of satisfaction of patient | 4.25 (0.70) |
| | |  | |
| App content for caregivers | *"To be able to keep micturition lists on your app and then forward them to your healthcare provider in an attachment." (PPT)*<br><br>*"I'd be interested in patient satisfaction…it's really about whether the app can help the patient to better control the disease." (GP)* | **Q6 Please indicate the extent to which you rate the following content options useful for caregivers *** | |
| | | a. Diagnosis type of UI. | 3.56 (1.24) |
| | | b. Monitoring severity of complaints | 4.16 (0.87) |
| | | c. Micturition lists. | 4.16 (0.92) |
| | | d. Monitoring fluid intake. | 3.96 (1.06) |
| | | e. Monitoring treatment adherence | 4.09 (0.88) |
| | | f. Level of satisfaction of patient. | 4.18 (0.87) |
| | |  | |

Abbreviations: GP, (resident) general practitioner; PA, practice assistant; PPT, Pelvic Physiotherapist; Q, Question; UG, (resident) urogynecologist/gynecologist.

* This question was not included in the survey for PAs due to a lack of relevance for this subgroup.

**Table 4**
Joint display of qualitative and quantitative results related to the theme 'Facilitators and barriers for implementation'.

| Category | Focus group examples | Quantitative survey results, *Mean (SD)* |
|---|---|---|
| Safety | *"I think it is important that it is safe and privacy is guaranteed." (PA)*<br><br>*"I perform a mini-research [to test an app] where I ask 5 friends of my daughter to use that app."(UG)* | **Q7 Before I advise an app for the treatment of UI*** |
| | | a. I want to try it out for myself. 3,79 (0,93) |
| | | b. The app should fulfil legal obligations regarding safety and privacy 4,42 (0,69) |
| | |  |
| Effectiveness | *"I make the choice whether or not to recommend an app on the basis of information from the source that I consider reliable." (GP)*<br><br>*"I don't really know how to make it effective and how to fit it in." (UG)*<br><br>*"You are left with that group that does not have the intellectual capacity[…] For this group we may have to think of something else." (UG)* | **Q8 Before I advise an app for the treatment of UI*** |
| | | a. The app should be developed by a reliable party 4,49 (0,63) |
| | | b. The effectiveness of the app should be demonstrated 4,16 (0,78) |
| | | *Q9 The following factors would be a barrier to using an app in treatment of UI in women* ***** |
| | | a. Doubts about the benefits for patients. 2,96 (0,99) |
| | | b. Doubts about the benefits for me as care provider 2,76 (0,96) |
| | |  |
| Time and financial compensation | *"It would be nice if the assistants could play a role in this. We just don't have the time or space for it. There has to be money for it." (GP)*<br><br>*"It is quite difficult to have everything finished within half an hour. If you also have to explain an app. That takes too much time." (PPT)* | **Q10 The following factors would be a barrier to using an app in treatment of UI in women*** |
| | | a. Lack of time to get familiar with the app 3,05 (1,04) |
| | | b. Lack of financial compensation for this time investment 2,58 (0,95) |
| | | c. Lack of clear legal guidelines regarding eHealth applications. 3,09 (1,01) |
| | |  |
| Personal contact | *Every now and then a patient also wants to see their care provider and talk - 'How are you?' That you can look the practitioner straight in the eye. In addition, patients want feedback. (PPT)* | **Q11 The following factors would be a barrier to using an app in treatment of UI in women*** |
| | | a. Fear of decreasing patient contact. 2,11 (0,76) |
| | | b. Fear of increased patient contact 2,09 (0,65) |
| | |  |

Abbreviations: GP, (resident) general practitioner; PA, practice assistant; PPT, Pelvic Physiotherapist; Q, Question; UG, (resident) urogynecologist/gynecologist.

* This question was not included in the survey for PAs due to a lack of relevance for this subgroup.

### 3.4. Theme: implementation (-related) facilitators and barriers

Table 4 shows the joint display for this theme. There were no major differences between care provider subgroups.

#### 3.4.1. Category: safety

*Focus groups.* Due to the rapid growth in the number of health apps, care providers stated that they found it difficult to know which to select for patients. Most also stated that the privacy of users should be well protected.

*Survey.* Participants agreed that an app should meet legal obligations regarding safety and privacy before patients are referred.

#### 3.4.2. Category: Effectiveness

*Focus groups.* Some care providers stated that their decision to use or refer to an app for UI was based on recommendation from a reliable source (e.g., a national organization). Others expressed uncertainty about effectiveness and that they required this to be proven before they would refer women.

*Survey.* Participants agreed that an app for UI should be developed by a reliable organization and that effectiveness should be proven before they would consider its use.

#### 3.4.3. Category: Time and finances

*Focus groups.* A lack of time to become familiar with an app or to incorporate it into a regular consult was mentioned frequently. Some

care providers felt they should be financially compensated for this investment before considering implementation.

*Survey.* Respondents were neutral regarding lack of time and financial compensation being barriers to implementation.

#### 3.4.4. Category: Personal contact

*Focus groups.* Several participants, mainly PPTs, mentioned that they feared a decrease in patient contact and that this could negatively affect outcomes. By contrast, other providers feared an increase in patient contact because they may need to provide extra guidance.

*Survey.* Respondents disagreed that fear of decreased or increased patient contact would be a barrier to app use.

## 4. Discussion

Among Dutch care providers, apps were considered to have a supportive role in UI treatment and there was uncertainty about their advantages in the absence of a care provider. It was agreed that an app should fulfill legal obligations regarding safety and privacy before it could be recommended to patients, while proven effectiveness would facilitate implementation. Of note, neither lack of time nor financial compensation were considered important barriers.

The successful adoption of an app for UI treatment is influenced by factors at the technology, organizational, and adopter level. The resulting complexity is widely recognized in eHealth implementation strategies, such as the NASSS framework [27].

In this study, although care providers shared a positive view of app use for UI treatment, most never to seldom referred their patients to existing tools. They also agreed that an app's effectiveness should be demonstrated first. During data collection, our evaluation of the URinControl app for stress UI and urgency UI in women had not been published, and only one study had recently shown the effectiveness of app treatment for stress UI [2,3]. In the meantime, the effectiveness and cost-effectiveness of the URinControl app has been published [3,4,28].

The limited number of referrals to existing tools could be explained by a lack of knowledge of such tools or the limited amount of evidence on the effectiveness of eHealth for UI at this time. Limited exposure to, or knowledge of, eHealth was described as the most frequent barrier to the adoption of eHealth in a systematic review [11]. Jacob et al. found that the strength or quality of clinical evidence influenced mHealth adoption, but that the perceived lack of firm evidence of clinical benefit was considered a barrier in only 10 of 171 included studies [13]. This could indicate that, despite proven effectiveness having a facilitating effect, a lack of evidence is not always a strong barrier to eHealth adoption. Instead, the specific context in which an eHealth app is implemented is more important.

Attitudes in this study were divided over whether an app for UI could be used as a standalone treatment. Whereas most PPTs (89%) and the majority of participants overall (56%) agreed that app use should be supervised, most GPs considered apps to be suitable alternatives for women who do not visit a care provider. This mixed opinion could be explained by a lack of proven effectiveness of apps in the absence of a care provider at the time of data collection. However, our results are consistent with those from a qualitative study among 13 Dutch GPs in 2019, when the effectiveness of eHealth for UI had been proven [14]. In that study, Firet et al. reported that GPs had mixed feelings regarding the use of eHealth for UI: although they considered approachability and flexibility to be major advantages for patients, they felt that the lack of personal feedback and the risk of losing motivation without professional support were major disadvantages. This could result from an unawareness of proven effectiveness among care providers given that knowledge dissemination can be sluggish. Moreover, the non-use of a technology is rarely due to a lack of knowledge or skills in isolation. We must acknowledge the importance of both emotional responses [29], and the fact that care providers may also hold persistent beliefs that technology will deliver a lower standard of care [30].

Caregivers in our study rated the inclusion of information on alarm symptoms, lifestyle factors, and treatment options as being of great importance. Other suggested content included diagnosis of UI type, PPT instructions, exercise reminders, personalization, severity monitoring, micturition diary, and patient satisfaction. The inclusion of preferred content in an eHealth app contributes to its perceived usefulness and is commonly described as an important facilitator of adoption by care providers [12,27]. Based on a qualitative synthesis, Jacob et al. described that "usefulness" was one of the main technological factors determining mHealth adoption. However, social and organizational factors (e.g., workload, time/cost efficiency, and safety) were much more prevalent in their study, possibly highlighting the importance of prioritizing these over perceived usefulness when addressing barriers to mHealth adoption [13]. Most participants in our study had no prior experience with app treatment for UI, meaning that we measured their expected preferences for app content, not their experiences.

Our survey respondents strongly agreed that an app for UI should meet legal obligations for safety and privacy and be developed by a reliable party. This is consistent with results from other studies among care providers, which describe that privacy and security concerns are among the main barriers to eHealth and mHealth adoption [11–13,31]. Mobile technology and medical apps must satisfy the legal requirements set forth by the European Commission, specifically the Medical Device Directives. A CE certification guarantees that a medical device has met these requirements, implying safety for free circulation and use in medical practice in Europe.

Study participants were neutral regarding lack of time being a barrier to app uptake for UI. Similarly, Gagnon et al. identified "time issues" as the most common factor (10 of 38 studies), but more often as a facilitator than as barrier (7 versus 3 studies) [12]. This suggests that, although lack of time is not perceived as an important barrier, implementation may be helped if care providers are given extra time to become familiar with the app. Several other studies have cited added workload and lack of time as the main barriers to eHealth adoption [11,31,32]. By contrast, care providers in this study disagreed that a lack of financial compensation would be a barrier to adopting an app for UI. Gagnon et al. also found that physician salary status and reimbursement rarely served as a barrier (one study) [12]. However, Peeters et al. found that 48.5% of a sample of Dutch GPs considered a lack of remuneration for the time spent implementing eHealth would inhibit eHealth uptake in general practice [31]. These differences between studies could reflect the differences between the research populations (e.g., workload and financial circumstances), the eHealth apps considered, and the expected time investments. The importance of awareness of these contextual and technology factors among stakeholders has been widely recognized and should be considered during both the design and the implementation phases [6,27].

This study benefited from preceding a hypothesis testing quantitative phase with a hypothesis generating qualitative phase among key stakeholders for UI care. The use of multiple focus group sessions and the inclusion of a large sample across a variety of care provider groups also enabled evaluation of the views of stakeholders throughout the UI care chain. However, the use of convenience sampling and collective recruitment through national associations and (social) media mean that response rates cannot be calculated. Therefore, although our sample was larger than the calculated target requirement, generalizability to the whole population might be compromised. It was also notable that relatively few men participated in either the focus groups or the survey. In part, this is explained by the demographics of care giver subgroups with (nearly) all PAs and PPTs in the Netherlands being female, and a growing number of GPs and UGs are female. Still, care giver sex seemed to have influenced the willingness to participate. We did not ask the participants for their continence status, that could also have influenced the participation rate. It is unclear to what extend overrepresentation of females in our study has influenced the outcomes. It is unclear to what extend this has influenced the outcomes of our study. Male

care providers could have a different view on the role of eHealth for UI, which might be underrepresented in our study. In Germany and Denmark, female GPs reported discussing UI in consultations more frequently than male GPs, suggesting that GP gender might be a barrier to UI treatment for women [33]. Moreover, most participants had no prior experience of app treatment for UI, and at the time of data collection, results of the URinControl trial had not been published. As such, opinions were expressed more in general. This is in contrast with the evaluation of the barriers and facilitators expressed by actual users of the URinControl app. In that patient evaluation we were able to connect factors to the actual treatment effect [20]. Finally, this study has been conducted prior to the COVID-19 pandemic. Due to the rapid developments in the field of eHealth, amplified by the pandemic, care provider opinions today could differ from those represented by our results.

The results of the present study can be used to optimize not only implementation strategies for other eHealth apps but also the uptake of UI treatment apps in the Netherlands. Implementation strategies must strive to enhance awareness of this mobile treatment option among care providers and women with UI. Our recently developed URinControl app for UI is an ideal candidate [28,34,35]. Emphasis can be placed on its proven effectiveness as a standalone treatment and on its strong security and respect for privacy. By allowing regular evaluation of automatically logged user data and patient feedback, it also allows for continuous evaluation and optimization of the uptake and effectiveness of the app in real life settings.

## CRediT authorship contribution statement

**Nienke J. Wessels:** Protocol development, Data collection, Data analysis, Manuscript editing. **Eline J. Ruiter:** Data collection, Data analysis (quantitative part), Manuscript editing. **Lisa Hulshof:** Data collection, Data analysis (qualitative part), Manuscript editing. **Anne M.M. Loohuis:** Additional grant proposal (Professor Huygen Award 2016), Protocol development, Interpretation of outcomes, Manuscript editing. **Julia E.W.C. van Gemert-Pijnen:** Mixed-methods design, Supervision of data analyses (qualitative and quantitative part), Interpretation of outcomes, Manuscript writing and editing. **Esther I. Metting:** Protocol development, Data collection (conducting focus group meetings), Interpretation of outcomes, Manuscript editing. **Henk van der Worp:** Protocol development, Supervision of project, Interpretation of outcomes, Manuscript editing. **Marco H. Blanker:** Grant proposal (ZonMw, PW Boer Foundation), Project development, Data collection (conducting of one focus group meetings), Supervision of data analyses (qualitative and quantitative part), Interpretation of outcomes, Manuscript writing and editing.

## Declaration of competing interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: Marco H. Blanker has patent issued to intellectual property of the URinControl app (no commercial interests).

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## Appendix A. Supplementary data

Supplementary material related to this article can be found online at https://doi.org/10.1016/j.cont.2023.100584.

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