Readiness for Technology

A READINESS ASSESSMENT FOR THE IMPLEMENTATION OF A MHEALTH APPLICATION WITHIN THE ZGT OBESITY CENTRE.

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NOVEMBER 15, 2018 | UNIVERSITY OF TWENTE

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ABSTRACT

Background Bariatric surgery is often recommended for morbid obese patients in order to manage weight loss. Despite a large short-term weight loss after surgery, many patients tend to regain weight on the long term. It is suggested that lifestyle interventions post-bariatric surgery could improve adherence to post surgery dietary and physical activity guidelines and may therefore improve weight loss and weight loss maintenance on the long term. Mobile technology might be an option for providing or supporting the post-surgery lifestyle intervention. The Obesity Centre of the ZGT is currently looking at the possibilities of implementing a smartphone app into the post-bariatric programme. However, they recognize that it is not just the technology to consider but a strong emphasis on the implementation process is considered necessary. Different domains influence the implementation process. Many barriers for implementation are identified within the individual domain. Research of the individual domain prior to implementation is therefore important. A relevant aspect is readiness, since assessing readiness could prevent loss of time, resources and energy. Therefore, in this study the readiness of healthcare professionals as well as their perception regarding the organisational readiness of the Obesity Centre for the potential implementation of a mHealth intervention was assessed.

Method This study used a mixed method design consisting of a survey and semi-structured interviews. Healthcare professionals involved in the care of patients from the Obesity Centre were asked to participate in the survey and the interviews. The Technology Readiness Index 2.0 (TRI) was used to assess the healthcare providers' technological readiness. The semi-structured interviews were based on six readiness types and were used also to further explore the individual readiness but also the perception of organisational readiness for the implementation of a mHealth application.

Results The overall TRI score of the Obesity Centre was 3,3 on a scale that runs from 1 till 5. The highest score was 4,3 and the lowest score was 2,2. Most of the respondents were classified as skeptics (63%). Of the 27 respondents, six respondents were classified as explorers, 1 as an avoider and 3 as hesitators. There was no clear tension for change among professionals, indicating low core readiness. However, healthcare providers were positive about the addition of mHealth to the post bariatric programme, which shows a high healthcare provider readiness. Organisational readiness was low. There was stated to be no technology policy concerning mHealth within the Obesity Centre and the ZGT in general. Also, there was no feeling of management support due to financial cutbacks. Additionally, some professionals did have a feeling that technology use was stimulated when they encouraged patients to use phone applications, but other professionals did not feel that technology use was stimulated due to organisational issues, such as lack of finances. There was no debate concerning mHealth among professionals indicating low engagement readiness. It was stated that there were no available resources to develop or maintain an application within the ZGT, resulting in a low technological/infrastructural readiness.

Conclusion The healthcare professionals can be perceived as technology ready based on their TRI score. However, the majority of the professionals was identified as skeptic. It is therefore of importance to include the professionals in the development process of the mHealth application. Core readiness is low, indicating that professionals do not feel that change is necessary. Despite the fact that professionals perceive the Obesity Centre as ready for the implementation of mHealth, the low organisational and engagement readiness indicate that this is not the case.

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INTRODUCTION

The rising rate of overweight and obesity are an increasing problem in Western and developing countries. In 2016 almost 50 percent of adults, of 20 years and older, in the Netherlands were overweight (BMI ≥ 25 kg/m^2). Of these adults 14,5 percent was classified as obese (BMI ≥30 kg/m^2) (1). Obesity is associated with numerous comorbidities, such as diabetes type II, cardiovascular diseases, osteoarthritis, chronic back pain, and several types of cancer (2). Obesity can be treated in diverse ways. Modest weight loss can be achieved by dietary methods, increasing physical activity, and behavioural therapy (3). These combined methods are called lifestyle interventions. For adults with a BMI ≥ 35 kg/m^2 with comorbidities or BMI ≥ 40 kg/m^2 without existing comorbidity bariatric surgery is the most effective treatment option (4-6). Despite a large short-term weight loss after surgery, many patients tend to regain weight on the long term. The initial weight loss and regain differs between different surgery types (7). Initial improvements in comorbidities after surgery might be abolished by weight regain on the long term (8).

It is suggested that lifestyle interventions post-bariatric surgery could improve adherence to post surgery dietary and physical activity guidelines, and may therefore improve weight loss and weight loss maintenance on the long term (9). Mobile technology might be an option for providing or supporting the post-surgery lifestyle intervention. For instance, web-based programs can be used at a convenient time for the patient (10), it gives the patients support around clinical appointments, and healthcare professionals can access patient data before a clinical appointment (11). Use of mobile apps as support tool for bariatric surgery patients was encouraged by allied healthcare professionals (12). For this reason, the Obesity Centre of the ZGT is currently looking into the possibilities of implementing a smartphone app into their post-bariatric programme. However, they recognize that it is not just the technology to consider but a strong emphasis on the implementation process is considered necessary. Implementation is defined as: "a planned process and systematic introduction of innovations and/or changes of proven value; the aim being that these are given a structural place in professional practice, in the functioning of organisations or in the health care structure "(13). This definition comprises all aspects of importance with implementation, from the planning in the beginning, till a sustainable implementation at the end. It has been found that effective implementation is associated with better outcomes of promotion and prevention programmes (14).

Implementation is a complex process with many stages that can be influenced by many factors. Moullin *et al*. (15) identified six domains that could influence implementation: innovation, individuals, organisation, local environment, and external system. Ample research is being performed into barriers and facilitators for implementation and adoption. In a review by Gagnon, a total of 81 barriers and 98 facilitators for mHealth adoption were identified. Barriers and facilitators were identified regarding factors related to the innovation domain (mHealth characteristics), individual domain (individual factors and human environment), organisational domain (organisational factors), and the local environment (human environment). In the individual domain, the support and promotion of mHealth by colleagues was seen as a facilitator, while a negative attitude of colleagues towards mHealth was seen as a barrier (16). Another study found that lack of staff preparation could result in fear and insecurity, which can be barriers for a successful implementation (17). Lack of staff preparation could also lead to resistance to implementation, resulting in implementation failure (18). This shows the level of influence individuals have on the implementation process.

Many of the identified barriers are related to the individual domain. It is therefore of importance to perform additional research into the individual domain prior to implementation. One aspect that is of relevance is readiness. Assessing readiness prior to implementation could prevent loss of time, resources and energy (19). Readiness is an abstract construct that knows many definitions. Rafferty *et al.* (20) identified six definitions of readiness for change, of which five were on the individual level and one on the organisational level. Rafferty concluded that an individual's readiness for organisational change is influenced by the following factors: *"the individual's belief that change is needed, that he or she has the capacity to successfully undertake change and that change will have positive outcomes for his or her job/role and by the individual's current and future-oriented positive affective emotional responses to a specific change event."*(20)*.* These aspects should be considered when assessing readiness among employees.

Barriers have also been identified within the organisational domain. It has been found that the perception of organisational readiness for change could affect the outcome of the change effort. Employees enable their organisation to implement changes when they perceive the organisation as ready to change, since this perception influences the behaviour of employees (21). However, the perception of the readiness of the organisation could be affected by the individuals own readiness to change (22). This shows that the readiness of the individual and the readiness of the organisation affect each other.

Research aim

The purpose of this research is to determine the mHealth readiness of healthcare professionals and their perception of organisational readiness of the Obesity Centre for the potential implementation of a mHealth application. This readiness assessment will be used to identify improvement points and provide recommendations for further implementation. The professionals are chosen as the target group, since the professionals have a key role in providing the intervention to the patient (23). It could be that, in case professionals do not support the technology, patients will have no access to the technology. This results in the following research questions:

1. What is the readiness of professionals within the Obesity Centre of the ZGT for the implementation of a mHealth application with the aim to support the post-bariatric programme?
2. What is the professionals' perception of readiness of the Obesity Centre for the implementation of a mHealth application?

THEORETIC FRAMEWORK

Terms and definitions

Several terms are being used in this thesis of which it is important to provide a definition. The first term is mHealth. mHealth stands for mobile health. mHealth is defined by the WHO as *"medical and public health practice supported by mobile devices, such as mobile phones, patient monitoring devices, personal digital assistants (PDAs), and other wireless devices"* (24). It is seen as a component of eHealth, which is the wide term for using technology within healthcare. The term mHealth only relates to the medium through which the care is provided. In the case of this thesis a smartphone is foreseen to be used to deliver the care to the patient. Therefore, the term mHealth is applicable in the setting of this thesis.

The second term is readiness. Two levels of mHealth readiness will be assessed in this thesis: individual readiness and organisational readiness. Individual readiness is defined as *"people's propensity to embrace and use new technologies for accomplishing goals in home life and work"(25)*. This definition will be used in this thesis, since it comprises the readiness for the use of technology. Organisational readiness will be assessed from the perception of the professional. Organisational readiness is defined as *"the preparedness of healthcare institutions or communities for the anticipated change brought by programmes related to ICT use"* (26). This definition is chosen, since it specifically focusses on the changes that are related to the use of ICT. Organisations and individuals can be ready for change, however, when they are not ready for technological change problems could still occur. Therefore, the technology aspects in the definitions is of importance.

Implementation

As mentioned before, implementation is a process of many stages which can be influenced by many factors. Moullin *et al*. (15) identified five domains which could influence implementation: innovation, individuals, organisation, local environment, and external system. These domains were used to structure the readiness assessment.

Readiness

Many frameworks to assess eHealth readiness can be found in literature. Mauco *et al.* (27) identified 13 eHealth readiness frameworks, in which different types of readiness were assessed. Frameworks were found to assess readiness in developed and developing countries. For example, Jennet *et al*. (28) assessed readiness in a rural community in Canada and Khoja *et al.* (26) constructed a readiness assessment framework for healthcare institutions in developing countries. From the frameworks Mauco *et al.* identified 8 readiness types (27): organisational, technological/infrastructural, healthcare provider, engagement, societal, core, government and public/patient readiness but the definitions of the readiness types were inconsistent between frameworks. For example, depending on the context, engagement readiness also addressed components of healthcare provider, organisational and public/patient readiness. To create more consistency Mauco *et al.* (27) developed enhanced definitions in a systematic way (appendix I). In this theses we will focus on the eight readiness types using the definitions provided by Mauco *et al*. (27) to ensure that the definitions of the readiness types is clear.

Relation between readiness and implementation

The types of readiness identified by Mauco *et al.* (27) could be linked to the influential domains for implementation identified by Moullin *et al.* (15) (figure 1). Technological/infrastructural readiness can be linked to the innovation domain. Healthcare provider and core readiness comprise the individual domain. Public/patient readiness is the domain of local environment. The organisational domain comprises most of the readiness types: organisational, societal and engagement readiness. The domain external system can be linked to government readiness. This linkage as shown in figure 1 makes clear that assessment of readiness is important for the whole implementation process. In this thesis the readiness types related to the innovation, individual and organisational domain will be assessed.
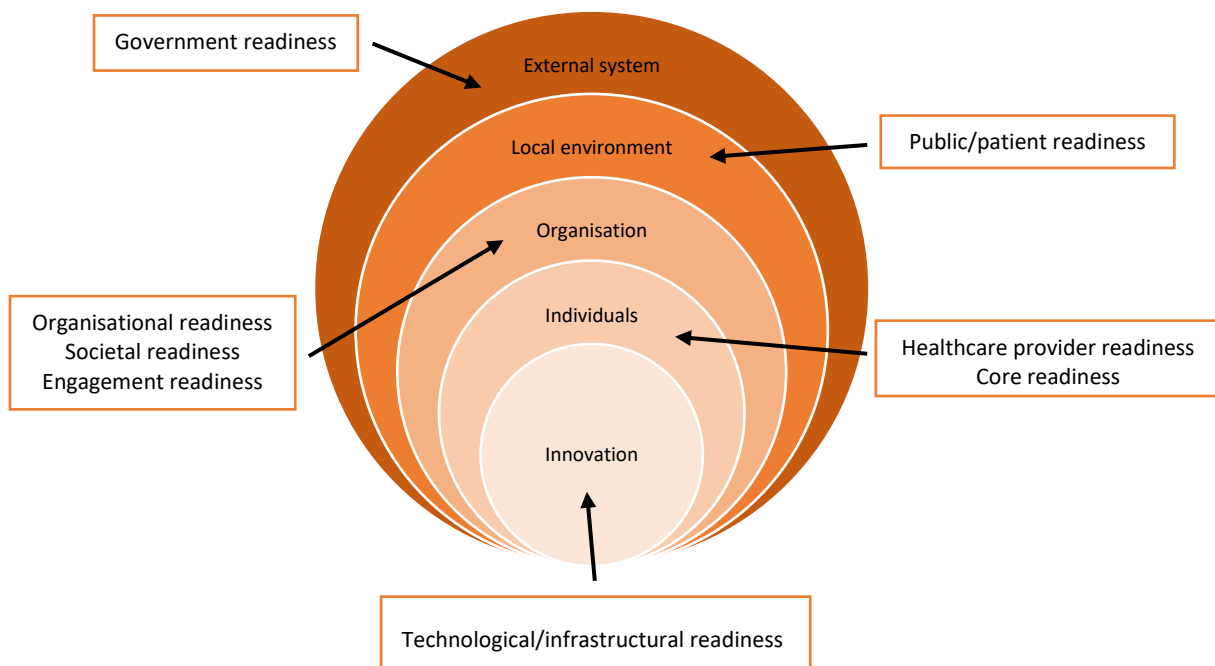

Figure 1 Relation between readiness and implementation

Looking at the individual level, in this case the healthcare professional level, it is important for the implementation process not just to focus on the general readiness level but go a step further into identifying the profile of these professionals. This is considered important as a tailored approach for implementation based on the profile can be made. For example, it has been found that creating profiles of employees can be used to identify which employees facilitate and which might inhibit the change (21). When you know an employee might inhibit the change, you can approach this employee in a different way than an employee that facilitates the change.

Parasuraman and Colby (29) created a typology of technology consumers. Individuals can be placed into five distinct groups based on different combinations of innovativeness, optimism, discomfort and insecurity (table 1). Each segment has a distinct personality and background. Therefore, individuals in a certain segment need to be addressed in a certain way. Knowing this, implementation could be tailored based on the technology segments present within the Obesity Centre.

Table 1 TRI segments with corresponding characteristics

Skeptics	Tend to have a detached view of technology, with less extreme positive and negative beliefs.
Explorers	Tend to have a high degree of motivation and low degree of resistance.
Avoiders	Tend to have a high degree of resistance and low degree of motivation.
Pioneers	Tend to hold both strong positive and negative views about technology
Hesitators	Stand out due to their low degree of innovativeness.

Table 1 TRI segments with corresponding characteristics

METHOD

Participants

This research was conducted at Ziekenhuisgroep Twente (ZGT). Participants were healthcare providers involved in the post-bariatric programme or treatment of patients related to the Obesity Centre. Management was also included as a relevant stakeholder, since management support could be an influential factor on implementation.

Survey

INSTRUMENT

An instrument developed to assess the readiness of individuals is the Technology Readiness Index (TRI) (25). The TRI was developed to assess the readiness of consumers to adopt new commercial technologies. The TRI measures four constructs: optimism, innovativeness, discomfort and insecurity. Optimism and innovativeness are drivers, while discomfort and insecurity are perceived inhibitors of technology readiness. Although designed to understand consumer readiness, the TRI can also be used to assess employee readiness. The TRI has been applied in some studies in the healthcare setting showing that, with some adaptations, the TRI is a sound instrument to measure individual technology readiness (30-32). The TRI 2.0 (33) is an updated version of the TRI. The TRI 2.0 consisted of a 16-item, measuring optimism, innovativeness, discomfort and insecurity (33). The statements can be found in table 2. The statements were scored on a five-point Likert scale, reaching from totally disagree (=1) to totally agree (=5). The TRI 2.0 was validated on construct validity, reliability, discriminant validity. The researches also performed a factor analysis for validation (33).

The TRI 2.0 was translated with permission of the authors. The statements were translated from English to Dutch by one researcher. A native English-speaking high school teacher translated the Dutch statements back to English, without knowledge of the original statements. The statements were compared by two individuals and disparities were resolved by means of discussion until consensus was reached (appendix IV). This translation method was chosen, to ensure that the translated statements would be as close to the original statements as possible. Demographic information, such as age and function, were also questioned within the survey so that subgroup analysis could be performed (appendix IV).

PROCEDURE

The anonymous survey was administered online with the help of Qualtrics. Participants were professionals providing care to patients of the Obesity Centre, support staff within the Obesity Centre, and management of the Obesity Centre. They received an e-mail containing an anonymous link, where participants could fill in the survey online. A reminder was sent seven weeks after first distribution. The survey link was active from 18 July 2018 till 12 September 2018. A total of 34 stakeholders were invited to take part in the questionnaire, of which 27 responded (table 3). The TRI 2.0 statements were automatically randomized by Qualtrics within every survey, as was advised by the authors.

$$TRI\ Score = \frac{optimism + innovativeness + (6 - discomfort) + (6 - insecurity)}{4}$$

Optimism

OPT1	New technologies contribute to better quality of life
OPT2	Technology gives me more freedom of mobility
OPT3	Technology gives people more control over their daily lives
OPT4	Technology makes me more productive in my personal life

Innovativeness

INN1	Other people come to me for advice on new technologies
INN2	In general, I am among the first in my circle of friends to acquire new technology when it appears
INN3	I can usually figure out new high-tech products and services without help from others
INN4	I keep up with the latest technological developments in my area of interest

Discomfort

DIS1	When I get technical support from a provider of a high-tech product or service, I sometimes feel as if I am being taken advantage of by someone who knows more than I do
DIS2	Technical support lines are not helpful because they don't explain things in terms I understand
DIS3	Sometimes, I think that technology systems are not designed for use by ordinary people
DIS4	There is no such thing as a manual for high-tech product or service that's written in plain language

Insecurity

INS1	People are too dependent on technology to do things for them
INS2	Too much technology distracts people to a point that is harmful
INS3	Technology lowers the quality of relationships by reducing personal interaction
INS4	I do not feel confident doing business with a place that can only be reached online

Note: These questions comprise the Technology Readiness Index 2.0 which is copyrighted by A. Parasuraman and Rockbridge Associates, Inc., 2014. This scale may be duplicated only with written permission from the authors.

ANALYSIS

The results of the questionnaire were analysed using SPSS 25. The overall readiness score was calculated with the help of formula 1, using the average scores for optimism, innovativeness, discomfort and insecurity. Classification of the respondents into segments was provided by Rockbridge Associates and was based on a proprietary algorithm.

Internal consistency of the constructs was determined with the use of Cronbach's α. In general internal consistency is perceived as acceptable when α ≤ 0.70, however, lower values have also been stated as being acceptable (34). The internal consistency for discomfort was acceptable with Cronbach α = 0,70. The

Cronbach α for optimism was just below the acceptable value (Cronbach α = 0,69). Internal consistency for innovativeness (Cronbach α = 0,64) was also below the acceptable value. However, a low number of items underpowers the calculation of Cronbach α (35). Therefore, the internal consistency of optimism and innovativeness could be perceived as acceptable, since there are only four statements per construct. For insecurity the internal consistency was low, with α = 0,36.

Interview

INSTRUMENT

A semi structured interview guide was developed (appendix III), based on the readiness types identified by Mauco *et al*. (27). Constructs were extracted from the definitions, which were then translated into questions. For example, from the definition of core readiness the construct change was extracted which resulted in the question: What would you change in the post-bariatric programme? Interview guides were specified to the stakeholder being interviewed:

- Organisational readiness: was questioned with all stakeholders, since it has been found that the perception of the readiness of the organisation can influence the professionals attitude towards change (21).
- Technological/infrastructural readiness: was only questioned with ICT, since ICT is most suited to describe what is possible within the hospital and Obesity Centre concerning mHealth.
- Healthcare provider readiness: was questioned with healthcare professionals to identify the perceptions regarding mHealth among healthcare providers.
- Engagement readiness: was questioned with the unit head to identify if management is involved in the discussion among mHealth. It was questioned with the healthcare professionals to identify if they feel that they are involved in the discussion about mHealth and if they are willing to accept training on how to use the mHealth application.
- Societal readiness: was questioned with the unit head to identify how the interaction between professionals is seen and with healthcare professionals to identify how the professionals see the interaction with other professionals.
- Core readiness: was questioned with unit head and healthcare professionals to identify if there is a perceived need of change for the post-bariatric programme.
- Public/patient and government readiness: were not questioned, since this readiness type was not relevant for this thesis.

Interviews were conducted from 19 July 2018 till 11 September 2018 and were held in Dutch. Participants were invited to participate in the interview through e-mail. A total of 31 stakeholders were invited to participate in an interview of which 16 responded. All participants signed an informed consent. Of the identified stakeholders at least one representative was interviewed.

ANALYSIS

Interviews were recorded and transcribed verbatim with the help of Microsoft Word. Interviews were uploaded into Atlas.ti 8 for coding. Interviews were coded deductively by using the Consolidated Framework of Implementation Research. The Consolidated Framework for Implementation Research (CFIR)

(36) is a meta-theoretical framework which can be used in different stages of the implementation process. It is constructed from 19 implementation models that facilitate the translation of research findings into practice. The framework "specifies a list of constructs within general domains that are believed to influence (positively or negatively) implementation" (36). Therefore, this framework was used to code the interviews, in order to identify possible improvement points from the readiness assessment. The framework consists of 5 domains with 39 constructs (appendix II).

Seven interviews were coded by two researchers (CM and LH). For the seven interviews a percentage agreement was calculated. The fragments were randomized in Excel and the top 10% was used to calculate the percentage agreement, which is seen as sufficient by Lombard *et. al* (37). A percentage agreement of 58% was found, which is below the minimal agreement of 75% (38). Disparities in coding were resolved by means of discussion until consensus was reached. Since consensus was reached, the remaining interviews were coded by one researcher (CM). All constructs of the CFIR were included in the coding scheme to ensure that relevant information would not be missed.

RESULTS

Participants

The participants were grouped into four groups: specialists, paramedic, nurses and other. The specialists were the healthcare professionals involved in direct medical procedures. The paramedics were the healthcare professionals who provide additional care to the medical procedures. The nurses, including specialised nurses, were a separate group, since they are the first contact point for the patient and they refer the patient to the specialist and paramedics when problems occur. The group specified as other were professionals that were not directly involved in patient care but are involved within the Obesity Centre or within ICT. This division was made to make it possible to conduct subgroup analysis based on the tasks performed by the professionals.

Table 3 Demographic information of the participants

	Interview	*n*	*%*	Survey	*n*	*%*
Age	46 ± 9,8	16	100	43,9 ± 11,8	25	92
Gender	Male	7	44	Male	6	22
	Female	9	56	Female	21	78
Function	Specialist	5	31	Specialist	4	15
	Paramedic	5	31	Paramedic	15	56
	Nurse	4	25	Nurse	4	15
	Other	2	13	Other	4	15
Active in process	Pre-bariatric surgery	14	88	Pre-bariatric surgery	22	82
	Bariatric surgical procedure	4	25	Bariatric surgical procedure	3	11
	Post-bariatric surgery	14	88	Post-bariatric surgery	22	82
	Other, namely	2	13	Other, namely	5	19
	The overall process			Coordinating role		
	Policy concerning the use of ICT			Lifestyle group		
				Patients who do not qualify for bariatric surgery		
				In low frequency pre-bariatric sporadic post-bariatric		
				From pre to post surgery and when patient is under control		

Survey

A total of 27 professionals filled in the survey (table 3). The average age was 43,9 with a standard deviation of 11,8 years. Two age responses were considered as missing, since one answer was not a number and one answer was an unrealistic age, namely 414. The majority of the respondents were female (78 %). Most respondents were involved in the pre-bariatric surgery and post-bariatric surgery care. Five respondents were not involved in the post-bariatric programme. Five participants responded to be involved in the Obesity Centre in another way. For example, one respondent was active in the lifestyle intervention and one respondent stated to have a coordinating role. Scores between the individual statements within a construct did not differ much, except for innovativeness. INN1 and INN2 had scores below 3 while INN3 and INN4 had scores above 3 (table 4).

As shown in table 5, the average TRI 2.0 score of the Obesity Centre of the ZGT was 3,3 on a scale that runs from 1 till 5. The highest score was 4,3 and the lowest score 2,2. Of the four dimensions optimism had the overall highest score and discomfort had the lowest overall score. Most of the respondents, 63%, were classified as skeptics (table 5). Furthermore, 6 respondents were classified as explorers, 1 as an avoider and 3 as hesitators. None of the respondents was classified as a pioneer. As shown in graph 1, all subgroups contained skeptics. The explorer group only contained specialist and paramedics. The avoiders and hesitators only contained paramedics.

Table 4 Average score per TRI 2.0 statement

Optimism		Innovativeness		Discomfort		Insecurity	
OPT1	3,7 ± 0,1	INN1	2,5 ± 0,2	DIS1	2,6 ± 0,2	INS1	2,8 ± 0,1
OPT2	3,7 ± 0,1	INN2	2,3 ± 0,2	DIS2	2,4 ± 0,2	INS2	2,8 ± 0,2
OPT3	3,6 ± 0,1	INN3	3,4 ± 0,2	DIS3	2,7 ± 0,2	INS3	3,0 ± 0,2
OPT4	3,5 ± 0,2	INN4	3,2 ± 0,2	DIS4	2,5 ± 0,2	INS4	2,7 ± 0,2

Table 5 Summation of the scores per segment and overall scores

Segments	N	%	Optimism	Innovative-ness	Discomfort	Insecurity	Average TRI score	Lowest score	Highest score
Explorers	6	22	4,3 ± 0,1	3,5 ± 0,2	2,1 ± 0,3	2,5 ± 0,2	3,8 ± 0,1	3,6	4,3
Pioneers	0	0	-	-	-	-	-	-	-
Skeptics	17	63	3,5 ± 0,1	2,9 ± 0,1	2,5 ± 0,1	2,9 ± 0,1	3,2 ± 0,1	2,8	3,8
Hesitators	3	11	3,7 ± 0,2	1,9 ± 0,1	3,1 ± 0,4	3,0 ± 0,5	2,9 ± 0,2	2,6	3,1
Avoiders	1	4	2,5	1,5	3,8	3,5	2,2	-	-
Total average	27	100	3,6 ± 0,1	2,9 ± 0,1	2,5 ± 0,1	2,8 ± 0,1	3,3 ± 0,1	2,2	4,3
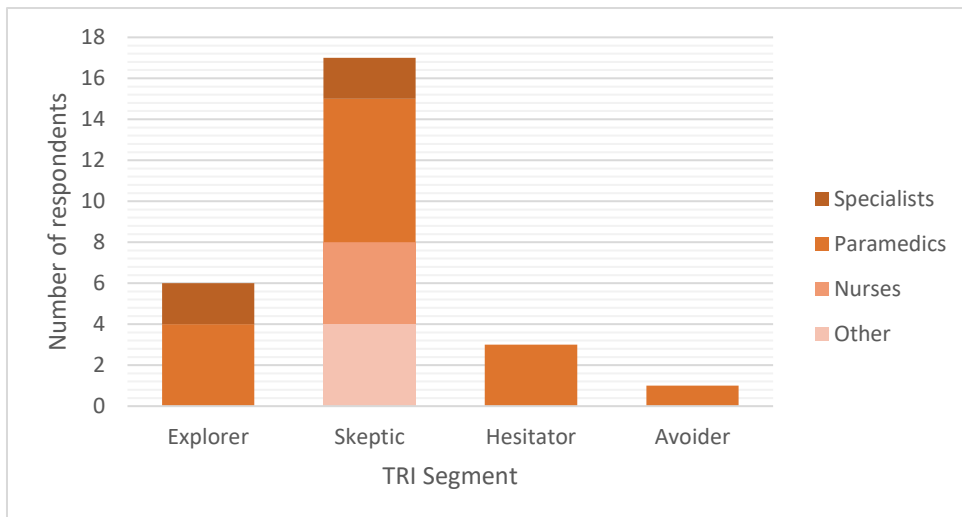
Graph 1 Number of professionals per segment specified per subgroup

Interview

Interviews were held with 16 professionals (table 3). The average age was 46 with a standard deviation of 9,8 years and 56% of the respondents was female. Two respondents were not directly involved in patient care. Most respondents were involved within the pre-bariatric and post-bariatric programme. One respondent had stated to be more active in the pre-bariatric programme. In total, 15 codes from the CFIR were used for the analysis of the interviews (appendix V)

TENSION FOR CHANGE

From the interviews in became clear that the majority of the respondents did not perceive a tension for change. Only two respondents identified clearly that there could be changes made in the post-bariatric programme or identified a problem within the programme: "*Uhm, I think that it is too laborious and uhm too shattered. We have made some improvements by uhm, making the specialist nurses a central contact point, but I still think that to many people are involved, making it not clear for the patients, in my impression, that they are dealing with one institution*" (interview 3) and "*There are really areas for improvement. Uhm, I do notice uhm, that some people who already did the post-bariatric programme and are doing it again, that people frequently say that they uhm, the groups are reduced, the group meetings. And they rather have the group meetings more spread and I can imagine that*" (interview 5). One respondent stated that he was not that involved in the post-bariatric programme. Another respondent stated to be involved limited in the post-bariatric programme but did see the importance of post-bariatric programmes: *Uhm, post-bariatric programmes are very important, I think, for your final results. I have experience with longer and shorter post-bariatric programmes. You see that uhm, institutions with longer post-bariatric programmes perform better on the longer term that those with shorter post-bariatric programmes. So, I do feel that it is an important component.*" (interview 4). However, twelve respondents perceived the post-bariatric programme as good. When asked what respondents would change about the programme, different aspects of improvement were pointed out, such as more follow-up, easier to enrol for group meetings, or more individual psychology. One respondent mentioned eHealth: *"Uhm, like, does everything has to be face to face or can we offer something to people via uhm, eHealth"* (interview 14). When asked about the addition

of a mHealth application to the post-bariatric programme respondents reacted positive. However, they did perceive it as an addition more than a substitution for providing care.

POLICY

Most of the participants responded that they did not know whether there was a policy for technology or not. However, it was stated that if mHealth was to be implemented, it should be accounted for in the policy plan of the Obesity Centre: *"Yes, I think you should include that in the policy plan anyway. … It is nice to investigate if it will work and if it works then you should include in in the policy. And you need to follow it, you shouldn't uhm, make up things, try it and then ooh, let it bleed out. Because that is not going to work."* (interview 10). MHealth is also not present in the technology policy of the hospital: *"We have not yet formulated an explicit policy, we are working on that"* (interview 15). If the Obesity Centre did want to formulate policy regarding mHealth, it was stated by an employee of the Information and Organisation department that this should be within the framework provided by the ZGT. This employee also stated that since the policy for mHealth applications was not present yet, it is important to include the ICT and information management departments in the process. However, some healthcare professionals expressed concerns regarding the ICT department: *"If I ask ICT like I want this to be automatic, I will not get immediate cooperation"* (interview 14)*, "And moreover, it seems convenient to me that the ICT of the hospital, uhm want to work a bit innovative, I have my doubts about that"* (interview 13)*, and "They are still busy eliminating the backlogs so that there is actually no time for innovation."* (interview 9)*.*

MANAGEMENT SUPPORT

Eleven respondents supported to feel no management support. When a lack of management support was mentioned, it was often related to the constraint of financial resources. Of the four respondents who perceive management support, two mentioned the issue with financial resources. One respondent viewed the fact that research was done into the use of mHealth as management support and another respondent mentioned the appointment of a professor in eHealth as being a sign of management support.

READINESS OBESITY CENTRE

The majority of participants felt that the Obesity Centre was ready for the use of mHealth. Some respondents did not know or were in doubt whether the Obesity Centre was ready. One respondent questioned the intention for the implementation of mHealth: *"Uhm, I wonder what the consideration is for mHealth, to use that. And I have the suspicion that is mostly uhm, mend to reduce cost. And I doubt if that is a good approach for developing policy"* (interview 9)*.* Some respondents indicated that they were not sure if the patients were ready for the use of mHealth, however, they did feel that the professionals within in the Obesity Centre were ready.

STIMULATION TECHNOLOGY USE

The professionals were divided whether use of technology was stimulated by the Obesity Centre. There were respondents that did feel that the Obesity Centre stimulated use of technology and other respondents felt that this was not the case. Some respondents pointed out that they stimulate patients to use mHealth applications themselves: *"Well, I, in the consulting-room then, what I told you, then I advise them to download apps to keep being engaged in their diet"* (interview 13)*.* Other factors that contributed to the

feeling that technology use was stimulated, were the development of a pre-operation app, the fact that patients were stimulated to fill in questionnaires online, and the feeling that the current unit head is open to the use of technology. Factors that contributed to the feeling that there was no stimulation were time, finances, the fact that there was no technology to stimulate, and that there was no approach from management to implement technology.

ATTITUDE TOWARDS MHEALTH APPLICATION

All healthcare professionals were positive about a mHealth application for the post-bariatric programme, regardless of negative, positive, or no experiences with mHealth apps. Professionals had different views on why it would be positive to implement a mHealth app in the post-bariatric programme. Most of the professionals did view the app as a support for care, in that it could not substitute the face to face care already provided. Professionals had different expectations of what mHealth could do for them in their work related to the Obesity Centre. For example, that patients could come more prepared to their appointments: "*That people come better prepared and uhm, to the consultation and uhm, that indeed questions can perhaps partly be answered in the mHealth and are not all asked here but can be read over at home.*" (interview 6). It was also seen to provide follow-up. Other responses were that it would make the work that had to be done easier, that it could help them notice patients that needed help or prevent relapse. Three respondents stated that it could not do much for them in their work: "*Uhm, well not that much directly. Would not change much no I think, no.*" (interview 12).

DEBATE CONCERNING MHEALTH

Most respondents did not experience that mHealth and the consequences, positive and negative, were discussed among professionals: "*I did not talk about it with colleagues, if that is what you mean*" (interview 8). One respondent did perceive that mHealth was being discussed: "*Uhm, that is discussed sometimes yes, definitely. If we talk about uhm, further policy and future plans.*" (interview 12). Two respondents did feel that there was discussion when the pre-bariatric app was developed: "*When we were developing that app, we did talk about it of course, so it comes around from time to time*" (interview 13) and "*Anyway, at the moment it is, uhm goes in slow motion, it is brought up less than before, so yes.*" (interview 5).

CAPACITIES AND TRAINING

The majority of the respondents felt that they had the competencies to use mHealth in their work. Some respondents did state that they would need to get instruction: "*If we have been properly instructed, then I am very positive about that yes*" (interview 1) and "*I really do need the training and that kind of stuff*" (interview 5). Everyone was prepared to follow training if necessary.

COMMUNICATION AND INTERACTION

Communication within the Obesity Centre is mostly done via e-mail, telephone, the electronic patient record (EPR) or face to face. In general, there was the perception that there is a lot of interaction between professionals within the Obesity Centre. However, some professionals that were only present on certain days in the Obesity Centre had the feeling they always saw the same people: "*Because, you will see, if your schedule changes, all of a sudden you see other people*" (interview 3). The fact that different disciplines are present in one building was also perceived as a benefit: "*And that is actually also the advantage that you*

are all in one building, because it is easy to just walk in with each other" (interview 8). The interaction was perceived as good, with short lines of communication. However, one respondent felt that it was difficult to reach multiple people: "*It is often… the lines are very short, but they are single lines. It is not that you immediately whoop, just reach everybody.*" (interview 7). Respondents did not agree whether mHealth could contribute to the interaction. A few respondents could not see how mHealth could contribute to the interaction or that it was not the purpose of mHealth: "*Hmm, contribute to the interaction, yes I don't know, that is not the purpose of mHealth according to me*" (interview 16). When respondents did feel that mHealth could have a contribution to the interaction, it was mostly because patient data could be shared among professionals which would make it easier to discuss patients who had problems. They did not see communication being done through a mHealth app: "*Uhm, I think that we need to prevent that healthcare professionals are going to communicate with each through a mHealth app. Then I prefer that they just call me*" (interview 4).

RESOURCES

An important aspect for ICT regarding the mHealth app was that it could be connected to the EPR. This was also stated by two professionals: "*One important obstacle for me, for my readiness is uhm, the inclusion in the EPR. If I have a separate device, where I have more work getting it into the EPR, then I really feel it as a step back into the Middle Ages*" (interview 2). It was stated that there was only one supplier of mHealth apps that was able to connect to the EPR. There was no desire to develop and maintain apps within the ZGT: "*No, no, you know, the development maybe, but uhm, apps need to be maintained, you need a uhm, a development street, that costs tons. Uhm, we can't afford that at the moment and we don't have the people to man such a street so to say.*" (interview 15).

IN SUM

Several improvement points were identified from the interviews (table 6). There were three points that were not perceived as ready. The first point was that there was no policy formulated concerning mHealth, not for the Obesity Centre but also not for the hospital in general. Second point is the lack of resources. Third, there was also no active debate about mHealth and the consequences corresponding with mHealth among professionals. Three points were not perceived as ready yet, since part of the respondents felt that they were not present, while some respondents did feel that they were present. There was no clear tension for change present among respondents. However, they did see the benefits of adding mHealth to the post-bariatric programme. Management support was not perceived as present, due to financial constraints. However, it was stated that the management of the Obesity Centre would support mHealth. Technology stimulation by the Obesity Centre was not perceived by all respondents.

Core readiness	Tension for change	🟧
Organisational readiness	Policy	🟥
	Management support	🟧
	OBC ready to use mHealth	🟩
	Stimulation to use technology	🟧
Healthcare provider readiness	See value of adding mHealth	🟩
Engagement readiness	Debate about mHealth	🟥
	Capacities to use mHealth and training to use mHealth	🟩
Societal readiness	Communication and interaction among professionals	🟩
Technological/infrastructural readiness	Available resources	🟥

DISCUSSION

The purpose of this research was to determine the mHealth readiness of healthcare professionals and their perception of organisational readiness of the Obesity Centre for the potential implementation of mHealth intervention. From the readiness assessment improvement points were identified and recommendations for implementation will be made based on the readiness assessment.

Readiness of the professionals

Based on the TRI score the healthcare professionals can be perceived as ready. This means that the healthcare professionals do have the tendency to embrace and use technology to achieve goals in home life and at work. This shows from the high overall optimism score and the lower discomfort and insecurity scores. A high optimism scores shows that the professionals have a positive feeling towards technology. The low discomfort score shows that professionals have a feeling that they have control over technology and not be overwhelmed by it. The low insecurity score shows that they trust technology and have no scepticism towards the working of the technology. This is beneficial for the implementation process, since the inhibitor factors are low. The innovation score is just below the neutral point. Innovativeness measures if individuals see themselves as technology pioneers and thought leaders. When looking at the scores for the individual innovativeness statements, the first two statements (INN 1 and INN2) have a score below the midpoints, while the last two statements (INN3 and INN4) have a score above the midpoint, resulting in the neutral score. This shows that the professionals are not the first to acquire new technology, but they do keep up with the technological development in their area of interest. It also shows that they feel that they can figure out new technology on their own, but do not feel that people come to them for advice. This could be due to the demographics of the study population. It has been found that males are more likely to give advice to others and are more likely be the first to try new technologies (29). Since the majority of the study population was female (78%), this could be an explanation in the differences in the scores between the statements.

Based on the TRI 2.0 healthcare professionals could be placed in to five segments. Four of the five segments were found within the professionals. The most ready individuals are the explorers, of which six were identified within the Obesity Centre. They are highly optimistic about technology and are often the first to adopt a new technology (33). Explorers can be seen as the early adopters (29). Therefore, explorers can be made useful in the role of champion. Research has shown that having a champion is found to be a factor that influences implementation positively (36, 39). The development, spread and implementation of innovations is generally more effective when champions play an active role in it (40). Champions believe so strongly in the innovation, that they are willing to risk their informal status and reputation. They support, market and overcome resistance towards the innovation (36). However, how champions should behave depends on the nature of the innovation, the organisational setting and the socio-political context (40). They could, for example, organise the development sessions or could be the point of contact for questions and remarks concerning the mHealth application and the implementation process. The majority of the professionals was classified as skeptic (17 professionals). Skeptics need to be convinced that the mHealth application has value for them (29). It is therefore important to include the skeptics in the development process of the application, especially since this is the largest group. By involving the skeptics in the

development process, they can influence the design of the mHealth application and are ensured that the application takes their values into account. It is also important to include the hesitators (3 professionals) in this process. Hesitators need to be supported and reassured (29). By involving them in the development, they can get familiar and comfortable with the technology that is going to be used before actual implementation, making the hesitators ready for when the mHealth application is being implemented. Involving the skeptics and hesitators in the development process can be done by using a participatory development method, as described by, for example, the CeHReS roadmap (41). The CeHReS roadmap involves key stakeholders in the development process by involving them in the goal specification and in defining the requirements needed to achieve this goal. By creating and testing mock-ups, storyboards and prototypes with the professionals, they see that their values and requirements are taken into account. One respondent was classified as an avoider. Avoiders often adopt new technology when they have no choice to do so (29). When a mHealth application is implemented within the post-bariatric programme of the Obesity Centre, the avoider will probably use it, since there is no choice, but he or she could resist to the use of the mHealth application. However, the avoider was rarely involved in the pre-, and post-bariatric programme. Therefore, no problems are foreseen with the avoider when the mHealth app is being implemented, since he or she will not have to use it often.

There was no clear tension for change, which means that core readiness is low. However, respondents did see the benefits and values of adding mHealth to the post-bariatric programme. It could be that implementing the mHealth app is not perceived as change of the programme, since respondents perceive the app as an addition and not as replacement. Tension for change was found to be a key predictor for successful change. When non-existent, it is difficult to create such a tension for change. Proper communication could help spread dissatisfaction with status quo (42), possibly creating a greater sense that change is needed. Proper communication could also help announce a change, create commitment and reduce resistance (42). Running a pilot could also be a possibility to enhance the tension for change. The value of the mHealth application could be clearer when a pilot is run, resulting in a greater feeling that the implementation of a mHealth application is needed. Despite a low core readiness, healthcare provider readiness was perceived as high, since the professionals have a positive attitude towards the addition of a mHealth application to the post bariatric programme.

Readiness of the Obesity Centre

The Obesity Centre is not ready on all readiness types. The lack of policy, management support and stimulation to use technology shows that there is low organisational readiness. Even though policy is considered in several readiness frameworks (17, 26, 43, 44), it is not stated clearly why policy is important for eHealth readiness. A systematic review identified that having a supportive policy resulted in sustained service funding for primary healthcare delivery models (45) and it was found that a long-run technology strategy lowers the risk of implementation failure (46, 47). Also, sufficient resources are needed to ensure a sustainable implementation (39). This should be captured in the policy of the ZGT and the Obesity Centre, to make sure that the resources for mHealth are available. Another reason to make policy, is that the Inspection for Healthcare and Youth expects that when technology is being used, policy and healthcare processes should be adjusted to the use of the technology (48).

From literature it was found that management support is an important factor for successful implementation (39). It was found that top management support has a positive influence on eHealth adoption (47). The involvement of the Information and Organisation and ICT department could therefore be of importance. The involvement of these departments in the development and implementation process shows that the ZGT is willing to invest resources in the mHealth application. This could create a greater feeling of support from management. Some respondents also found that students were researching the possibilities for mHealth as a sign of management support. Continuing research may therefore enlarge this sense of being supported. However, the restraint of financial resources was mentioned most often when there was a feeling of no management support. When resources are allocated to the development and implementation of the mHealth application the feeling of management support could increase. However, policy is needed for a sustainable resource allocation, meaning that the available resources for the mHealth application depend on the policy that will be developed.

When respondents had the feeling technology was not stimulated by the organisation, they mentioned the same reasons as why they felt no management support. This suggests that stimulation of technology could be perceived as management support. However, professionals who stated that they recommended applications to patients did feel that there was technology stimulation from the Obesity Centre. This stimulation could play an important role in the acceptation of technology by patients (49). However, the fact that some respondents viewed the stimulation from the organisational perspective and others from the patient's perspective shows that there was a different view of what comprises the Obesity Centre. This could mean that the question was not stated clearly enough, which lead to a different interpretation of what was meant by the Obesity Centre. This could have been resolved by providing a definition of what was meant by the Obesity Centre.

Despite the fact that professionals were willing to participate in training, engagement readiness was perceived as low. Healthcare professionals did not perceive that there was a debate concerning mHealth and its advantages and disadvantages. Jennet *et al*. conducted sixteen interviews, from which, among others, engagement readiness was identified. In other frameworks that measure engagement readiness, they do not state why clearly why this is measured (50-52), except that it has its foundation in change theories (50). However, it could be reasoned that a discussion of perceived benefits and negative impacts could be beneficial for the implementation process. When negatives impacts are perceived, this could harm the implementation process. When these perceptions are assessed in advance, professional can be reassured that the application will not have those impacts. On the other hand, when perceived benefits are unrealistic, they can be tempered. This results in a more realistic view of the possibilities of the innovation. The fact that the mHealth application is not being developed yet, could be the reason why there is no debate so far. However, according to the CeHReS roadmap, eHealth development is a participatory process (41). A debate among professionals could therefore be beneficial to the development process, since perceived positive and negative impacts are shared among professionals, possibly leading to a better value specification. To start the debate special mHealth meetings could be organised in which the benefits and negative impacts are being discussed.

The technological/infrastructural readiness is perceived as low due to lack of resources. Currently, there is only one supplier that has a license to provide a link between the EPR and applications (53). Since this

supplier has no mHealth app related to Obesity Care, there is no mHealth application available if a link to the EPR is an essential need (54). However, collaboration with a supplier is needed, since the ZGT has no desire to develop and maintain apps in-house. When a supplier has been chosen, it is important to collaborate with the supplier (39). Collaboration with the vendor can bring ICT expertise and clinical expertise together, which can help solve problems during implementation (55).

Societal readiness was perceived as high. Societal readiness was only assessed within the Obesity Centre. Interaction with other healthcare institutions and with the local environment were also measured when societal readiness was assessed (27). This was not done in this study, since the main focus was the readiness of healthcare professionals and the Obesity Centre. The fact that communication between the professionals was perceived as good is of importance for the quality of care. It has been found that communication failure leads to unsafe situations for patients resulting in patient harm (56). This suggests that societal readiness is of key importance for safe patient care.

Recommendations for implementation

To guide further implementation the Quality Implementation Framework is recommended (QIF) (figure 2) (57). This framework was chosen, since it focusses on the how to of implementation. Another motive to choose this framework was that quality implementation was defined as "putting an innovation into practice in such a way that it meets the necessary standards to achieve the innovation's desired outcomes" (57), which shows that the implementation is focussed on getting the outcomes that were intended with the innovation rather than solely on the implementation of the innovation. The QIF was comprised of the synthesis of 25 implementation frameworks. Fourteen critical steps were identified, which were divided into four phases. The majority of these steps need to be assessed pre-implementation. The QIF suggests there is a temporal order for the steps that have to be taken. However, implementation is a dynamic process, that does not always occur in the exact order of the steps provided by the QIF. Some steps have to be assessed later or could potentially be skipped. It is therefore important, when the QIF is used for implementation, to assess which steps are relevant for that time in the process and if all steps are necessary.
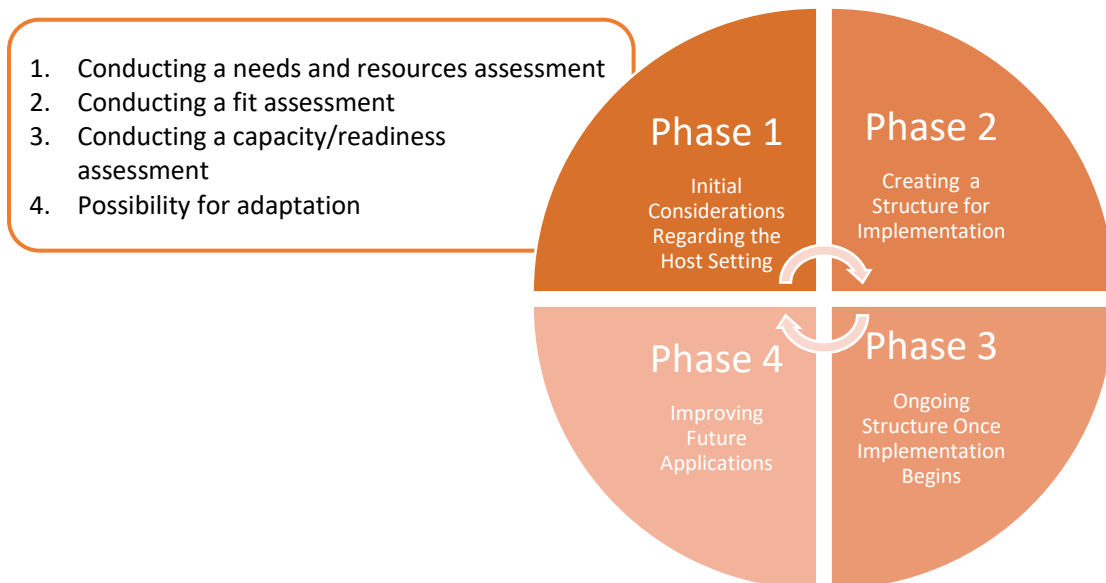
1. Conducting a needs and resources assessment
2. Conducting a fit assessment
3. Conducting a capacity/readiness assessment
4. Possibility for adaptation

Phase 1
Initial Considerations Regarding the Host Setting

Phase 2
Creating a Structure for Implementation

Phase 4
Improving Future Applications

Phase 3
Ongoing Structure Once Implementation Begins

Figure 2 The phases of the Quality Implementation Framework and the QIF steps described for the ZGT, adapted from (57).

Currently, the implementation of the mHealth application is in the first phase, initial considerations regarding the host setting (figure 2). In this thesis step three, conducting a capacity/readiness assessment, was done (figure 2). For the ZGT the next important step is to conduct a needs and resources assessment, which is the first step of phase one of the QIF. Since there is no clear tension for change, the question is whether a mHealth application is necessary. Therefore, it is important to clarify what the perceived goal of the mHealth application is. When the goal is not clearly stated, difficulties could arise when conceptualizing the organisational transformations that are required (58). Furthermore, when there is no clear goal stated for the mHealth, it is not possible to measure outcomes, since it is not clear what is intended with the mHealth application.

The second step is to conduct a fit assessment, in which is assessed if the perceived innovation fits the setting. However, to assess such a fit, it has to be identified what requirements are needed in the mHealth application. Therefore a value specification could be performed, in which key stakeholders identify the added values they want to achieve by the mHealth application (41).

Since no policy has been made yet, it is of importance to involve the ICT and Information and Organisation departments in step three, fit assessment, and step four, assessing whether the innovation needs adaptation. These departments have the expertise on what requirements the application has to meet to fit within the existing systems of ZGT for the fit analyses. They also have insight on which resources can be spend in which phase. Furthermore, they could provide support in identifying a possible relevant existing application or in identifying suppliers that could develop and maintain the application. Step four only applies when an existing app has been identified as a suitable fit for the Obesity Centre and adaptation to fit within the ZGT are needed.

Once a mHealth app has been chosen for implementation and adaptations are discussed, the last stage of phase one is to start capacity building by, for example, obtaining buy-in from critical stakeholders and

building organisational capacity. In phase two the structure for implementation is created. In phase three actual implementation begins. The fourth phase is the evaluation phase, in which learning from experience has a central role (57).

Strengths and limitations

The strength of this research is that it used a mixed-method approach of both quantitative and qualitative methods to assess the readiness. Readiness of the professionals was assessed using the validated TRI 2.0. However, validity was not assessed after translation of the TRI 2.0. The translation method was aimed to ensure that the statements were linguistic and conceptual equivalent to the original TRI 2.0. The Cronbach α for the construct insecurity was low, despite the use of a validated questionnaire. It should therefore be noted that the results should be interpreted with caution. The segmentation of the respondents is based on the outcomes of the NTRS, which is distributed in the United States. It is possible that the results are not generalizable to the Netherlands. However, due to the difference in the respondent groups, no conclusion can be drawn regarding generalizability. Therefore, it is assumed that the segmentation is generalizable.

The definitions provided by Mauco et.al (27) were the base for the interview guide. The definitions were based on 13 eHealth readiness frameworks, from both developed and developing countries. The definitions are therefore perceived as a solid foundation to have based the interview guide on.

The CFIR was used as a coding scheme. Some limitations were found when using the CFIR. Due to the broadness of the constructs, it was sometimes difficult to determine which code should be addressed to the fragment. This shows in the agreement percentage of 58% between the two coders. However, by using a second coder for part of the interviews, discrepancy could be resolved by means of discussion. It could also have been prevented by adapting and operationalizing own definitions for each construct (36). This was not done to ensure that the framework was not comprised.

A limitation of this study is that there is no mHealth application yet to be implemented. This makes the mHealth application very abstract, with a lot of space to fantasize about the possibilities of the mHealth application, despite the fact that a description of mHealth was provided. Due to this, there is a possibility that healthcare professionals have different visions on the mHealth application. This is something to take into consideration in the development phase of the application.

Recommendations for further research

In this thesis two types of eHealth readiness were not assessed: patient/public readiness and government readiness. It could be beneficial to conduct a readiness assessment among patients., since patients have to use the mHealth application. When patients are not ready to use such an intervention, the desired outcomes of the mHealth application could not be achieved. Government readiness could be assessed to, for example, identify possible support systems that could help in the development and implementation of the mHealth application. However, when the government is proves not to be ready, it cannot be influenced by the Obesity Centre and ZGT, meaning that the assessment can only be used informative.

CONCLUSION

The technology readiness score of the healthcare professionals indicated that professionals can be perceived as ready for technology. Although being optimistic, they were less innovative. The professionals did feel comfortable and secure regarding technology. Since the majority of the professionals was identified as skeptic, it is of importance to include the professionals in the development process of the mHealth application. Despite own experiences with mHealth, all professionals had a positive attitude towards mHealth indicating that healthcare provider readiness is high. However, the low core readiness indicates that professionals do not feel that change is necessary. This could harm the implementation process. It is therefore of importance to create a greater sense that the mHealth application is necessary.

The healthcare professionals do perceive the Obesity Centre as ready for the implementation for mHealth. However, organisational readiness and engagement readiness are low, indicating that the Obesity Centre is not ready for the implementation of mHealth. This could be improved by the formulation of policy, increasing the feeling of management support and that use of technology is stimulated, and by stimulating the debate concerning mHealth among healthcare providers.

The implementation of the mHealth application is in its infancy. The first step to be taken is to see whether a mHealth application is necessary, since there is a low core readiness. It is therefore of importance to clarify the perceived goal of the mHealth application to ensure that it is clear what is expected of the mHealth application and that the right changes will be made within the Obesity Centre.

REFERENCES

1.   CBS Statline. Lengte en gewicht van personen, ondergewicht en overgewicht; vanaf 1981 2017 [cited 2018 March 12th]. Available from: http://statline.cbs.nl/Statweb/publication/?DM=SLNL&PA=81565ned&D1=0-4&D2=0&D3=5&D4=0&D5=0,10,20,30,33-35&HDR=T&STB=G1,G2,G3,G4&VW=T.

2.   Guh DP, Zhang W, Bansback N, Amarsi Z, Birmingham CL, Anis AH. The incidence of co-morbidities related to obesity and overweight: A systematic review and meta-analysis. BMC Public Health. 2009;9.

3.   Kissane NA, Pratt JSA. Medical and surgical treatment of obesity. Best Practice and Research: Clinical Anaesthesiology. 2011;25(1):11-25.

4.   International Federation for the Surgery of Obesity and Metabolic Disorders. Are you a candidate 2014 [cited 2018 March 12th]. Available from: http://www.ifso.com/are-you-a-candidate/.

5.   Yumuk V, Tsigos C, Fried M, Schindler K, Busetto L, Micic D, et al. European Guidelines for Obesity Management in Adults. Obesity Facts. 2015;8(6):402-24.

6.   Bult MJF, van Dalen T, Muller AF. Surgical treatment of obesity. European Journal of Endocrinology. 2008;158(2):135-45.

7.   Sjöström L, Lindroos AK, Peltonen M, Torgerson J, Bouchard C, Carlsson B, et al. Lifestyle, diabetes, and cardiovascular risk factors 10 years after bariatric surgery. New England Journal of Medicine. 2004;351(26):2683-93.

8.   Shah M, Simha V, Garg A. Review: Long-term impact of bariatric surgery on body weight, comorbidities, and nutritional status. Journal of Clinical Endocrinology and Metabolism. 2006;91(11):4223-31.

9.   Kalarchian M, Turk M, Elliott J, Gourash W. Lifestyle Management for Enhancing Outcomes after Bariatric Surgery. Current Diabetes Reports. 2014;14(10).

10.   Webb TL, Joseph J, Yardley L, Michie S. Using the Internet to promote health behavior change: A systematic review and meta-analysis of the impact of theoretical basis, use of behavior change techniques, and mode of delivery on efficacy. Journal of Medical Internet Research. 2010;12(1).

11.   (GB) NIB. Personalised health&care 2020. Using data and technology to transform outcomes for patients and citizens. A framework for action. 2014.

12.   Graham YNH, Hayes C, Mahawar KK, Small PK, Attala A, Seymour K, et al. Ascertaining the Place of Social Media and Technology for Bariatric Patient Support: What Do Allied Health Practitioners Think? Obesity Surgery. 2017;27(7):1691-6.

13.   Zorg Onderzoek Nederland. Met het oog op toepassing. Beleidsnota Implementatie ZON 1997-1999 [With a view to application. Policy document Implementation ZON 1997-1999]. In: ZON, editor. Den Haag1997.

14.   Durlak JA, DuPre EP. Implementation Matters: A Review of Research on the Influence of Implementation on Program Outcomes and the Factors Affecting Implementation. American Journal of Community Psychology. 2008;41(3):327.

15.   Moullin JC, Sabater-Hernández D, Fernandez-Llimos F, Benrimoj SI. A systematic review of implementation frameworks of innovations in healthcare and resulting generic implementation framework. Health Research Policy and Systems. 2015;13(1).

16.   Gagnon MP, Ngangue P, Payne-Gagnon J, Desmartis M. M-Health adoption by healthcare professionals: A systematic review. Journal of the American Medical Informatics Association. 2016;23(1):212-20.

17.   Jennett P, Yeo M, Pauls M, Graham J. Organizational readiness for telemedicine: implications for success and failure. Journal of telemedicine and telecare. 2003;9 Suppl 2:S27-30.

18.   Weiner BJ, Amick H, Lee SYD. Review: Conceptualization and measurement of organizational readiness for change. A review of the literature in health services research and other fields. Medical Care Research and Review. 2008;65(4):379-436.

19.   Jennett PA, Gagnon PM, Brandstadt HK. Preparing for success: Readiness models for rural telehealth. J Post grad Med [serial online]. 2005 [cited 2018 May 18]:279-85.

20.   Rafferty AE, Jimmieson NL, Armenakis AA. Change Readiness: A Multilevel Review. Journal of Management. 2013;39(1):110-35.

21.   Vakola M. Multilevel Readiness to Organizational Change: A Conceptual Approach. Journal of Change Management. 2013;13(1):96-109.

22.   Eby LT, Adams DM, Russell JEA, Gaby SH. Perceptions of organizational readiness for change: Factors related to employees' reactions to the implementation of team-based selling. Human Relations. 2000;53(3):419-42.

23.   Dohmen D. De'e'van e-Health. Juiste energie voor optimale implementatie van moderne technologie in de zorg thuis. 2012.

24.   Kay M, Santos J, Takane M. mHealth: New horizons for health through mobile technologies. World Health Organization. 2011;64(7):66-71.

25.   Parasuraman A. Technology Readiness Index (Tri): A Multiple-Item Scale to Measure Readiness to Embrace New Technologies. Journal of Service Research. 2000;2(4):307-20.

26.   Khoja S, Scott RE, Casebeer AL, Mohsin M, Ishaq AFM, Gilani S. e-Health readiness assessment tools for healthcare institutions in developing countries. Telemedicine and e-Health. 2007;13(4):425-31.

27.   Mauco KL, Scott RE, Mars M. Critical analysis of e-health readiness assessment frameworks: suitability for application in developing countries. Journal of Telemedicine and Telecare. 2018;24(2):110-7.

28.   Jennett P, Jackson A, Healy T, Ho K, Kazanjian A, Woollard R, et al. A study of a rural community's readiness for telehealth. Journal of Telemedicine and Telecare. 2003;9(5):259-63.

29.   Parasuraman A, Colby CL. Techno-ready marketing: How and why your customers adopt technology. New York: The Free Press; 2001.

30.   Caison A, Bulman D, Pai S, Neville D. Exploring the technology readiness of nursing and medical students at a Canadian University. Journal of Interprofessional Care. 2008;22(3):283-94.

31.   Melas CD, Zampetakis LA, Dimopoulou A, Moustakis VS. An empirical investigation of Technology Readiness among medical staff based in Greek hospitals. European Journal of Information Systems. 2014;23(6):672-90.

32.   Kuo KM, Liu CF, Ma CC. An investigation of the effect of nurses' technology readiness on the acceptance of mobile electronic medical record systems. BMC Medical Informatics and Decision Making. 2013;13(1).

33.   Parasuraman A, Colby CL. An Updated and Streamlined Technology Readiness Index: TRI 2.0. Journal of Service Research. 2015;18(1):59-74.

34.   Peterson RA. A meta-analysis of Cronbach's coefficient alpha. Journal of consumer research. 1994;21(2):381-91.

35.   Cortina JM. What Is Coefficient Alpha? An Examination of Theory and Applications. Journal of Applied Psychology. 1993;78(1):98-104.

36.   Damschroder LJ, Aron DC, Keith RE, Kirsh SR, Alexander JA, Lowery JC. Fostering implementation of health services research findings into practice: A consolidated framework for advancing implementation science. Implementation Science. 2009;4(1).

37.   Lombard M, Snyder-Duch J, Bracken CC. Practical resources for assessing and reporting intercoder reliability in content analysis research projects. Retrieved April. 2004;19(2004).

38.   Inter-rater   reliability   [cited   2018   October   24th].   Available   from: https://www.pcc.edu/resources/academic/learning-assessment/documents/LACMtg2InterRater_Reliability.pdf.

39.   Nguyen TTH, Saranto K, Tapanainen T, Ishmatova D, editors. A review of health information technology implementation success factors: Importance of regulation and Finance. Proceedings of the Annual Hawaii International Conference on System Sciences; 2014.

40.   Greenhalgh T, Robert G, Bate P, Kyriakidou O, Macfarlance F, Peacock R. How To Spread Good Ideas: A systematic review of the literature on diffusion, dissemination and sustainability of innovations in health service delivery and organisation. London: NCCSDO; 2004.

41.   van Gemert-Pijnen JE, Nijland N, van Limburg M, Ossebaard HC, Kelders SM, Eysenbach G, et al. A holistic framework to improve the uptake and impact of eHealth technologies. Journal of medical Internet research. 2011;13(4).

42.   Gustafson DH, Sainfort F, Eichler M, Adams L, Bisognano M, Steudel H. Developing and Testing a Model to Predict Outcomes of Organizational Change. Health Services Research. 2003;38(2):751-76.

43.   Scharwz F, Ward J, Willcock S. E-Health readiness in outback communities: an exploratory study. Rural Remote Health. 2014;14(3):2871.

44.   Wickramasinghe NS, Fadlalla AM, Geisler E, Schaffer JL. A framework for assessing e-health preparedness. International Journal of Electronic Healthcare. 2005;1(3):316-34.

45.   Wakerman J, Humphreys JS, Wells R, Kuipers P, Entwistle P, Jones J. Primary health care delivery models in rural and remote Australia - A systematic review. BMC Health Services Research. 2008;8.

46.   Lorenzi NM, Riley RT. Organizational issues = change. International Journal of Medical Informatics. 2003;69(2-3):197-203.

47.   Faber S, van Geenhuizen M, de Reuver M. eHealth adoption factors in medical hospitals: A focus on the Netherlands. International Journal of Medical Informatics. 2017;100:77-89.

48.   Brons I. IGZ: Toezicht op technologie in de zorg: In voor zorg!; 2015 [cited 2018 September 24th]. Available from: http://www.invoorzorg.nl/verslag-Toezicht-op-technologie-in-de-zorg.html.

49.   Peeters J, Wiegers T, De Bie J, Friele R. Technologie in de zorg thuis: Nog een wereld te winnen! : Nivel; 2013.

50.   Ojo SO, Olugbara OO, Ditsa G, Adigun MO, Xulu SS, editors. Formal model for e-healthcare readiness assessment in developing country context. Innovations'07: 4th International Conference on Innovations in Information Technology, IIT; 2008.

51.   Rezai-Rad M, Vaezi R, Nattagh F. E-health readiness assessment framework in Iran. Iranian Journal of Public Health. 2012;41(10):43-51.

52.   Li J, Land LPW, Ray P, Chattopadhyaya S. E-Health readiness framework from Electronic Health Records perspective. International Journal of Internet and Enterprise Management. 2010;6(4):326-48.

53.   Zorgplatform: 1e intergratie EPD en thuismetingen 2018 [cited 2018 November 4th]. Available from: https://chipsoft.nl/nieuws/225/Zorgplatform-1e-integratie-tussen-EPD-en-thuismetingen.

54.   Focuscura. Producten en Diensten   [cited 2018 November 4th]. Available from: https://www.focuscura.com/nl/producten-en-diensten.

55.   Amirfar S, Taverna J, Anane S, Singer J. Developing public health clinical decision support systems (CDSS) for the outpatient community in New York City: our experience. BMC Public Health. 2011;11:753-.

56.   Leonard M, Graham S, Bonacum D. The human factor: the critical importance of effective teamwork and communication in providing safe care. Quality and Safety in Health Care. 2004;13(suppl 1):i85.

57.   Meyers DC, Durlak JA, Wandersman A. The Quality Implementation Framework: A Synthesis of Critical Steps in the Implementation Process. American Journal of Community Psychology. 2012;50(3-4):462-80.

58.   Cresswell KM, Bates DW, Sheikh A. Ten key considerations for the successful implementation and adoption of large-scale health information technology. Journal of the American Medical Informatics Association. 2013;20(E1):e9-e13.

APPENDIX

Appendix I Readiness Types

Organisational readiness	Gauges the extent to which the institutional setting and culture supports and promotes awareness, implementation and use of e-health innovations (e.g. presence of relevant policies; senior management support)
Technological/infrastructural readiness	Gauges the availability and affordability of ICT resources necessary to implement a proposed e-health innovation (e.g. skilled human resources, ICT support, quality ICT infrastructure and power supply)
Healthcare provider readiness	Gauges the influence of a healthcare provider's personal experience; primarily their perception and receptiveness towards the use of e-health technology
Engagement readiness	Gauges the extent to which members of a community are exposed to the concept of e-health and are actively debating its perceived benefits as well as negative impacts. It also involves gauging the willingness of members of a community to accept training on e-health
Societal readiness	Gauges the degree of 'interaction' associated with a healthcare institution. Interaction is described by three parameters; interaction among members of a healthcare institution, interaction of a healthcare institution with other healthcare institutions, and interaction of a healthcare institution with its local communities
Core readiness	Gauges the extents to which members of a community are dissatisfied with the current status of their healthcare service provision, see e-health as a solution, and express their need and preparedness for e-health services
Government readiness	Gauges the extent to which a country's government and politicians support and promote awareness, implementation, and use of e-health innovations (e.g. presence of relevant policies and funding)
Public/patient readiness	Gauges the extent to which members of the public and patients are aware of, and can afford and access, e-health services. It also involves gauging the influence of their personal experiences on their perception and receptiveness towards the use of e-health technology

Appendix II CFIR Constructs

CFIR constructs (36)

Domain	Construct	Sub-construct
Innovation characteristics	Innovation source	
	Evidence strength and quality	
	Relative advantage	
	Adaptability	
	Complexity	
	Design quality and packaging	
	Cost	
Outer setting	Patient needs and resources	
	Cosmopolitanism	
	Peer pressure	
	External policy and incentives	
Inner setting	Structural characteristics	
	Networks and communications	
	Culture	
	Implementation climate	Tension for change
		Compatibility
		Relative priority
		Organisational incentives and rewards
		Goals and feedback
		Learning climate
	Readiness for implementation	Leadership engagement
		Available resources
		Access to knowledge and information
Characteristics of individuals	Knowledge and beliefs about the intervention	
	Self-efficacy	
	Individual stage of change	
	Individual identification with organisation	
	Other personal attributes	
Process	Planning	
	Engaging	Opinion leaders

		Formally appointed internal implementation leaders
		Champions
		External change agents
		Key stakeholders
		Innovation participants
	Executing	
	Reflecting and evaluating	

Appendix III Interview Guide

Introductie

Bedankt dat u mee wilt werken aan dit onderzoek. Ik zal nu eerst een en ander uitleggen over het onderzoek. Binnen het obesitas centrum wordt gekeken naar de mogelijkheden om mHealth te implementeren. MHealth is mobiele technologie die wordt ingezet om zorg te ondersteunen of te leveren. Het implementatie proces is erg belangrijk bij de implementatie van technologie. Daarom willen wij voor de implementatie onderzoeken of er al verbeter punten geïdentificeerd kunnen worden. Om deze reden ga ik je vragen stellen die kunnen helpen deze verbeter punten naar boven te halen. Het interview zal ongeveer 30 tot 45 minuten duren.

Ik zou graag dit interview willen opnemen. De gegevens zullen anoniem worden gebruikt, verwerkt en besproken met derden betrokken bij dit onderzoek. Heeft u bezwaar tegen het opnemen van het interview?

Ik zal nu eerst een korte omschrijving geven van mHealth, zodat u een beetje een beeld hebt wat het is en hoe het gebruikt zou kunnen worden:

Een mHealth applicatie is een smartphone app die zorg kan leveren of die zorg kan ondersteunen buiten het ziekenhuis. Met behulp van een smartphone app kunnen patiënten gemonitord worden. De stappenteller op de telefoon kan bijvoorbeeld gebruikt worden om beweging te monitoren of een elektronisch voedsel dagboek kan helpen om de eiwitten te tellen. Daarnaast kan via een app een patiënt ook gecoacht worden, ook op basis van de gemonitorde variabelen. Dit kan door middel van automatisch gegenereerde berichten of door contact met een zorgprofessional via bijvoorbeeld een chat.

Heeft u hier nog vragen over?

Dan beginnen we met de eerste vraag

HEALTHCARE PROVIDER

Core readiness	Wat vindt u van het huidige post-bariatrische na traject?
	Wat zou u veranderen aan het post-bariatrische na traject?
	Wat denkt u over het toevoegen van mHealth aan het na traject?
Organisational readiness	Ervaart u support vanuit het management op het gebied van mHealth?
	Is er binnen het Obesitascentrum een technologiebeleid?
	Heeft u het gevoel dat het Obesitascentrum klaar is voor het gebruik van mHealth?
	Wordt vanuit het Obesitascentrum gebruik van technologie gestimuleerd?
Healthcare provider readiness	Heeft u al eens gebruik gemakt van mHealth applicaties?
	Was dit gebruik persoonlijk of professioneel?
	Hoe heeft u dit gebruik ervaren?
	Hoe staat u tegenover het gebruik van een mHealth app in het post bariatrische traject?
	Wat verwacht u dat een mHealth app voor u kan doen in uw werk binnen het Obesitascentrum?
Engagement readiness	Wordt er binnen het Obesitascentrum gepraat over mHealth en de gevolgen hiervan?
	Heeft u het gevoel dat u de capaciteiten bezit om mHealth te gebruiken in uw werk?
	Bent u bereidt training te volgen op het gebied van mHealth wanneer dit geïmplementeerd wordt?
Societal readiness	Hoe wordt er binnen het Obesitascentrum gecommuniceerd?
	Is er veel interactie binnen het obesitascentrum tussen de professionals?
	Hoe ervaart u deze interactie?
	Denkt u dat mHealth zou kunnen bijdragen aan de interactie op het Obesitas centrum?

Dit was de laatste vraag van het interview. Heeft u verder nog aanvullingen of vragen?

Bedankt voor uw deelname aan het dit onderzoek.

UNIT LEADER

Core readiness	Wat vindt u van het huidige post-bariatrische na traject?
	Wat zou u veranderen aan het post-bariatrische na traject?
	Wat denkt u over het toevoegen van mHealth aan het na traject?
Organisational readiness	Ervaart u support vanuit het management op het gebied van mHealth?
	Is er binnen het Obesitascentrum een technologiebeleid?
	Heeft u het gevoel dat het Obesitascentrum klaar is voor het gebruik van mHealth?
	Wordt vanuit het Obesitascentrum gebruik van technologie gestimuleerd?
Engagement readiness	Wordt er binnen het Obesitascentrum gepraat over mHealth en de gevolgen hiervan?
	Heeft u het gevoel dat u de capaciteiten bezit om mHealth te gebruiken in uw werk?
	Bent u bereidt training te volgen op het gebied van mHealth wanneer dit geïmplementeerd wordt?
Societal readiness	Hoe wordt er binnen het Obesitascentrum gecommuniceerd?
	Is er veel interactie binnen het obesitascentrum tussen de professionals?
	Hoe ervaart u deze interactie?
	Denkt u dat mHealth zou kunnen bijdragen aan de interactie op het Obesitas centrum?

Dit was de laatste vraag van het interview. Heeft u verder nog aanvullingen of vragen?

Bedankt voor uw deelname aan het dit onderzoek.

ICT

Organisational readiness	Ervaart u support vanuit het management op het gebied van mHealth?
	Is er binnen het Obesitascentrum een technologiebeleid?
	Heeft u het gevoel dat het Obesitascentrum klaar is voor het gebruik van mHealth?
	Wordt vanuit het Obesitascentrum gebruik van technologie gestimuleerd?
Technological/infrastructural readiness	Wat is er nodig om een mHealth app te gebruiken binnen het Obesitascentrum?
	Zijn deze faciliteiten aanwezig?
	Heeft ICT de kwaliteiten om support te geven over het gebruik van een mHealth app?

Dit was de laatste vraag van het interview. Heeft u verder nog aanvullingen of vragen?

Bedankt voor uw deelname aan het dit onderzoek.

Appendix IV Survey

Hallo,

Ik ben Carlijn Mels en ik studeer Gezondheidswetenschappen aan de Universiteit van Twente. Voor mijn masterthesis doe ik onderzoek naar de implementatie van mobiele technologie binnen het bariatrische na traject. Ik focus mij vooral op de verbeterpunten die voor de implementatie al aangepakt kunnen worden.

Bij de implementatie van technologie is het erg belangrijk dat de mensen die in aanraking komen met deze technologie zich hier klaar voor voelen. Met behulp van deze vragenlijst kijk ik naar de algemene technologische readiness van het Obesitascentrum. Eerst zullen er wat algemene vragen gesteld, zoals geslacht, leeftijd en functie. Vervolgens wordt van 16 stellingen gevraagd in hoeverre u het eens bent met de stelling: volledig oneens tot volledig eens. Het invullen van deze vragenlijst zal ongeveer … minuten duren.

De gegevens van de enquête zullen anoniem geanalyseerd en verwerkt worden in een verslag. U kunt uw deelname op elk gewenst moment terugtrekken. Door op volgende te klikken geeft u aan hiervan op de hoogte te zijn en gaan u akkoord met het gebruik van de door u verstrekte gegevens en antwoorden. Uw deelname aan dit onderzoek is volledig vrijwillig en u kunt stoppen op elk gewenst moment.

Ik wil u alvast bedanken dat u de tijd neemt om deze vragenlijst in te vullen.

Met vriendelijke groet,

Carlijn Mels

Algemene vragen

Wat is uw geslacht?

- ☐ Man
- ☐ Vrouw

Wat is uw leeftijd?

…… jaar

Wat is uw functie binnen het Obesitascentrum?

- ☐ Basispsycholoog
- ☐ Chirurg
- ☐ Diëtiste
- ☐ Fysiotherapeut
- ☐ GZ-psycholoog
- ☐ Internist
- ☐ Medisch secretaresse
- ☐ Psychologisch medewerker
- ☐ Obesitasverpleegkundige
- ☐ Verpleegkundig specialist

Bij welke onderdelen van het bariatrische proces bent u betrokken? *Er zijn meerdere antwoorden mogelijk.*

- ☐ Pre-bariatrische traject
- ☐ Bariatrisch chirurgische ingreep
- ☐ Post-bariatrische traject
- ☐ Anders, namelijk:

In het volgende deel wordt u mening gevraagd over een aantal stellingen. Voor iedere stelling wordt naar de mate waarin u het (on)eens bent met de stelling gevraagd. Geef het antwoord dat het meest overeen komt met uw gedachte. U kunt bij elke stelling maar één antwoord geven.

	Helemaal oneens	Oneens	Neutraal	Eens	Helemaal eens
Nieuwe technologieën dragen bij aan een betere kwaliteit van leven					
Technologie geeft mij meer bewegingsvrijheid					
Technologie geeft mensen meer controle over hun dagelijks leven					
Technologie maakt mij productiever in mijn persoonlijke leven					
Andere mensen komen naar mij toe voor advies over nieuwe technologieën					
Over het algemeen ben ik een van de eersten in mijn vriendenkring die nieuwe technologie verkrijgt wanneer deze verschijnt					
Ik kan doorgaans de werking van nieuwe high-tech producten en diensten uitvinden zonder hulp van anderen					
Ik blijf op de hoogte van de nieuwste technologische ontwikkelingen in mijn interessegebied					
Wanneer ik technische ondersteuning krijg van een leverancier van een high-tech product of dienst, heb ik soms het gevoel dat iemand van mij profiteert die meer weet dan ik					
Technische hulplijnen zijn niet behulpzaam omdat ze de dingen niet uitleggen in termen die ik begrijp					
Op sommige momenten denk ik dat technologische systemen niet gemaakt zijn voor gebruik door gewone mensen					
Er bestaat niet zoiets als een handleiding voor een high-tech product of dienst die in duidelijke taal geschreven is					
Mensen zijn te afhankelijk van technologie om dingen voor hun te doen					
Te veel technologie leidt mensen dermate af dat het schadelijk is					
Technologie verlaagt de kwaliteit van relaties door persoonlijke interactie te verminderen					
Ik heb er geen vertrouwen in om zaken te doen met een plek die alleen online bereikt kan worden.					

Appendix V Factors identified from the interviews

Used codes with factors identified from the coded fragments. Sub-codes with their corresponding code are depicted in italics.

Domain	Code	Factors
Characteristics of the individuals	Knowledge and beliefs about the innovation	mHealth can add something to the post-bariatric programme
		Perceptions of requirements and possibilities of the mHealth app
		Perceptions of what a mHealth app can do in their work
		Mostly the app is perceived as supportive, not as replacing
	Other personal attributes	Professional did use mHealth apps personal/professional
		Professional did not use mHealth apps personal/professional
		Other statements regarding personal attributes
	Self-efficacy	Professional did feel he/she had the capacity to use mHealth
		Professional did not feel he/she had the capacity to use mHealth
	Individual stage of change	Professionals are willing to follow training
Inner setting	Networks and communication	Communication media: face-to-face, telephone, e-mail, MDO, letter
		There is a lot of interaction
		Interaction is perceived as good
	Structural characteristics	Size of the Obesity Centre
		Current protocols in the Obesity Centre
		Current way of working within the Obesity Centre
		The Obesity Centre is now ready for the implementation of mHealth
	Implementation climate	The Obesity Centre does stimulate the use of technology (to patients)
		The Obesity Centre does not stimulate the use of technology
		There is no debate among professionals concerning mHealth and the consequences of mHealth
		There was a debate among professionals concerning mHealth when the pre-bariatric app was developed
	Tension for change	Initially the current post-bariatric programme is good

Implementation climate		When asked changes could be made in the post-bariatric programme
	Compatibility	Connection between the mHealth app and the EPR
Readiness of implementation	*Leadership engagement*	No feeling of management support due to financial cutbacks, no mHealth app present
		Unit head does support mHealth
	Access to knowledge and information	No technology policy is present
	Available resources	One supplier has ability to link to EPR
		Supplier has no app for bariatric surgery
Innovation characteristics	Innovation source	Positive about mHealth app used in other hospital
		Initiatives from private individuals
Outer setting	Needs and resources of those served by the organisation	User friendliness
		Questions whether patient population is ready for mHealth
		Statements regarding characteristics of the patient population (e.g age).
	Cosmopolitanism	A network of physical therapists has been developed