USE OF HOME MEDICATION DURING HOSPITAL ADMISSION

AN EFFECT- AND PROCESS EVALUATION

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Preface

This thesis is the final component of the Master's in Health Sciences with a focus on Optimization and Innovation of Healthcare Processes at the University of Twente. The assignment started at Medisch Spectrum Twente in Enschede. Following this challenging period of hard work and, above all, optimism, I proudly present this thesis entitled "*Use of Home Medication during Hospital Admission: an Effect- and Process Evaluation*." I have learned a great deal and I would therefore like to thank the people who supported me during this final period of my studies.

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I hope you will enjoy reading this thesis.

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Abstract

Introduction

The Institute of Medicine has released a report named *Crossing the Quality Chasm*, which provides a plan that classifies and unifies the components of healthcare quality by stipulating six elements for improvement: safety, effectiveness, efficiency, timeliness, patient centeredness, and equitability. The aims of these topics (patient safety, increasing healthcare costs, the waste of medication, and the upcoming trend of shared decision-making) are reasons to implement the innovation "Use of Home Medication during Hospital Admission" (UHDH). Use of Home Medication during Hospital Admission is an innovation according to which patients bring their own medication to hospitals and use their own medication during admission. Although the use of patients' own medication (POM) may appear unsafe, the effects that can be expected are significantly important, making it useful to allow patients to bring their own medication to hospital under the right conditions. The objective of the effect evaluation is to determine whether UHDH has an effect on medication adherence and patient satisfaction. The objective of the second study is to identify the determinants that affect the implementation process of UHDH using data from two different departments, the Internal Medicine (Hematology) and the Neurology departments, in order to improve medication safety, efficiency, patient centeredness, and consequently the overall healthcare quality.

Methodology

The effect evaluation includes a pretest and posttest design. To measure whether the innovation influenced medication adherence and patient satisfaction with medication use, a questionnaire was developed. Two months prior to the implementation of UHDH, 18 patients filled in the questionnaire. Three weeks after the implementation of UHDH, 15 patients filled in the questionnaire. The questions regarding adherence were supported by the Morisky Measurement Adherence Scale 8. Furthermore, a literature study was conducted to develop questions to determine patient satisfaction with medication use. The process evaluation included a cross sectional study design. Determinants found in the literature led to an (online) questionnaire that was filled in by 56 respondents, in order to determine the facilitating and impeding factors of the implementation process of UHDH according to the stakeholders.

Results

No significant differences were observed for the medication adherence and patient satisfaction. However, slight differences were observed in terms of adherence between the pretest and posttest. The multivariate analysis revealed that the effects of the independent variables on the differences in the average adherence score were not significantly associated. A small trend was noticed for all the mean scores of patient satisfaction in this study, as these were higher in the pretest. The process evaluation revealed that the most impeding determinants and significant differences were found in the organization category of determinants for both the Internal Medicine (Hematology) and Neurology departments. For both departments, the most facilitating factors were found in the healthcare professional category. Additionally, the emotions of the stakeholders in the Internal Medicine (Hematology) department towards UHDH were more negative than those of stakeholders of the Neurology department.

Conclusion

The effect evaluation shows that the level of both medication adherence and patient satisfaction with medication use is very high in both the pretest and posttest. This ceiling effect could be an important factor explaining why only a slight increase in adherence and patient satisfaction was observed. Another possible reason could be that UHDH was poorly implemented. The process evaluation shows that an innovation, such as the UHDH, requires a well prepared organization, which was not the case here. Implementing such an innovation while an organization is undergoing restructuring and other implementations are executed simultaneously is not advisable. If the organization meets the conditions, such as the development of storage of POM, medication safety could be improved and cost savings ultimately achieved. To execute this implementation differently in the future, recommendations are provided.

Samenvatting

Introductie

Het instituut van geneeskunde heeft een rapport uitgebracht, genaamd Crossing the Quality Chasm, met een plan dat de componenten van kwaliteit van zorg classificeerde middels zes doelen voor verbetering: veiligheid, effectiviteit, efficiëntie, tijdigheid, patiëntgerichtheid en gelijkheid. Onderwerpen van deze doelen (de patiëntveiligheid, de toenemende zorgkosten, verspilling van medicatie en de opkomende trend van gedeelde besluitvorming door patiënt en professional) zijn redenen om de innovatie “Doorgebruik Thuismedicatie” (DGTM) te implementeren. Patiënten nemen hun eigen medicatie mee naar het ziekenhuis en gebruiken deze gedurende de opname. Hoewel het gebruik van eigen medicatie in het ziekenhuis onveilig lijkt, zijn de effecten die kunnen worden verwacht zo van belang, dat het nog steeds nuttig is om patiënten hun eigen medicatie onder de juiste voorwaarden naar het ziekenhuis mee te laten brengen. Het doel van de effectevaluatie is om te bepalen of DGTM een effect heeft op de medicatie therapietrouw en de tevredenheid van de patiënt. Het doel van de procesevaluatie is om de determinanten te identificeren die van invloed zijn op het implementatieproces van DGTM volgens de afdeling Interne Geneeskunde (Hematologie) en Neurologie. Met als doelen de medicatieveiligheid, efficiëntie, patiëntgerichtheid te verbeteren, en daarmee de kwaliteit van zorg.

Methode

De effectevaluatie omvatte een voor- en nameting. Om te meten of de innovatie de medicatie therapietrouw en patiënttevredenheid van medicijngebruik beïnvloedde, werd een vragenlijst ontwikkeld. Twee maanden voorafgaand aan de implementatie van UHDH vulden 18 patiënten de vragenlijst in. Drie weken na de implementatie van UHDH vulden 15 patiënten de vragenlijst in. De vragen over de medicatie therapietrouw werden ondersteund door de Morisky Measurement Adherence Scale 8. Verder werd een literatuurstudie uitgevoerd om vragen te ontwikkelen om de patiënttevredenheid van medicatiegebruik te bepalen. De procesevaluatie omvatte een cross-sectioneel ontwerp. Determinanten, gevonden in de literatuur, leidden tot een (online) vragenlijst, die werd ingevuld door 56 respondenten, om de faciliterende en belemmerende factoren te bepalen van het implementatieproces van DGTM volgens de stakeholders.

Resultaten

Er werden geen significante verschillen waargenomen voor de medicatie therapietrouw en de tevredenheid van de patiënt. Er werden echter kleine verschillen waargenomen voor de medicatie therapietrouw tussen de voor- en nameting. Uit de multivariate analyse bleek dat de effecten van de onafhankelijke variabelen op de verschillen in de gemiddelde medicatie therapietrouw niet significant geassocieerd waren. Een kleine trend werd opgemerkt voor alle gemiddelde scores van patiënttevredenheid in deze studie: deze waren hoger in de pretest. In de procesevaluatie werd vastgesteld dat de meest belemmerende determinanten en significante verschillen werden gevonden in de organisatiecategorie van determinanten voor beide afdelingen. Voor beide afdelingen werden de meest faciliterende factoren gevonden in de categorie gezondheidszorgprofessionals. Daarnaast waren de emoties van de respondenten van de afdeling Interne Geneeskunde (Hematologie) in de richting van DGTM negatiever en minder positief dan de respondenten van de afdeling Neurologie.

Conclusie

De effectevaluatie toonde aan dat de score van zowel de medicatie therapietrouw als de tevredenheid van de patiënt over het medicijngebruik erg hoog was, zowel in de voor- als de nameting. Dit effect zou een belangrijke factor kunnen zijn dat verklaart waarom slechts een kleine toename in therapietrouw en patiënttevredenheid werd waargenomen. Een andere mogelijke reden zou kunnen zijn dat DGTM slecht is geïmplementeerd. De procesevaluatie toonde aan dat een innovatie zoals DGTM een goed voorbereide organisatie vereist, wat hier niet het geval was. Het implementeren van een dergelijke innovatie, terwijl een organisatie momenteel wordt geherstructureerd en andere implementaties tegelijkertijd worden uitgevoerd, is niet wenselijk. Als de organisatie aan de voorwaarden voldoet, kan de medicatieveiligheid worden verbeterd en uiteindelijk kostenbesparingen worden bereikt. Om deze implementatie in de toekomst anders uit te voeren, worden aanbevelingen beschreven.

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1. Introduction

In 2001, the Institute of Medicine (IOM) released a report named *Crossing the Quality Chasm* which provided a plan that ordered and unified the components of healthcare quality through six aims for improvement (1). These six dimensions are safety, effectiveness, efficiency, timeliness, patient centeredness, and equitability; these are considered very important for the current healthcare system, as they are fundamental to all healthcare changes (2). Although medication safety is an issue in healthcare in general, it is particularly prominent in hospitalized patients (3) and is therefore in need of increased attention in the context of Dutch hospitals (4). Even though the medication process has improved on the local, national, and international levels during the past years, there are still challenges in these areas (4)(5). For years, the World Health Organization (WHO) has been trying to engage key stakeholders, partners, and the industry to raise awareness about unsafe medication practices and actively pursue the improvement of medication safety all over the world (6). Efficiency is also of great importance in a healthcare environment. According to Berwick (2), efficiency means that healthcare should be cost-effective and waste should be removed from the system. In addition, patients are becoming increasingly involved in healthcare and are allowed to make their own decisions during treatment (7). Medication safety, patient safety, increasing healthcare costs, the waste of medication, and the trend of shared decision-making are the focus of the six aims and underlie the implementation of the innovation "Use of Home Medication during Hospital Admission" (UHDH); these aim to change the medication process, making it more safe, efficient, patient centered, and of a higher quality. UHDH is an innovation that allows patients to bring their own medication to hospitals and use it during admission. In this way, physicians do not need to prescribe much hospital medication since patients bring most of the medication from home.

The current state of affairs is that patients stop using their home medication during hospital admission. A hospital physician re-prescribes (some of) the home medications and/or prescribes new medications to be used during the hospital stay. Currently, 40% of home medication is substituted by other medications during hospitalization (8), which has a number of consequences. Each medicine that has to be reversed by a pharmacy costs 15 minutes of their time, resulting in a loss of €6 million a year in The Netherlands (8). Patients do not normally use the initial medication after discharge; instead, they leave the hospital with medication other than the one they used at home, which results in discarded medication (9). The substitution of home medication following hospital admission has become more common for shorter time periods because of the increase in short-stay admissions (10). More importantly, because of such substitutions, medication errors can occur, such as prescription errors or documentation errors. Moreover, the use of drugs with a different appearance can be confusing for patients, adversely affecting medication adherence (9). One way of achieving less medication substitution during hospital admission is to maintain the use of patients' own medication (POM) during hospitalization.

Although the use of POM may appear unsafe, the expected effects are so important that it is useful to allow patients to bring their own medication to hospital under the right conditions. According to Lummis & Sketris (11), hospitals need to put an effort into the development of identification, storage, and documentation of POM, in order to achieve effects such as medication safety and cost savings. If the conditions are met, hospitals can benefit from the advantages of the use of POM in hospitals. Potential cost savings were cited as a main advantage by 67% of 72 hospitals in Canada, followed by decreased inventory with 57%, and reduced delays in therapy and continuity of care, both at approximately 20% (11). Other examples of benefits include the continuation of well-known treatment; less drug waste within the healthcare system; and a better compliance after discharge (8)(12)(11)(13). Furthermore, Grissinger (12) has stated that patients bring their own medication because they are more satisfied with the fact that they can self-administer it. The importance of POM can therefore be viewed from different perspectives (those of the patient, healthcare professional, and organization).

In practice, addressing the use of POM appears to be difficult sometimes (11)(12). Although the majority (72%) of hospitals in Canada has an approved policy regarding the use of home medication, challenges were faced in order to improve this policy, especially for the remaining 28% of hospitals. These challenges were: the verification

and storage of POM; public and staff awareness; communication; and staff resources, such as the time to process medications (11)(14). Yet, these challenges are important conditions to successfully implementing an innovation involving POM (11). In several studies, potential medication errors were cited as a main disadvantage of POM (12)(11)(15)(14). The substitution of medication was often described as an important reason for these medication errors (9)(15)(14). Other causes included complex drug names; a high workload; sloppiness and the absence of double checking; an inadequate medical record and/or prescription (15); and the differences between home medication and hospital medication (14). In almost half of the 879 reports in a study by the Pennsylvania Patient Safety Authority, unauthorized medication was described as a main medication error. In 2-24% of the reports, errors such as a wrong dose or overdose were mentioned (12). Furthermore, the issues cited included medications not being a part of the pharmacy drug distribution system, as well as a lack of knowledge about when refills were needed (both 19%), delays in therapy while awaiting verification of medication, and patient dissatisfaction with using their own medications (both beneath 10%) (12).

Although the adoption of POM is often experienced as difficult and challenging, the innovation has garnered much positive feedback, and hospitals often voluntarily choose to adopt POM. Rather than relying on the initiative of patients to bring their medication to hospital, which may confuse both patients and professionals and cause errors, it appears better to institute a hospital policy regarding the use of home medication applicable to all patients. The innovation UHDH was therefore launched by the Dutch government, as part of the Approach of Waste in Healthcare program. The pilot was first executed at one of the departments in the hospital Radboud UMC, after which other hospitals executed the pilot in their departments under the supervision of the Radboud UMC. Subsequently, the Dutch hospital, Medisch Spectrum Twente (MST), implemented the innovation UHDH in the Internal Medicine (Hematology) department.

In this study, an effect- and process evaluation of the innovation UHDH are carried out. The two primary outcomes of an effect evaluation are medication adherence and patient satisfaction with medication use. The measurement of medication adherence and patient satisfaction is important because it is crucial for both patients and healthcare professionals that the adherence and satisfaction do not deteriorate following the implementation of an innovation (16). Medication adherence is found to be important when it comes to reaching goals such as a higher quality of care and more safety (17). Moreover, patients' participation in medication use must not deteriorate, which requires the (active) involvement of a patient together with a healthcare professional (7). This joint decision-making adds value for both healthcare professionals and patients, as it leads to appropriate care and increases the satisfaction of both (7). Patient centeredness can be measured with patient satisfaction (2). Therefore, an effect evaluation is provided, in order to determine whether the use of home medication is effective in this Dutch setting, according to the opinions of the stakeholders (patients) involved in the Internal Medicine (Hematology) department. The first objective is to determine whether UHDH has an effect on medication adherence and patient satisfaction with medication use.

In addition to the effect evaluation, a process evaluation is carried out. It often takes a long time before innovations in healthcare find their way into daily practice and eventually achieve their intended results (18)(19). In the context of healthcare, there are many different interventions, as there is no such thing as one practice for all innovations in all settings (18). Even if healthcare professionals are directly confronted with potential improvements, adjustments often do not take place in their daily routines (18). Therefore, it is important to also focus on the implementation process itself.

The process evaluation is conducted by identifying the facilitating and impeding factors that affect the implementation process of UHDH by means of a questionnaire addressed to two different departments: the Internal Medicine (Hematology) department (where the pilot has been executed) and the Neurology department (the control group in this study). It was decided to compare two different departments in order to determine if there is any difference in opinions about UHDH. In this way, it can be determined whether the same conditions and criteria apply to each department or whether each department has its own characteristics that need to be taken into account and investigated prior to the implementation process. The stakeholders involved in the

process evaluation are the nurses, physicians, pharmacy assistants/Medication Assignment (MA), and pharmacy assistants/Medication Verification (MV). With the results of this study, the MST hospital may be able to improve the implementation of UHDH in different hospital departments in the future.

The research questions of this study are as follows:

1. What is the influence of the innovation UHDH on medication adherence and patient satisfaction with medication use in the Internal Medicine (Hematology) department at MST?
2. Which determinants affect the implementation process of the innovation UHDH in the Internal Medicine (Hematology) department, and which determinants affect the implementation process if UHDH is also introduced in the Neurology department of MST?

For the first research question, it is hypothesized that both medication adherence and patient satisfaction with medication use will improve while using home medication during hospital admission. Thus, UHDH positively affects medication adherence and patient satisfaction with medication use.

For the second research question, it is hypothesized that the same determinants positively and negatively affect the implementation process for both the Internal Medicine (Hematology) and the Neurology departments according to the stakeholders.

2. Theoretical framework

The theoretical framework discusses the most important aspects of implementations of innovations in healthcare. Those are useful in creating the research proposal, as well as interpreting the results.

Implementation is a term often used in healthcare and is linked to other terms such as improvement, change, diffusion, and innovation. This makes it a term with an ambiguous meaning (20). The following description of the term implementation is particularly apt: "a processual and planned introduction of innovations and/or improvements with the aim of making this become a structural place in the professional activity and/or the functioning of the organization" (21).

Implementation of complex innovations in healthcare organizations

The amount of new innovations and technologies in healthcare is growing. Such changes improve the quality of care and patients' safety (22). Information found in other studies suggests that the implementation of complex innovations can improve these processes; however, such implementations are often not executed well (14)(23)(24). Approximately 30-90% of innovation implementations in healthcare organizations fail (23).

There is a growing interest in the use of several approaches to gain an insight into all kinds of healthcare implementations, for example the implementation of a new device, a process, or eHealth, and why some of them are more likely to succeed than others (25). Every innovation is different and there are so many of them. There are often many stakeholders with individuals interests involved in an innovation implementation, which can result in a conflict of interests (25). If one of these stakeholders and its practice are not comfortable with an innovation, its implementation becomes difficult (20). Systematic approaches with proper planning and preparation are important to achieve the effective implementation of innovations (26). The process of an innovation implementation can be affected by different determinants (27)(24).

Determinant categories

Determinants can be categorized in many ways. The focus can be on determinant categories such as patients, employees, or the process itself (28). Moreover, different levels can be distinguished, such as the hospital and department levels, as well as the professional interaction and individual levels (29). Sometimes determinants are divided into primary drivers (for example planning and infrastructure) and secondary drivers (for example vison and aim or resources) (30). A driver can be referred to as a barrier or facilitator (31). The most common five determinant categories in the literature are the user (or healthcare professional), the technological innovation, the patient, the socio-political context, and the organizational context (22). For each of these categories, other determinants are described, with some being more important than others. Determinants found in this literature review, and that are relevant in this study, are listed in Table 1. The determinants are categorized in the categories of the healthcare professional, the organization, the innovation, and the socio-political category. These categories are chosen because they are most relevant in this study, were the focus is on an innovation in a hospital department. In addition the Measurement Instrument of Determinants of an Innovation (MIDI) by Fleuren et al. can be used to evaluate implementation processes in healthcare (32). MIDI uses the same four categories, is rather up-to-date and is applicable to an extensive variety of settings in healthcare (32).

At the level of the healthcare professional, many different, frequently mentioned determinants can be distinguished. Some are only related to the actual user of the innovation, for example a professional's capacity to adopt said innovation (22)(30)(28)(31)(33). Other determinants are related to the professionals who cooperate with the user of the innovation, such as the communication between healthcare professionals in different (involved) departments (30). The support of these other colleagues is found to be important (22)(30)(28)(31).

The research to the category “the technological innovation” is scarce. According to the study of de Veer et al. (22), determinants that belong to the category “the technological innovation”, focus on the relative advantage, the ease of use, and the relevance of an innovation for patients. As can be seen, the determinants are described generally, which might be caused by the fact that each innovation contains of specific characteristics that need to be taken into account. That is probably the reason that this category is not often mentioned in other studies in contrast to the other four categories (healthcare professional, the patient, socio-political context, and organizational context).

For the determinant category “the patients,” the focus is usually on the effect evaluation during or after the implementation to measure the appreciation of an innovation (28)(31). Patients’ characteristics (such as age, diseases, physical, and emotional condition) and the effects of these characteristics on the way they want to be involved in the development of an innovation are important factors determining whether an innovation is likely to succeed (28). Although patients are often very important stakeholders, determinants mainly focus on the primary users of an innovation (healthcare professionals) and organizations, since they have to adopt an innovation in first instance (22). On the other hand, patients evaluate healthcare using their own criteria (34), and patient satisfaction is therefore very important to determine. The inclusion of individual patients preferences in treatment decisions improves the patient satisfaction and adherence to treatment and is called Shared Decision Making (7). And since the patient is involved in treatment decisions, this will affect implementation processes also.

Of the determinants identified, most belong to the organizational category. On this level, the focus is not only on innovation, but on an organization as a whole. Leadership appears to be of great importance, especially in terms of the extent to which leaders can make necessary changes (29)(30)(31)(33)(35)(28). A leader is responsible for the endorsement of an innovation, especially by his or her colleagues. In addition, the vision or aim of an innovation has to be the clear to everyone to achieve a successful implementation (28)(30). In order to prevent the organization from an unfortunate result, evaluation and monitoring during the implementation appear to be important factors because in this way, the implementation can constantly improve, according to the literature (30)(33)(28).

The determinants in Table 1 are derived from different kinds of innovations, which can be divided into general innovations, service innovations, process innovations, system or program innovations, and model innovations, as well as innovations focused on eHealth. Many determinants belong to several types of innovations. The studies on general innovations focus on healthcare in general or large-scale innovations in regional or national settings (30). Service innovations are innovations that focus on providing better information to the patient prior, during or after a treatment. The process innovations focus on (a part of) the process in healthcare settings. This involves small processes in hospitals, but also complete care paths from general practitioner to the specialist. System or program innovations focus on a better integration of certain systems or programs, such as an electronic health record system but also focus on a better integration of palliative care in primary healthcare (36). Additionally, there are model innovations, which are very complex interventions, mainly because many stakeholders are involved (33). Model innovations focus, for example, on mobilizing community resources, enabling patient self-management, care coordination, or health promotion (33). At last, there are eHealth innovations. These innovations are very popular due to the increasing use of ICT in healthcare. Examples of eHealth innovations are telemonitoring of patients with chronic health conditions, but also prevention using technology to keep people healthy.

The determinants that are found to be relevant in this study are mentioned in more than one innovation category or are found to be relevant by the researchers of this study (which is determined by experience).

Table 1 Determinants, affecting implementation processes divided into four categories: healthcare professional, the technological innovation, the patient, the socio-political context, and the organizational context.

Determinants	Definitions	References	Innovation group[1]					Excluded in this study
			GI	SI	PI	MI	EI	
HEALTHCARE PROFESSIONAL								
Skills and knowledge	Extent to which the healthcare professionals have pre-existing knowledge or expertise about targeted condition, and do they have the skills to adhere.	(29)(22)(30)(31)(33)	X		X	X	X	
Communication	Extent to which the healthcare professionals communicate between the different involved departments or disciplines.	(30)	X					
Commitment / Willingness to cooperate	Extent to which all organizations jointly develop, understand, and implement the innovation based on compromises and consensus. Also, the capacity to listen and respect opinions of the other departments or disciplines involved. In addition, the extent to which there is resistant to change.	(31)(33)(35)(28)		X	X	X		
Support colleagues	Support from colleagues in using the innovation.	(22)(30)(31)(28)	X	X	X		X	
Feelings healthcare professionals	The most frequently mentioned emotions are ignorance, skepticism, frustration, enthusiasm, motivation, satisfaction, stress, and empathy.	(31)(28)		X	X			
Education	Extent to which there is adequate education and training for the healthcare professionals.	(36)			X			
Trust	Extent to which professionals being open and transparent with each other and trusting in the other departments or disciplines that the initiative will be successful.	(28)		X				X
Identification of suitable patients	Are the right patients been chosen to cooperate with the innovation?	(36)			X			X

Determinants	Definitions	References	Innovation group[1]					Excluded in this study
			GI	SI	PI	MI	EI	
TECHNOLOGICAL INNOVATION								
Relevance for patient / patient focused	Extent to which the innovation is relevant for the patient and if it is based on the needs and preferences of patients.	(22)(28)		X			X	
Relative advantage	If the innovation is perceived advantageous or not (shortcomings).	(22)					X	
Supported and encouraged	Extent to which the innovation is supported and encouraged to engage with care.	(33)				X		X
Planning and infrastructure	Considerations about planning and infrastructure or having a well-structured project structure. Having an action plan.	(30)(28)	X	X				
Relevance to everyday tasks	Extent to which the implementation is relevant to everyday task.	(30)	X					X
Ease of use of innovation	Extent to which the innovation is easy to use.	(22)					X	X
Functioning innovation	Extent to which the innovation is functioning, looking at: dysfunctional or does it contain bugs for example.	(22)					X	X
Research	Extent to which there has been research about the innovation.	(31)(35)		X	X			X
THE PATIENT								
Appreciation of service	Extent to which patients appreciate the innovation.	(31)		X				
Safety for patient	Extent to which the technology carries risks for the patient compared with the existing situation.	(22)					X	
Patient characteristics	Age of patients, their diseases, their physical and emotional condition and the effects of these aspects on the way they want to be involved in the development of the innovation and are interesting to use it.	(28)		X				

Determinants	Definitions	References	Innovation group[1]					Excluded in this study
			GI	SI	PI	MI	EI	
Experienced results	Frequency of evaluation during the evaluation process.	(31)		X				X
Understanding the innovation	Extent to which the patient understands why there is this innovation.	(28)		X				X
SOCIO-POLITICAL CONTEXT								
Legislation and regulations	Extent to which the technological innovation fits in with existing legislation and regulations.	(22)(32)	X	X	X	X	X	
ORGANIZATIONAL CONTEXT								
Vision/aim	Extent to which the vision and aim are the same for everyone.	(30)(28)	X	X				
Workload	Extent to which there is a high (impede) or a low (facilitate) workload.	(30)(35)	X	X				
Resources	Extent to which the resources that are needed to adhere are available, like: time, personnel, funding, investment, space, material, capability, capacity, collaborations other health care services.	(29)(22)(30)(31)(33)(35)(28)(36)	X	X	X	X	X	
Leadership	The number of leaders in the organization and the extent to which there are leaders that can make necessary changes.	(29)(30)(31)(33)(35)(28)	X	X	X	X		
Information	Extent to which there is information provided about the change and is there guideline or protocol accessibility in the organization.	(29)(33)	X			X		
Timing	Extent to which the organization choose the right timing.	(28)		X				
Monitoring and evaluating (feedback systems)	Extent to which there has been monitored and organized an evaluation during the implementation process (with feedback for example)	(30)(33)(28)		X				

Determinants	Definitions	References	Innovation group[1]					Excluded in this study
			GI	SI	PI	MI	EI	
Involvement	Extent to which nurses are involved in the development of the innovation strategy or the technology.	(22)					X	X
Champions	Extent to which there is a champion available who is promoting the implementation or innovation.	(30)	X					X
Failure in system	Extent to which there is a failure in the system that affects adherence.	(29)	X					X
Quality improvement team	Extent to which there is a quality improvement team present.	(29)	X					X
Link between innovation and important objectives of organization	Extent to which there is a possibility to link the innovation to important objectives of the organization.	(31)			X			X
Social networks	Extent to which there are social networks to generate motivation and increase energy for improvement.	(30)	X					X
Learning networks	Extent to which there are learning networks to maximize workforce improvement capability.	(30)	X					X
Organization and system capability	The ability to plan and deliver widespread innovation requires scale-up and spread capability. Relationship building, leadership investment, and training are pivotal.	(30)	X					X
Organization and system culture	Sensitivity to local cultural norms and the ability to identify potential cultural strengths and weaknesses.	(30)	X					X
Data infrastructure	Extent to which there is a sound data process and infrastructure in place to collect reliable and valid data and link the data to the change initiative and results.	(30)	X					X

Determinants	Definitions	References	Innovation group[1]					Excluded in this study
			GI	SI	PI	MI	EI	
Change theories used	Extent to which the underlying change theory drives the work.	(30)	X					X
Culture change regarding palliative care across settings.	Extent to which there is a change regarding palliative care cross settings.	(36)			X			X
Structure of the US healthcare system	Extent to which the structure of a system is fragmented or not.	(36)			X			X
Regulatory barriers to greater palliative care integration in nursing home setting.	Extent to which there are regulatory barriers to greater palliative care integration in the nursing home setting.	(36)			X			X

[1]*Abbreviations: General innovations (GI), Service innovation (SI), Process innovations (PI), Model innovations (MI), eHealth innovations (EI)*

3. Methodology

In this study, there are two study designs concerning the same intervention, namely the UHDH.

The innovation UHDH was implemented for two months for patients in the E6, Internal Medicine (Hematology) department, beds 102-107, who brought their home medication to the hospital and kept using it during their hospital stay. In order to achieve this, the medication process needed to be rearranged. In this study, the effect of the innovation on medication adherence and patient satisfaction was measured, and the innovation process was evaluated. The initial and rearranged medication process is described below.

3.1. The initial and rearranged medication process

First, the medication process takes place with the pharmacy assistants of the medication verification (MV) at the preoperative screening or, in case of an emergency, the medication list is checked at the ward. All the received information is processed by the online medication program named Pharma. The currently used medication is compared with the home medication, which provides an overall overview of the medication that needs to be used at home after admission. At the hospital pharmacy, the pharmacy assistants are responsible for the medication assignment (MA). When there is a change in medication, the medicine is indicated in red in Pharma. These MAs are checked by the pharmacy assistants before the office receives the order. Controlling the MAs includes, for example, checking whether medicines are still in stock at a particular department or whether the prescribed medication does not exceed the daily maximum. The office then receives the orders they need to prepare for the wards. After that, the medication is taken to the wards and stored in a medical department, called Pysix. For all patients, medication is stored in a personal box in the car-on-wheels (COW), from where it is distributed. In case the deployed medication has not been used, this medication is placed in a box that is returned to the pharmacy. Medication whose packaging has already been opened cannot be reused and must therefore be discarded. To prevent waste, a list of expensive medication that cannot be discarded has been drawn up. At discharge, normally the hospital medication is stopped and patients are supposed to start using their home medication again with or without adjustments made by the hospital physician.

To use home medication during the hospital stay, the medication process is rearranged. Before admission, patients with an elective or follow-up cure admission received a letter from the secretary requesting that they bring their home medication. When the patient was admitted urgently, the family was asked to bring the home medication. At the moment the home medication arrived, the pharmacy assistant MV was called by the nurse to verify the home medication; after that, the medication was stored in a box and was then distributed to the patient at the right time. Sometimes it occurred that a physician stops the home medication at admission. In this case, the patient brought the home medication to the hospital, even though it was not be used. The patient took this medication back home after discharge. Some medication administrations required a second check. Therefore, the nurses executed the medication round with two nurses. In the most ideal situation, a patient is responsible for his or her own medication, which was difficult to execute this in this study because medication administration is the responsibility of the nurses. Therefore patients were not in charge of their own medication during the implementation of UHDH. Medication used during the hospital admission was also used at home. Medication started during admission that must also be used at home must be prescribed and sent to a public/outpatient pharmacy.

The following medications were also excluded during the implementation: the medication that patients received from the clinical pharmacy during the admission, as well baxter medication and opiates.

3.2. The effect evaluation of UHDH

Study design

This study includes a pretest and posttest design. The implementation duration was eight weeks. During the two months prior to the implementation of UHDH and three weeks after discharge from the ward E6 Internal Medicine (Hematology) department, patients were asked to fill in a questionnaire.

Study population

During the pretest, the patients were assigned to beds 102-109 of the E6. Two beds were excluded during the posttest, meaning that only beds 102-107 were ultimately included. For both the pre- and posttest, only the patients whose physical condition was considered suitable by the nurses were asked to participate in the questionnaire. In addition, the patients needed to be fluent in the Dutch language. Three patients who were discharged and moved to another department in the hospital or institution where they were not in charge of their own medication were excluded.

Data collection - questionnaire

For medication adherence and patient satisfaction with medication use, a questionnaire was used as a measurement method. Medication errors were excluded because of the lack of time; the development and execution of other measurements was already underway before the measurement of medication errors could begin. Compared to other measurement methods, completing a questionnaire requires less time from a patient; moreover, questionnaires are relatively simple to develop (36). The questionnaire was divided into two parts, one for medication adherence and one for patient satisfaction with medication use. To develop questions to determine medication adherence, the Morisky Medication Adherence Scale 8 (MMAS-8) was used. The MMAS-8 is a validated measurement that focuses on the limits of the medication adherence and the patients' behaviour of the administration of medication. In addition, the MMAS-8 is suitable for every patient group (17)(37). Therefore, the MMAS-8 was chosen over the MARS (another measurement instrument to measure the adherence) (17). The MMAS-8 is a questionnaire with seven questions that are answered with yes or no; for one question, a five-point Likert scale was used. The outcome is the MMAS-8 score arising from the completed questionnaires. The score for each question could be zero or one. Each "no" response was rated as one and each "yes" response was rated as zero, except for item 5, in which each "yes" was rated as one and each "no" as zero. For item 8, the code (0-4) was standardized by dividing the result by four to calculate a summated score. Thus, the final score is between zero and eight. The medication adherence was divided into three categories: high, moderate, and low. A score of eight meant that a patient had a high medication adherence, a score of six to lower than eight was moderate, and a score lower than six was considered as a patient with low medication adherence. For medication adherence, only the patients who filled in the entire MMAS-8 questionnaire were included.

The second part of the questionnaire contained questions about the patient satisfaction with medication use. The patient satisfaction with medication use was developed in several topics that were divided into eight questions. The subjects of the questions to determine patients' satisfaction were: medication administration before admission; problems with using medication during admission; wishes that were taken into account while using medication; no adverse experiences with the medication at the hospital compared with experiences at home; the way nurses handled the medication; receiving clear information about medication during the discharge conversation; enough information regarding the correct use of medication at home; and the satisfaction with the fact that nurses regulate the medication at the hospital. For this part of the questionnaire, a five-point Likert scale was also used. The questions were analyzed separately. Therefore, the patients were only included when they actually answered the questions. The questionnaire can be found in Appendix I: Questionnaire Medication Use.

Statistical analysis

The data analysis was conducted using SPSS and comparing the data from before and after the implementation of UHDH to provide a statistical analysis. First, a scale reliability analysis was used in order to examine the scale's reliability in the present population. This was done by using Cronbach's alpha. The value for Cronbach's alpha should be at least 0.7. Every value above this point is acceptable, and when the Cronbach's alpha value is lower, it is considered inconsistent (38). Then, the adherence score was calculated. Subsequently, several independent samples t-tests were used to calculate the association between the whole groups in the pretest and posttest and between various sociodemographic factors (sub-groups) related to medication adherence; the latter are presented in the Results chapter. The mean was calculated for patient satisfaction for each subject. The items with a mean higher than 3.0 were considered satisfactory, and the items with a mean score lower than 3.0 were considered not satisfactory. After that, the independent samples t-test was used to calculate the possible association between the pretest and posttest. In addition, the five-point Likert scale was separated into two categories in order to provide a clear overview and because of the small population. Furthermore, a cross-tabulation was conducted, in which the data was classified according to two categorical variables. The nonparametric Chi-Square test of Independence determined whether there was an association between these categorical variables. When 25% of the cells had a value below 5, the Chi-Square test was not suitable. In that case, the value given by Fisher's exact test was used. Finally, a multivariate analysis was done by conducting a linear regression model. The purpose was to determine what the effects of the independent variables were on the differences in average adherence scores of the respondents. The independent variables used were the pre- and posttest, age, gender, and educational level. The independent variables were added in a regression model one at a time.

3.3. The process evaluation of UHDH

Study design

This study has a cross sectional study design, the data for which was obtained using questionnaires three weeks after the start of the implementation of the innovation UHDH, named UHDH-Q. This design is relevant to examining the facilitating and impeding determinants for the innovation in the Internal Medicine (Hematology) department and the Neurology department, identified by the relevant stakeholders.

Study population

A stakeholder analysis was done in order to determine the study population and to decide which professionals should be included in this research. Some stakeholders play a bigger role than others and were therefore included in this research. First, a network of actors describing the current roles of each stakeholder involved in the ongoing medication process was created, depicted in Table 11.

Subsequently, the identification of the stakeholders for this research was done using two techniques. First, a basic stakeholder analysis was conducted (39). This technique was executed using the stakeholders described in the network of actors. The interests of stakeholders in the project UHDH and the extent to which they can influence this project was considered. This was judged on a scale from one to five, where one is "no influence" or "no interest" and five is "has a lot of influence" or "extensive interest". The second technique used was the power versus interest grid, which created a clear matrix using the results from the basic stakeholder analysis (39). By determining how a stakeholder acquires their ability to influence the project and what goals he or she pursues, it was possible to further develop the basic stakeholder analysis. In this way, it becomes clear how a stakeholder depends on the project or how the project depends on a stakeholder (39). The stakeholder analysis can be found in Appendix II. As a result of these analyses, it was determined that the following stakeholders had the greatest interest and influence on the project overall (scores of 4 or 5): the MST board/management; the clinical pharmacy (in particular the pharmacy assistants of the MV and MA); the nurses of the E6 Internal

Medicine (Hematology) and Neurology departments; healthcare insurers; subsidy providers; the physicians directly related to the E6 Internal Medicine (Hematology) and Neurology departments; and the patients and family. Not every stakeholder was included; healthcare insurers and subsidy providers were excluded because this study does not focus on the financial part and laws and regulations and because their share in this implementation was small. The patients and family were excluded in this part of the study because they had a small role in this pilot. Moreover, because of the scope of this research, the focus of the process evaluation was on the healthcare professionals. Patients were included in the effect evaluation.

Data collection – questionnaire UHDH-Q

The determinants, described in Table 1, were found in the literature and during conversations conducted prior to this study in MST; they affect the implementation process of different innovations in healthcare. It was determined which determinants were encountered in what kind of innovation, which were separated into a general innovation (GI), a service innovation (SI), a process innovation (PI), a model innovation (MI), and an eHealth innovation (EI). Those innovations are similar to the innovation UHDH. The determinants derived from innovations focused on systems or programs, for instance, are excluded. For this research, the determinants were divided into four categories: the healthcare professional, the patient, the organization, and the innovation. The determinants that are marked green in Table 1 were included in the questionnaire because they were mentioned in more than one innovation category or were found to be relevant by the researchers of this study (determined by experience).

The determinants of implementations were measured by means of an online questionnaire on a scale from one (totally disagree) to five (totally agree). Nurses from the Neurology department filled in the paper-based questionnaire, available in Appendix III. The UHDH-Q was composed of several determinants that were different for each stakeholder, as can be seen in Table 2. The rest of the stakeholders received an e-mail with a link to their own questionnaire.

The UHDH-Q formulation was based on the measurement instrument for determinants of innovations (MIDI) (32). The MIDI is a validated and reliable instrument that is often used in other studies with satisfactory results. The determinants mentioned in this measurement were compared to the ones found in the literature. The comparison showed that there were many similarities between the determinants. Therefore, the MIDI was complemented, which resulted in 31 relevant determinants. After merging the determinants, new determinant categories were created: the healthcare professional, the innovation, the socio-political environment, and the organization. All stakeholders were provided with some information before answering the UHDH-Q, otherwise they had no knowledge of the innovation.

In contrast to the determinants mentioned in the previous paragraph, only the question about the determinant “feelings healthcare professional” was formulated otherwise. Six feelings could be chosen by the respondent. The respondents of the Internal Medicine (Hematology) department answered this question after they participated in the innovation UHDH. The respondents of the Neurology department did not had any experience with UHDH but they had information about UHDH, so that they could answered the question.

Statistical analyses

The data analysis was conducted with SPSS. First, the mean score of every determinant was calculated for both the stakeholders of the Internal Medicine (Hematology) department and the Neurology department. Cut-off points were developed to determine whether the determinants impede of facilitate the innovation UHDH according to the stakeholders. Determinants were considered facilitating when they had a mean higher than 3.0 and when more than 50% of the respondents had a positive attitude towards them. When a determinant had a mean score of 3.0 or lower or when (less than) 50% of the respondents had a negative attitude towards said determinant, the determinant was considered impeding (40).

The parametric independent samples t-test was used to compare the mean scores of the two independent groups (experienced and inexperienced) in order to determine whether there was statistical evidence that the mean scores were significantly different.

To determine if the stakeholders were mainly positive or negative, the five answer categories (from 1 = strongly disagree to 5 = strongly agree) were divided into two answer categories (1 to 3 = disagree and 4 and 5 = agree). A cross-tabulation was conducted in which the data was classified according to two categorical variables. In addition, a cross-tabulation was conducted to determine which stakeholder group was actually positive towards a determinant in relation to their own stakeholder group (absolute and percentage). A wide variance of the mean score can, for instance, be explained by the fact that nurses totally disagree with a statement while physicians totally agree. Therefore, what percentage of each stakeholder was positive or negative towards a determinant was determined.

The nonparametric Chi-Square test of Independence determined whether there was an association between these categorical variables. When 25% of the cells had a value below five, the Chi-Square test was not suitable. Therefore, the value given by Fisher's exact test was used.

Table 2 Determinants used in UHDH-Q for each stakeholder separately

Stakeholders of Internal Medicine (Hematology) department and Neurology department
A Nurses
B Physicians
C Patients
D Pharmacy assistants MV
E Pharmacy assistants MA
F Board / Management

	Healthcare professional	**A**	**B**	**C**	**D**	**E**	**F**
1	Awareness of content of innovation	X	X	X	X	X	X
2	Vision / Aim	X	X		X	X	X
3	Skills and Knowledge	X		X	X	X	
4	Self-efficacy	X			X	X	
5	Professional obligation	X			X	X	
6	Outcome expectations	X	X		X	X	X
7	Social support / Support collegeagues	X			X	X	
8	Emotions healthcare professionals	X	X		X	X	
9	Personal and relative benefits/drawbacks	X		X			
10	Patient satisfaction / Appreciation service	X	X	X	X	X	
11	Patient cooperation / Characteristics patient	X	X	X	X	X	
	Innovation UHDH	**A**	**B**	**C**	**D**	**E**	**F**
13	Commitment / Willingness to cooperate	X	X	X	X	X	X
13	Compatibility	X	X		X	X	
14	Completeness	X	X		X	X	
15	Complexity	X			X	X	
16	Relevance for patient	X	X		X	X	
17	Observability	X	X		X	X	X
	Socio-political environment	**A**	**B**	**C**	**D**	**E**	**F**
18	Legislation and regulations	X			X	X	
	Organization	**A**	**B**	**C**	**D**	**E**	**F**
19	Formal ratification by management	X	X		X	X	X
20	Replacement when staff leave	X			X	X	X
21	Staff capacity / Workload	X			X	X	X
22	Unsettled organization	X	X		X	X	X
23	Financial resources						X
24	Time available	X	X		X	X	
25	Material resources and facilities	X	X		X	X	
26	Education	X	X		X	X	X
27	Coordinator / Leadership	X	X		X	X	
28	Timing	X	X		X	X	X
29	Information accessible about use of innovation / Information	X	X		X	X	
30	Performance feedback / Monitor and evaluate	X	X		X	X	X
31	Communication	X	X		X	X	X

4. Results

The innovation UHDH was executed for two months for patients in the E6, Internal Medicine (Hematology) department, beds 102-107, who brought their home medication to the hospital and kept using it during hospital admission.

4.1. The effect evaluation of UHDH

Overview of respondents

The percentages and the sociodemographic characteristics of the patients who participated two months prior and three weeks after the implementation of UHDH are shown in Table 3. Eight patients (three before the implementation and five after) were not asked to fill in the questionnaire because their medical condition was not considered suitable by the nurses. Sixty-two respondents were asked to fill in the written questionnaire, 21 of them during the two months before the implementation and 15 three weeks after the implementation. Three of the 21 respondents were discharged from the Internal Medicine (Hematology) department and moved to another department in the hospital or institution where they were not responsible for their own medication during the two months prior to the implementation of UHDH. They were excluded from this study. Males accounted for 54.5% and females for 45.5% of the total population. The average age of the respondents during the two months before the implementation was 59.3 (*SD* = 14.5 years) and 62.5 years old (*SD* = 10.2 years) for the respondents three weeks after the implementation of UHDH.

Table 3 Respondents rate and comparison socio-demographic characteristics of the respondents of the pre- and posttest.

Characteristics	**Two months prior to implementation UHDH**	**Three weeks after implementation UHDH**	**Total**
	N = 18[1]	**N = 15**	**N = 33**
Age Mean (*SD*)	59.3 (14.5)	62.53 (10.2)	60.8 (12.6)
Gender N (%)			
Female	6 (33.3)	9 (60)	15 (45.5)
Male	12 (66.7)	6 (40)	18 (54.5)
Education level[2] N (%)			
Lower educational level	11 (61.1)	7 (46.7)	18 (54.5)
Higher educational level	7 (22.2)	8 (53.3)	15 (45.5)

[1]*15 of the 18 respondents were included for the analysis of the medication adherence because they answered all questions.*

[2]*Levels of education (which are described in Dutch) are classified into: lower educational level (basisonderwijs and LBO, VMBO basis of kader, MAVO, MULO, VMBO gemengd of theoretisch) and higher educational level (VWO, HBO, WO and MBO, HAVO, HBS)* (41).

Medication adherence

Of the 30 patients discharged from the hospital, 15 (50%) filled in the whole questionnaire for medication adherence (MMAS-8) before the implementation. The adherence in the subgroups based on age and education is shown in Table 4.

Table 4 Mean (SD) of the adherence scores before and after the implementation of UHDH

Characteristics	**Adherence score two months prior to implementation UHDH**		**Adherence score three weeks after implementation UHDH**		
	N = 15[1]		**N = 15**		
	N	**Mean (*SD*)**	**N**	**Mean (*SD*)**	***p*-value[2]**
All respondents[3]	15	7.5 (0.8)	15	7.4 (0.8)	0.68
Gender[3]					
Female	5	7.6 (1.0)	9	7.4 (0.7)	0.82
Male	10	7.5 (0.7)	6	7.3 (0.9)	0.64
Age[3]					
< 65	12	7.5 (0.8)	8	7.7 (0.4)	0.47
65 and older	3	7.7 (0.8)	7	7.0 (1.0)	0.34
Education level[3, 4]					
Lower education level	8	7.5 (0.7)	7	7.2 (1.0)	0.53
Higher education level	7	7.5 (0.9)	8	7.6 (0.5)	0.94

[1]*15 of the 18 respondents were included for the analysis of the medication adherence because they answered all questions.*

[2]*P-value is measured with a t-test.*

[3]*The scale for adherence is considered as: <6 = low, 6-8 = moderate, and 8 = high.*

[4]*Levels of education (which are described in Dutch) are classified into: lower educational level (basisonderwijs and LBO, VMBO basis of kader, MAVO, MULO, VMBO gemengd of theoretisch) and higher educational level (VWO, HBO, WO and MBO, HAVO, HBS)* (41).

Scale's reliability analysis revealed an overall Cronbach's alpha of 0.35 for the eight items of the MMAS-8. Removing some of the respondents did not increase the Cronbach's alpha substantially.

No significant differences were observed between all the respondents before and after the implementation and the subgroups gender, age, and educational level. However, slight differences were observed between two months before and three weeks after the implementation. In the case of both men and women above the age of 65, the patients were less likely to adhere to their medication in the posttest than in the pretest. In addition, it was found that the adherence score was approximately the same for participants with a high educational level in both the pretest and posttest (7.5 (*SD* = 0.9) and 7.6 (*SD* = 0.5)). For lower educated patients there was a difference of 0.3, while the average score in the pretest was lower with 7.5 (*SD* = 0.7).

In Table 5, the coefficients of the dependent variable "average adherence score" are presented. The multivariate analysis revealed that the effects of the independent variables on the differences in the average adherence score were not significantly associated. For instance, model 1 illustrates that the relation between the pre- and posttest and the average adherence was not significant (β = -0.117, *p* = 0.680). Similarly high *p*-values were applied to the other relations in model 2 between the independent variables and the average adherence score. For example,

adjusted for the influences of the pre- and posttest, age, and gender, the relation between the level of education and the average adherence score was not significant either (β = 0.21, *p* = 0.19).

Table 5 Coefficients of the multivariate analysis of the dependent variable average adherence score and the independent variables "pre- and posttest", "age", "gender", and "level of education".

Coefficients[1]				
		Unstandardized Coefficients		
Model		**β**	**Std. Error**	***p*-value**[2]
1	(Constant)	7.62	0.44	0.00
	Pretest and posttest	-0.12	0.28	0.68
2	(Constant)	7.00	1.06	0.00
	Pretest and posttest	-0.28	0.31	0.37
	Age	0.02	0.01	0.22
	Gender	0.07	0.30	0.82
	Level of education	0.22	0.16	0.19

[1]*Dependent variable: Average adherence score*

[2]*P-value is measured with a t-test.*

Patient satisfaction

No subgroups were created for patient satisfaction. Cronbach's' alpha was greater than 0.70 for each of the eight items comprising the scale used to determine patient satisfaction, showing internal consistency.

No significant differences were found between the eight items mentioned in Table 6. However, a small trend was visible for all the mean scores of patient satisfaction in this study, as these were higher three weeks after the implementation of UHDH.

Items 4 and 8 showed the largest mean difference (0.6) in satisfaction in comparison to the other six items. All the participants (100%) who answered question four after the implementation were satisfied about the fact that they experience no other adverse symptoms from the medication at the hospital compared to at home. This was in contrast to 83.3% of responses prior to the implementation. In addition, 92.9% of the participants who answered question eight were also more satisfied about the fact that nurses regulated their medication in the hospital three weeks after the implementation. This contrasted with the 68.8% before the implementation of UHDH.

There was a higher variety in the standard deviation in the pretest than in the posttest. In the pretest, the standard deviation varied between 1.0 and 1.4, while in the posttest between 0.3 and 0.6. In addition, the percentages that had a positive attitude towards UHDH were higher in the posttest.

Table 6 Mean (SD) scores of the satisfaction scores and comparison (dis)satisfaction per subject of the patients between before and three weeks after the implementation of UHDH

	Statements	**Satisfaction medication use two months prior to the implementation of UHDH**			**Satisfaction medication use three weeks after the implementation of UHDH**				
		N	**Mean (*SD*)** [1]	**Positive attitude towards UHDH N (%)**	**N**	**Mean (*SD*)** [1]	**Positive attitude towards UHDH N (%)**	*p-value mean*	*p-value %*
1	The medication administration before hospital admission went well	15	4.7 (1.0)	14 (93.3)	15	4.9 (0.3)	15 (100)	0.35	1.00
2	No problems with the medication use during admission	18	4.7 (1.0)	17 (94.4)	15	4.8 (0.6)	14 (93.3)	0.64	1.00
3	Wishes were taken into account, while medication was used	16	4.7 (1.0)	15 (93.8)	14	4.8 (0.6)	13 (92.9)	0.75	1.00
4	No other adverse events of medication at hospital compared to at home	18	4.3 (1.4)	15 (83.3)	15	4.9 (0.3)	15 (100)	0.12	0.23
5	Way nurses handled the medication went well	18	4.6 (1.0)	17 (94.4)	14	4.9 (0.3)	14 (100)	0.25	1.00
6	Received clear information about the medication at discharge	16	4.4 (1.4)	13 (81.3)	12	4.8 (0.4)	12 (100)	0.29	0.24
7	Enough information to use the medication well at home	17	4.7 (1.0)	16 (94.1)	12	4.9 (0.3)	12 (100)	0.48	1.00
8	Satisfied that nurses take care of medication	16	4.1 (1.0)	11 (68.8)	14	4.7 (0.6)	13 (92.9)	0.11	0.18

[1]*The scale 1-5 for satisfaction: >3 is considered as satisfied and values below 3 are considered as dissatisfied.*

4.2. The process evaluation of UHDH: by the stakeholders

Overview of respondents

From the 141 respondents who were asked to fill in the questionnaire, 56 stakeholders of different specializations participated in this research, as depicted in Table 7. Thus, the response rate was 39.7%. The average age of the respondents experienced in UHDH was 43.7 years (*SD* = 8.4) and 40.9 years (*SD* = 12.8) for the respondents not experienced in UHDH.

Table 7 Respondents of the questionnaire classified per stakeholder group.

Characteristics	**Number of stakeholders Internal Medicine (Hematology) department**[1]	**Number of stakeholders Neurology department**[1]
	N = 26	**N = 30**
Nurses N (%)	7 (26.9)	13 (43.3)
Physicians N (%)	0 (0)	5 (16.7)
Pharmacy assistants MV N (%)	14 (53.8)	6 (20)
Pharmacy assistants MO N (%)	5 (19.2)	6 (20)
Board / Management N (%)	0 (0)	0 (0)
Age mean (*SD*)	43.7 (8.4)	40.9 (12.8)

[1]*Percentage is relative to the entire subgroup Internal Medicine (Hematology) department or Neurology department.*

Impeding and facilitating determinants experienced by the Internal Medicine (Hematology) department and Neurology department

As illustrated in Table 8, several determinants with a mean score beneath 3.0 or a negative attitude of the stakeholders (percentage beneath 50%) were identified, meaning that these determinants were considered as impeding factors. According to these cut-off points, the impeding factors were specifically found in the organization category for both the Internal Medicine (Hematology) and the Neurology departments; the other categories were more often facilitating.

Overall, 17 impeding factors were found at the Internal Medicine (Hematology) department, 10 of which occurred in the organization category. From the stakeholders of the Internal Medicine (Hematology) department, 8 of the 13 determinants were experienced negatively by all the nurses as can be seen in Table 9. At the Neurology department, the pharmacy assistants MV experienced the factors unsettled organization, material resources, and facility in the organization category as less impeding than the nurses. Examining the *p*-values, most differences were also seen in the organization category. Except for the factors "unsettled organization" and "leadership," all factors in this category were significantly different. Most of those determinants were impeding at the Internal Medicine (Hematology) department and considered facilitating or less impeding at the Neurology department (for example education, timing, and communication).

In contrast to the impeding factors, there were also determinants mentioned as facilitators (average score above 3.0 and more than 50% of the respondents were positive towards the determinant). For both the Internal Medicine (Hematology) and the Neurology departments, the most facilitating factors were found in the healthcare professional category (which included 6 of 11 determinants). At the Internal Medicine (Hematology) department, the determinants were found most facilitating by the pharmacy assistants MV and MO, while at the Neurology department, the determinants were not specifically mentioned as a facilitator by one particular stakeholder. Only two determinants in the healthcare professional category had a significant difference, namely

“awareness of the content of the innovation” and “personal and relative benefits/drawbacks” (only asked to nurses). The first factor was considered a barrier at the Neurology department, while the second factor was a barrier for both, but most prominently so for the Internal Medicine (Hematology) department.

The number of impeding factors in the other categories was practically the same as the number of facilitating factors for both the Internal Medicine (Hematology) and Neurology departments. The facilitating determinants were experienced less positively in categories other than the healthcare professional category. For the compatibility, complexity, relevance for the patient, and the observability in the innovation category, a significant difference was noted. The Neurology department considered the first three as impeding and the last one facilitating. For the Internal Medicine (Hematology) department this was the other way around.

The graph in Figure 1 shows the feelings that healthcare professionals had toward UHDH. The question related to this determinant was asked differently, as previously mentioned. The respondents had the possibility to give more than one answer in the UHDH-Q. Overall, the emotions of the stakeholders in the Internal Medicine (Hematology) department toward UHDH were more negative and less positive than the stakeholders of the Neurology department. The difference in percentages for enthusiasm is notable, as this was nearly 25% for the inexperienced and nearly 5% for the experienced group. In addition, the respondents’ feelings of scepticism in both groups were remarkable, as nearly 50% experienced this feeling in both groups.

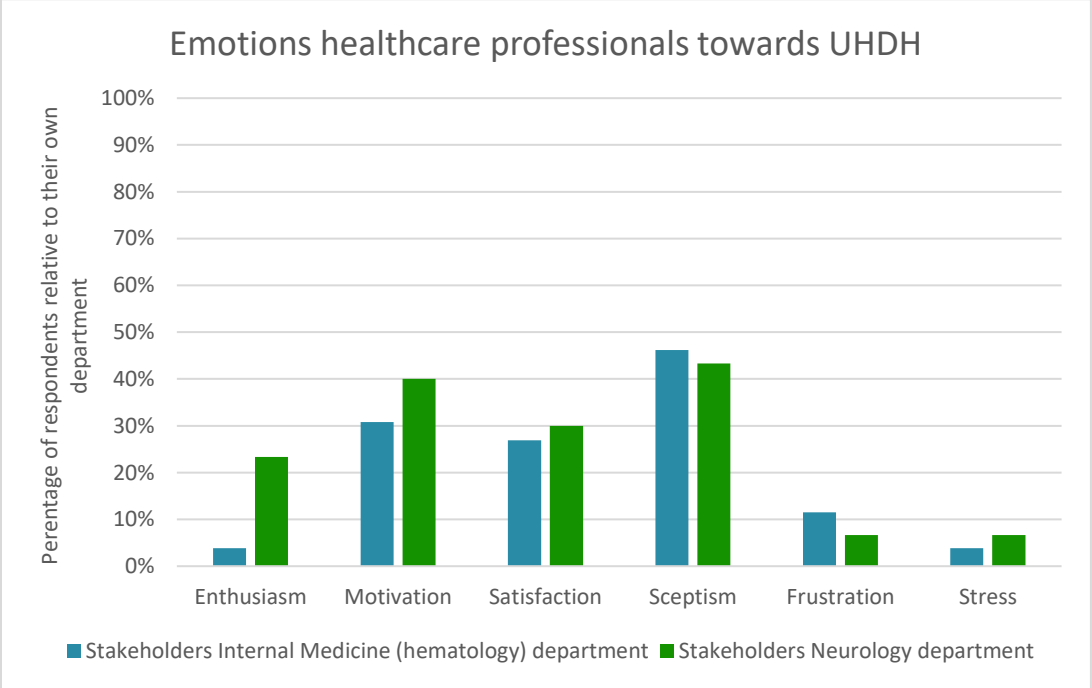

Figure 1 Emotions of the healthcare professionals towards UHDH, percentage relative to their own department (Internal Medicine (Hematology) department or Neurology department). Question asked was: In general, I do have the following feelings towards UHDH (more answers possible).

Table 8 Mean (SD) scores per determinant, attitude towards UHDH (positive or negative) and comparison determinants between the Internal Medicine (Hematology) department and the Neurology department[1]

	Determinants		**Internal Medicine (Hematology) department**			**Neurology department**		
		Stakeholders who answered question[1]	N	Mean (*SD*)[2]*	Positive attitude towards UHDH N (%)[3]*	N	Mean (*SD*) [2]*	Positive attitude towards UHDH N (%)[3]*
	Healthcare professional							
1	Awareness of content of innovation	A,B,D,E	26	3.2 (1.0)	14 (53.8)*	30	2.9 (0.9)	6 (20)*
2	A clear vision/aim of innovation	A,B,D,E	26	3.2 (0.9)	12 (46.2)	30	3.6 (0.9)	20 (66.7)
3	Enough skills and knowledge of the innovation to execute the activities	A,D,E	26	3.7 (1.0)	19 (73.1)	25	3.6 (1.0)	16 (64)
4	Self-efficacy: able to implement activities involved in innovation	A,D,E	26	3.9 (0.8)	20 (76.9)	25	3.9 (0.9)	19 (76)
5	Professional obligation: responsibility to use the innovation	A,D,E	26	3.6 (1.0)	17 (65.4)	25	3.8 (0.9)	19 (76)
6	Clear outcome expectations to achieve	A,B,D,E	26	4.2 (0.5)	25 (96.2)	30	4.0 (0.7)	27 (90)
7	Sufficient social support/support collegeagues	A,D,E	26	3.8 (0.8)	20 (76.9)	25	3.7 (0.8)	17 (68)
8	Feelings healthcare professionals[4]	A,B,D,E						
9	Enough personal and relative benefits/drawbacks for the professionals to use innovation	A,B,D,E	7	1.7 (0.7)*	0 (0)	13	2.5 (0.6)*	2 (15.4)
10	Patient will be satisfied with the innovation according to professional/appreciate the innovation	A,B,D,E	26	3.3 (0.5)	8 (30.8)	30	3.4 (0.7)	13 (43.3)
11	Patient will be cooperative with the innovation according to professional	A,B,D,E	26	3.3 (0.6)	10 (38.5)	30	3.2 (0.7)	11 (36.7)
	Innovation UHDH							
12	Enough commitment/willingness to cooperate with the innovation	A,B,D,E	26	3.7 (0.9)	20 (76.9)	30	3.8 (0.9)	22 (73.3)

13	Innovation is compatible to current work method	A,B,D,E	26	3.3 (0.9)*	13 (50.0)*	30	2.8 (0.7)*	6 (20)*
14	Innovation is completely described with information and materials to execute the activities proper	A,B,D,E	26	3.1 (1.0)	10 (38.5)	30	3.1 (1.0)	12 (40)
15	Innovation is too complex to execute activities of the innovation	A,D,E	26	3.8 (0.8)	21 (80.8)*	25	3.7 (0.8)	14 (56)*
16	Relevance for patient: the innovation is suitable for the patient group	A,B,D,E	26	3.0 (1.1)	11 (42.3)*	30	2.7 (0.8)	5 (16.7)*
17	Observability: clear visibility of the outcomes for the professionals	A,B,D,E	26	2.7 (0.9)*	5 (19.2)*	30	3.7 (1.1)*	21 (70)*
	Socio-political environment							
18	Legislation and regulations: activities innovation fit in with existing legislation and regulations	A,D,E	26	3.7 (0.7)	20 (76.9)	25	3.6 (0.7)	16 (64)
	Organization							
19	Formal ratification by management: management includes protocols or policy documents[5]	A,B,D,E	15	2.7 (1.0)*	4 (26.7)*	23	3.6 (1.0)*	14 (60.9)*
20	Replacement when staff leave[5]	A,D,E	20	3.8 (1.8)*	3 (21.4)	16	2.8 (0.7)*	2 (12.5)
21	Staff capacity is sufficient/workload is low[5]	A,D,E	24	3.3 (1.3)*	12 (52.2)*	23	2.2 (0.9)*	2 (8.7)*
22	Unsettled organization: there are reorganizations, fusions, cuts, other innovations to consider	A,B,D,E	26	2.4 (1.1)	6 (23.1)	30	2.1 (0.9)	3 (10)
23	Sufficient financial resources[6]	-						
24	Enough time available to integrate the innovation in the daily routine	A,B,D,E	26	3.0 (1.0)	11 (42.3)*	30	2.7 (0.9)	6 (20)*
25	Sufficient material resources and facilities to execute the innovation	A,B,D,E	26	2.9 (1.0)	9 (34.6)*	30	2.6 (0.9)	3 (10)*
26	Education: need of extra training courses	A,B,D,E	26	2.1 (1.0)*	3 (11.5)*	30	3.2 (0.9)*	14 (46.7)*
27	At least one coordinator/leader present to coordinate the implementation	A,B,D,E	26	3.4 (0.9)	15 (57.7)	30	3.7 (0.7)	21 (70)
28	Right timing to introduce the innovation	A,B,D,E	26	2.8 (1.0)*	6 (23.1)*	30	3.6 (1.0)*	18 (60)*

29	There is enough information accessible about use of innovation	A,B,D,E	26	3.4 (0.9)*	15 (57.7)*	30	2.9 (0.7)*	21 (70)*
30	Regularly performance feedback about the progress of the innovation/monitor and evaluate	A,B,D,E	26	2.6 (0.9)*	5 (19.2)*	30	4.0 (0.7)*	27 (90)*
31	Enough and clear communication between the departments	A,B,D,E	26	2.7 (0.9)*	5 (19.2)	30	3.1 (0.7)*	9 (30)

**: p-value* ≤ 0.05 and therefore significant.

[1]*A= Nurses, B= Physicians, D= Pharmacy assistants MV, E= Pharmacy assistants MA.*

[2]*Scale 1-5 of the determinants: a mean above 3.0 is considered as a facilitating factor towards the implementation of UHDH and mean values through 3.0 are considered as impeding factors.*

[3]*Scale of the determinants: When the percentage is above 50, the respondents considered this determinant as a facilitating factor towards the implementation of UHDH and percentages through 50 are considered as a impeding factors towards the implementation.*

[4]*Not possible to determine a mean. See Figure 2 for results of this determinant.*

[5]*Additional answer choice: I cannot judge this question.*

[6]*No results.*

Table 9 Number and percentage of positive attitude towards UHDH of all stakeholders and each stakeholder group (nurses, physician, pharmacy assistant MV, pharmacy assistant MO).

	Determinants	**Internal Medicine (Hematology) department**					**Neurology department**				
		Total positive	Nurses	Physician	MV	MO	Total positive	Nurses	Physician	MV	MO
	Healthcare professional		7 (100)	0	14 (100)	5 (100)		13 (100)	5 (100)	6 (100)	6 (100)
1	Awareness of content of innovation	14 (53.8)	2 (28.6)	-	9 (64.3)	3 (60)	6 (20)	1 (7.7)	0 (0)	3 (50)	2 (33.3)
2	A clear vision/aim of innovation	12 (46.2)	2 (28.6)	-	7 (50)	3 (60)	20 (66.7)	8 (61.5)	-	5 (83.3)	3 (50)
3	Enough skills and knowledge of the innovation to execute the activities	19 (73.1)	3 (42.9)	-	12 (85.7)	4 (80)	16 (64)	6 (46.2)	4 (80)	6 (100)	4 (66.7)
4	Self-efficacy: able to implement activities involved in innovation	20 (76.9)	5 (71.4)	-	11 (78.6)	4 (80)	19 (76)	8 (61.5)	-	5 (83.3)	6 (100)
5	Professional obligation: responsibility to use the innovation	17 (65.4)	3 (42.0)	-	10 (71.4)	4 (80)	19 (76)	10 (76.9)	-	4 (66.7)	5 (83.3)
6	Clear outcome expectations to achieve	25 (96.2)	6 (85.7)	-	14 (100)	5 (100)	27 (90)	13 (100)	4 (80)	5 (83.3)	5 (83.3)
7	Sufficient social support/support collegeagues	20 (76.9)	3 (42.9)	-	12 (85.7)	5 (100)	17 (68)	8 (61.5)	-	4 (66.7)	5 (83.3)
8	Feelings healthcare professionals[4]										
9	Enough personal and relative benefits/drawbacks for the professionals to use innovation	0 (0)	0 (0)	-	-		2 (15.4)	2 (15.4)	-	-	-
10	Patient will be satisfied with the innovation according to professional/appreciate the innovation	8 (30.8)	0 (0)	-	8 (57.1)	0 (0)	13 (43.3)	5 (38.5)	2 (40)	2 (33.3)	4 (66.7)
11	Patient will be cooperative with the innovation according to professional	10 (38.5)	2 (28.6)	-	8 (57.1)	0 (0)	11 (36.7)	4 (30.8)	3 (60)	1 (16.7)	3 (50)

12	Enough commitment/willingness to cooperate with the innovation	20 (76.9)	5 (71.4)	-	11 (78.6)	4 (80)	22 (73.3)	11 (84.6)	4 (80)	3 (50)	4 (66.7)
13	Innovation is compatible to current work method	13 (50.0)	0 (0)	-	10 (71.4)	3 (60)	6 (20)	2 (15.4)	1 (20)	1 (16.7)	2 (33.3)
14	Innovation is completely described with information and materials to execute the activities proper	10 (38.5)	1 (14.3)	-	9 (64.3)	0 (0)	12 (40)	4 (30.8)	2 (40)	3 (50)	3 (50)
15	Innovation is too complex to execute activities of the innovation	21 (80.8)	4 (57.1)	-	12 (85.7)	5 (100)	14 (56)	6 (46.2)	-	4 (66.7)	4 (66.7)
16	Relevance for patient: the innovation is suitable for the patient group	11 (42.3)*	2 (28.6)	-	6 (42.9)	3 (60)	5 (16.7)	1 (7.7)	2 (40)	1 (16.7)	1 (16.7)
17	Observability: clear visibility of the outcomes for the professionals	5 (19.2)	0 (0)	-	3 (21.4)	2 (40)	21 (70)	11 (84.6)	2 (40)	4 (66.7)	4 (66.7)
	Socio-political environment										
18	Legislation and regulations: activities innovation fit in with existing legislation and regulations	20 (76.9)	5 (71.4)	-	11 (78.6)	4 (80)	16 (64)	8 (61.5)	-	3 (50)	5 (83.3)
	Organization										
19	Formal ratification by management: management includes protocols or policy documents[1]	4 (26.7)	0 (0)	-	2 (20)	2 (50)	14 (60.9)	6 (54.4)	4 (80)	2 (50)	2 (66.7)
20	Replacement when staff leave[1]	3 (21.4)	0 (0)	-	1 (11.1)	2 (66.7)	2 (12.5)	2 (18.2)	-	0 (0)	0 (0)
21	Staff capacity is sufficient/workload is low[1]	12 (52.2)	0 (0)	-	9 (69.2)	3 (75)	2 (8.7)	1 (7.7)	-	0 (0)	1 (20)
22	Unsettled organization: there are reorganizations, fusions, cuts, other innovations to consider	6 (23.1)	1 (14.3)	-	4 (28.6)	1 (20)	3 (10)	1 (7.7)	2 (40)	0 (0)	0 (0)
23	Sufficient financial resources	-	-	-	-	-	-	-	-	-	-

24	Enough time available to integrate the innovation in the daily routine	11 (42.3)	0 (0)	-	7 (50)	4 (80)	6 (20)	1 (7.7)	3 (60)	1 (16.7)	1 (16.7)
25	Sufficient material resources and facilities to execute the innovation	9 (34.6)	0 (0)	-	6 (42.9)	3 (60)	3 (10)	2 (15.4)	0 (0)	1 (16.7)	0 (0)
26	Education: need of extra training courses	3 (11.5)	0 (0)	-	3 (21.4)	0 (0)	14 (46.7)	5 (38.5)	4 (80)	3 (50)	2 (33.3)
27	At least one coordinator/leader present to coordinate the implementation	15 (57.7)	1 (14.3)	-	9 (64.3)	5 (100)	21 (70)	7 (53.8)	5 (100)	4 (66.7)	5 (83.3)
28	Right timing to introduce the innovation	6 (23.1)	1 (14.3)	-	2 (14.3)	3 (60)	18 (60)	7 (53.8)	3 (60)	5 (83.3)	3 (50)
29	There is enough information accessible about use of innovation	15 (57.7)	2 (28.6)	-	9 (64.3)	4 (80)	21 (70)	1 (7.7)	3 (60)	2 (33.3)	0 (0)
30	Regularly performance feedback about the progress of the innovation/monitor and evaluate	5 (19.2)	0 (0)	-	3 (21.4)	2 (40)	27 (90)	12 (92.3)	4 (80)	6 (100)	5 (83.3)
31	Enough and clear communication between the departments	5 (19.2)	0 (0)	-	3 (21.4)	2 (40)	9 (30)	3 (23.1)	3 (60)	1 (16.7)	2 (33.3)

[1]*Additional answer choice: I cannot judge this question.*

5. Discussion

The first objective of this study was to determine the influence of the innovation UHDH on medication adherence and patient satisfaction with medication use. Additionally, this study aimed at identifying the determinants affecting the implementation process of UHDH.

Effect evaluation

The results of the effect evaluation involving the patients show that there were no significant differences in medication adherence and patient satisfaction two months before and three weeks after the implementation of UHDH.

Although there were no significant differences in medication adherence, small differences were observed for adherence, as patients above the age of 65 were less likely to adhere to their medication in the posttest than in the pretest. This is also confirmed by the study of Aldridge et al. (36). In addition, the lower educated patients had a slightly higher adherence score in the pretest. The severity of the disease might explain the higher adherence in the pretest. The patients in the posttest were possibly more ill than the patients in the pretest. Another reason could be the fact that the responsibility for making their own decisions and taking action regarding their health is burdensome when patients use their own medication at the hospital, according to the WHO (42). However, in this study, the patients did not self-administer their medication because this criterion was excluded during the pilot. This may have resulted in distorted results. However, when looking at the *p*-values and the few respondents, it appears that these differences are most likely a coincidence.

Furthermore, the mean score of patient satisfaction was considered very high for all the eight themes (focused on patient satisfaction) of the questionnaire, two months before and three weeks after the implementation. It seems to be difficult to determine the level of satisfaction, as it is a broad and subjective issue with many definitions and is therefore difficult to measure in a reliable and valid manner (43). According to the study of Lummis & Sketris (11), patients are often satisfied with using their own medication in hospitals (11). Although a small trend, whereby patient satisfaction slightly increased after the implementation of UHDH, is visible, in this study it appears that the patients were already satisfied before using their own medication in the hospital. Moreover, since the differences in the scores of patient satisfaction in the posttest are so small and the number of respondents was limited, a conclusion might be that the patients are not less satisfied with using their own medication.

This study indicates that the level of both medication adherence and patient satisfaction with medication use was very high in both the pretest and posttest. This ceiling effect could be an important factor explaining why only a slight increase in adherence and patient satisfaction was observed. Another possible explanation could be that UHDH was poorly implemented, which is discussed in the following paragraphs.

Process evaluation

In general, the results of the process evaluation show that the amount of facilitating and impeding determinants in each determinant group (healthcare professionals, innovation, socio-political environment, and the organization) is approximately the same for the Internal Medicine (Hematology) and the Neurology departments. For both respondent groups, the most impeding factors are found in the organization category of determinants and the most facilitating ones in the healthcare professionals category. Upon comparing all factors between the respondent groups, it transpired that the most significant differences between the two groups can be observed in the organizational category, where the respondents of the Internal Medicine (Hematology) department considered most determinants as impeding or as less facilitating than the respondents of the Neurology department. The stakeholders of the Internal Medicine (Hematology) department may have been prejudged, which could explain the differences in the percentages of emotions between the two departments; the

stakeholders of the Internal Medicine (Hematology) department experienced less enthusiasm, motivation, and satisfaction with UHDH, as well as more sceptism and frustration than the stakeholders of the Neurology department.

In many studies, the most facilitating and impeding determinants were found in the healthcare professionals category and the organization category (29)(30)(35)(28). This study confirms that the determinants that affected the implementation process the most were also found in these categories. The literature has indicated that the difficulties in addressing the use of POM are related to the storage of patients' medication and resources, such as the time, are necessary to process medication (11)(12). The results of this study confirm the literature (11)(12). The difficulties described in the literature with regard to healthcare professionals are notable. Specifically, staff awareness and a lack of compliance appear to be difficult when addressing the use of POM (11). However, this study shows that these were positively evaluated by the healthcare professionals. As depicted in Table 1, the determinants in the innovation category were not mentioned often in the literature, due to the fact that this category affects the implementation process less than the other categories; this was also the case in this study. The double checking of medication was also mentioned as an important subject by the healthcare professionals in this study. Before the innovation was implemented, the nurses did the medication round on their own, while other nurses executed the double check, if necessary. During the innovation implementation, all medication had to be double checked, which resulted in medication rounds being executed by two nurses to guarantee safety. However, this also took a great deal of time. Therefore, the healthcare professionals experienced the execution of the double check as an impeding factor.

The impeding factors (an average score beneath 3.0 or a percentage beneath 50%) found in the organization category could imply that the organization was not well prepared and that the department was not ready for the implementation of the innovation UHDH. Prior to the implementation of UHDH, a Prospective Risk Assessment (PRA) was performed in the Internal Medicine (Hematology) department of the MST. The purpose of this assessment was to identify and analyze the risks that arise in the medication process. In the assessment, the process steps were identified and prioritized. This was done under the supervision of the research coordinator of the UHDH for the Radboud UMC, a hospital pharmacist, a pharmaceutical assistant, and the head nurse of the Internal Medicine (Hematology) department. Subsequently, the head nurse communicated the innovation UHDH to the rest of the department to prepare the nurses for the implementation.

Looking at the results of this research, it appears that 8 out of 10 impeding factors were considered negative by all the nurses of the Internal Medicine (Hematology) department. The high standard deviations of at least *SD* = 0.9 can therefore be explained by the fact that the other stakeholders gave a much higher or lower score to these determinants. Moreover, the high standard deviations might imply that some of the stakeholders of the Internal Medicine (Hematology) department fell back to their former way of working. One of the most important impeding determinants that was department dependent was the "relevance of the patient" (the suitability of the innovation for the patient group) to UHDH. Some patients at the Internal Medicine (Hematology) department were admitted for a therapy for one day, every week or two weeks. According to the healthcare professionals these patients considered it a burden to let them participate. The stakeholders of the Neurology department stated that patients with short- or long-term memory loss (or other cognitive illnesses) were not a suitable group for UHDH. These arguments could imply that the stakeholders did not have much faith in the innovation implementation because the stakeholders did not consider their patient group suitable for the innovation. However, if the innovation was executed in another department, there might also have been fewer effects in the context of waist of medication and costs. In that perspective the chosen departments were suitable. According to the Neurology department, the innovation was not compatible with the current work method. Currently, UHDH is no longer carried out in the Internal Medicine (Hematology) department; everyone fell back to their former way of working, and POM was substituted with hospital medication again.

It can be concluded that the determinants that positively affected the innovation were not part of the organization category, but rather of the innovation and healthcare professional categories. The determinants

related to healthcare professionals had the most positive effect on the innovation implementation, according to the stakeholders of both departments. These facilitating factors could indicate the healthcare professionals' extremely positive self-image or their dissatisfaction with the organization. The MA pharmacy assistants, who have worked with the innovation least, are more likely to respond positively, which could cause a distortion in the results. Additionally, the determinants of the innovation category were also seen as predominantly positive. This could imply that, although the stakeholders viewed UHDH as an opportunity for their department, the implementation process was disrupted by all the peripheral issues surrounding the organization, such as the unsettledness of the organization.

Limitations

Effect evaluation

Upon examining this study critically, it becomes apparent that there certain elements may have influenced the results. The questionnaires used for the effect evaluation are a self-reporting, subjective tool and do not necessarily provide valid information. Thus, it is possible that they showed the patients' desire to maintain a positive image, overestimating the rate of medication adherence. This could have impacted the high mean adherence scores. The socially desirable responses about both medication use and patient satisfaction could have yielded distorted results, even though the questionnaire was conducted in a neutral way, the responses were anonymous, and identities irretraceable. Yet, there was not much variety in answers because all the mean scores were high.

The effect of the number of pills per patient on medication adherence was not studied. The possibility exists that the difference in average number of pills per patient in the pretest and posttest influences the average adherence.

Additionally, the Cronbach's alpha for medication adherence was so low that internal inconsistency was assumed. A reason explaining the low Cronbach's alpha could be that there were not enough questions. In addition, the relation between the items may have been poor (38). However, the determination of the Cronbach's alpha was only an estimate of the internal consistency, so the results could still be representative.

Process evaluation

Although the amount of patients' admissions was low, approximately 58.1% filled in the questionnaire, which is relatively high. However, not all stakeholders were equally represented in this study, which could lead to distorted results. To limit this problem, the number and percentage of stakeholders per stakeholder group with a positive attitude towards each determinant was determined (illustrated in Table 9).

The variety of responses to the UHDH-Q focusing on the process evaluation could also be caused by numerous factors, such as age and the experience healthcare professionals have with innovations. The healthcare professionals of the Internal Medicine (Hematology) department appeared to have more knowledge regarding the implementation of innovations; they may have been more experienced with UHDH or with innovations in general in comparison to the stakeholders of the Neurology department. On the other hand, the healthcare professionals of the Internal Medicine (Hematology) department could have been prejudiced.

The study shows that the organization is currently not designed to ensure that an innovation can be implemented effectively. The organization's structure does not encourage innovation and implementation, which results in resistance from all stakeholders and involved departments. The determinant unsettled organization confirmed this, both through the negative mean score and the negative attitude towards UHDH for both departments. The hospital was (and still is) in a process of reorganization, which caused a varying staff composition and, therefore, agitation in the departments. In addition, other innovation implementations that are underway need to be taken into account because they are already time-consuming for healthcare professionals.

Overall conclusion

An innovation such as the UHDH requires a well prepared organization, which was not the case here. Creating awareness about an innovation among all stakeholders and making an inventory of the required resources can contribute to a decent start for the implementation. Implementing such an innovation while an organization is undergoing a restructuring and other implementations are executed simultaneously is not advisable. If an implementation meets the conditions, medication safety could ultimately be improved. In addition, cost savings can be achieved. In this study, no effects were found regarding the medication adherence and patient satisfaction with medication use. A possible reason could be that the innovation was poorly implemented. To execute this implementation differently in the future, the recommendations mentioned in the following section should be considered.

5.1. Recommendations

Recommendations based on the effect evaluation

The implementation of the innovation UHDH was not well prepared and was therefore not optimally executed, which could imply that the effects were not measured accurately. Although the average scores of medication adherence and patient satisfaction were not significantly different, it is recommended that this be measured again, if another effect evaluation is performed. Another effect that should be measured is the influence of the number of pills per patient on medication adherence. The adherence and satisfaction of a patient are very important for the quality of care and the reduction of adverse events (16)(17).

Recommendations based on the process evaluation

Since the Internal Medicine (Hematology) department may have been prejudged about the innovation, the recommendations discuss how the implementation should be executed from the beginning. First, the most important conditions that an organization needs to meet, according to this study, are described in Table 10, in order to achieve effects such as medication safety, quality of care, and cost savings. In addition, the steps of the implementation plan are described. According to Grol and Wensing (26), the most reliable phases in the process of change are orientation, insight, acceptance, change, and maintenance. By following these steps correctly, the innovation has more chances of succeeding. The phases have been elaborated using the determinants that were found to be important in this study.

Table 10 Conditions an organization needs to meet in order to achieve the effects, according to this study.

	Conditions	Explanation
1	Implement the innovation UHDH at the right time	It would be advisable to take the timing of an implementation process into account. In this case, the timing was not suitable due to ongoing reorganizations, innovations that were implemented simultaneously, and the change of staff at the departments. When an organization is unsettled, healthcare professionals experience higher levels of stress and a higher workload. This does not have a positive effect on attitudes towards the implementation process of an innovation and can act as a barrier to successful implementation.
2	Enough time to integrate the innovation into the daily routine	The implementation of UHDH had to be carried out quickly because the Radboud UMC required the data on time to continue their research. When there is more time to integrate an innovation, healthcare professionals do not fall back to their former way of working as easily (44).
3	Sufficient material resources and facilities to execute the innovation	The hospital needs to put effort into identification, storage, and documentation for POM (11). Additionally, the organization needs

		schedule staff who are knowledgeable about an innovation and capable of executing it in such a way that a change of staff does not matter.
4	Provide education	The hospital needs to educate healthcare professionals to ensure that they are capable of executing the innovation implementation.
5	One coordinator/project leader present to coordinate the implementation process	The first three phases of change aim towards orientation, insight, and acceptance prior to the implementation of an innovation (26). Therefore, three meetings should be arranged by one coordinator or leader prior to the actual implementation. In this way it is clear for every stakeholder to whom they can go with questions and comments. Additionally, a leader is responsible for the endorsement of an innovation, especially by his or her colleagues.

As previously mentioned, the first three phases in the process of change aim towards orientation, insight, and acceptance prior to the implementation of an innovation (26). Therefore, three meetings should be planned prior to the actual implementation. Moreover, the phases change and maintenance are described.

1 Orientation phase: Creating awareness of an innovation among stakeholders by arranging a short meeting with the project team and all involved stakeholders. Every stakeholder needs to think the innovation is interesting, useful, and relevant to themselves and patients.

A short meeting with the project team (with a clear coordinator or leader) and all the involved stakeholders prior to the innovation implementation should be organized in order to ensure that all participants are adequately informed about the innovation UHDH and create awareness about the innovation's content. In this study, it appeared that the nurses did not know the personal and relative benefits/drawbacks of using the innovation. During the first meeting, the benefits should be made clear.

Moreover, it appeared that there was not enough accessible information about the use of the innovation according to the nurses. Although the focus should be on all stakeholders, initially, the nursing staff should be particularly involved to assess whether the innovation has any relevance to them. Furthermore, it is important that the supervisor supports the innovation, as this can create a positive atmosphere. Finally, even though physicians only have a supporting task, it is important that they support the innovation, since they prescribe the medication.

2 Insight phase: Convincing the healthcare professionals to integrate an innovation in their current routines during a second meeting. The aim is to help stakeholders understand what an innovation entails and get insight into their own role.

During a follow-up meeting, the project team should convince the stakeholders that the innovation is compatible with the current work method. Although most of the healthcare professionals from the Internal Medicine (Hematology) department found the innovation compatible, the healthcare professionals of the Neurology department were mostly negative toward this determinant. The double checking of medication must be organized in a way that does not cost the nurses much time and it can contribute to a more positive attitude towards UHDH. The healthcare professionals are already convinced that they have enough skills and knowledge to carry out the tasks of the innovation and also consider themselves capable of implementing the innovation. In this meeting, the innovation should be described in detail and information and materials to execute the activities properly should be provided. This is important as nearly half of the participants in this study experienced this determinant as negative.

3 Acceptance phase: The aim in the third meeting is to create a positive intention, attitude, and motivation, which is necessary for real change in a medication process.

According to the stakeholders of the Neurology department, patients who suffer from cognitive problems are unable to cooperate with UHDH because UHDH's objective is that patients be in charge of their own medication eventually. The innovation is not relevant for patients in this case, as revealed by the scores and attitudes of the determinant relevance of the patient. Thus, a recommendation would be to set up criteria to include or exclude certain patients in a department. The criteria could be determined by asking relevant stakeholders in the department questions during this third meeting. These questions should be posed after the stakeholders have received information about UHDH in the second meeting, giving them time to consider possible obstacles in their specific department. Looking at other departments, the innovation will be more likely to succeed in departments with patients who suffer less from cognitive illnesses. Moreover, these patients are often capable of being in charge of their own medication.

Although the outcome expectations seemed to be clear to the stakeholders and 30%-40% of the stakeholders appeared to be motivated and satisfied with the innovation, the nurses did not experience personal and relative benefits by using the innovation, which is demonstrated by the low percentages of enthusiasm. By arranging short meetings, the enthusiasm, motivation, and satisfaction can be increased prior to implementation.

4 Change phase: This phase aims to adopt an innovation in practice. The healthcare professionals experience the value and benefits of the innovation UHDH for themselves and patients.

This phase should check whether the previous meetings achieved their goals. The healthcare providers can implement new routines (such as the rearranged double check) and conclude whether the innovation works and can be implemented further. If this is not the case, a fourth meeting should be arranged where the unclear subjects can be discussed again. Another strategy might to provide extra resources or (extra) courses to train the skills of the healthcare professionals (44).

5 Maintenance phase: The aim of this phase is to integrate new practices into routines and embed or support the innovation in such a way that the healthcare professionals do not fall back to former ways of working.

A recommendation would be to provide regular performance feedback at meetings during the implementation (which was not done enough according to the stakeholders of the Internal Medicine (Hematology) department, but was considered important by the stakeholders of the Neurology department), with at least a substantial number of the stakeholders involved in the innovation present. In this case, only one feedback meeting between the project team of UHDH and the head nurse took place, while the other stakeholders were excluded from this process. When more stakeholders that are directly involved with the implementation are included, minor issues can be solved immediately. This ensures that stakeholders feel heard and guided during the process, as opposed to simply experiencing an increased workload and a lack of support.

Recommendations for future research

The current study can be seen as an introduction to the experienced facilitating and impeding determinants of the implementation process of UHDH and how they can contribute to a successful implementation in the future. Future research should focus on similar research at other departments in the hospital because every department has patients with different characteristics. Future studies should provide a more in-depth answer regarding the differences between departments. Moreover, it would be interesting to study how the double checking of medication can be done without requiring additional time or enhancing the workload of the individuals involved. Eliminating the double check is not an option, as its absence results in medication errors (15). An implementation plan should be carried out further. Lastly, a better effect evaluation should be conducted following a well prepared implementation of the innovation.

References

1. Wyszewianski L. THE HEALTHCARE QUALITY BOOK Vision, Strategy, and Tools. Third edit. Ransom SB, Ransom ER, Joshi MS, Nash DB, editors. Health Administration Press; 2014. 31-49 p.
2. Berwick DM. A User's Manual For The IOM's "Quality Chasm" Report. Health Aff. 2002;21(3):80–90.
3. CMR. Jaarrapportage Centrale Medicatie-incidenten Registratie (CMR) Ziekenhuizen (ZH) 2012. 2011;(April).
4. VMS zorg. Platform voor patiëntveiligheid [Internet]. 2013. Available from: http://www.vmszorg.nl/
5. De Blok C, Koster E, Schilp J, Wagner C. Implementatie VMS Veiligheidsprogramma - Evaluatieonderzoek in Nederlandse ziekenhuizen [Internet]. Utrecht; 2013. Available from: https://www.nivel.nl/sites/default/files/bestanden/Rapport-Implementatie-VMS-Veiligheidsprogramma.pdf
6. WHO | Medication Without Harm: WHO's Third Global Patient Safety Challenge [Internet]. WHO. World Health Organization; 2017. Available from: http://www.who.int/patientsafety/medication-safety/en/
7. Meijerink Leden Mw mr AM van Blerck-Woerdman H Bosma Mw prof dr DDM Braat Mw ER Carter VM, dr WNJ Groot dr Mackenbach Mw drs M Sint dr DL Willems Algemeen secretaris drs TFM Hooghiemstra MJ. De participerende patiënt. Den Haag; 2013.
8. Bunningen C Van, Kleven P. Projectomschrijving doorgebruik van thuismedicatie in het ziekenhuis. Nijmegen; 2016.
9. Rijksoverheid. Factsheets Programma Aanpak verspilling in de zorg. 2016. p. 1–23.
10. Knoester PD, van den Bemt P. Omzetting van thuismedicatie naar ziekenhuisassortiment. Is het nog rationeel? 2005;(43):1347–9. Available from: https://dspace.library.uu.nl/bitstream/handle/1874/11622/Bemt_04_Omzettingvanthuismedicatienaar ziekenhuisassortiment.pdf?sequence=2
11. Lummis H, Sketris I. Use of patients' own medications in Canadian hospitals: A national survey. Can J Hosp Pharm. 2008;61(2):114–22.
12. Grissinger M. Patients Taking Their Own Medications While in the Hospital. 2012;9(2):50–8.
13. Lummis H, Sketris I, Veldhuyzen van Zanten S. Systematic review of the use of patients' own medications in acute care institutions. J Clin Pharm Ther. 2006;31(6):541–63.
14. Karapinar F. Transitional pharmaceutical care for patients discharged from the hospital (Thesis). Utrecht; 2012.
15. Hakonsen H, Hopen HS, Abelsen L, Ek B, Toverud E-L. Generic substitution: a potential risk factor for medication errors in hospitals. Adv Ther. 2010;27(2):118–26.
16. World Health Organization. Adherence to Long-term Therapies: Evidence for action [Internet]. 2003. Available from: http://apps.who.int/iris/bitstream/10665/42682/1/9241545992.pdf
17. Lam WY, Fresco P. Medication Adherence Measures: An Overview. Biomed Res Int [Internet]. 2015; Available from: 10.1155/2015/217047
18. Grol R, Wensing M. Implementation of change in healthcare: a complex problem. In: Grol R, Wensing M, editors. Improving Patient Care: The Implementation of Change in Health Care. 2nd ed. Nijmegen; 2013. p. Chapter 1.
19. Grol R, Wensing M, Eccles M, Davis D. Improving Patient Care: The Implementation of Change in Health Care, Second Edition [Internet]. Oxford, UK: John Wiley & Sons, Ltd; 2013. Available from: http://doi.wiley.com/10.1002/9781118525975
20. De Groot N, Vlaar P, Van Der Zwet R, Hooghiemstra E, Tilma I, Stortelder M, et al. Implementeren in het

sociale domein: Vernieuwingen met succes in de praktijk brengen [Internet]. 2016. Available from: https://www.movisie.nl/sites/default/files/alfresco_files/Implementeren-in-het-sociale-domein [MOV-9932411-1.0].pdf

21. Grol, R. & Wensing M. Implementatie: effectieve verbetering van de patiëntenzorg. Maarssen: Elsevier Gezondheidszorg; 2006.

22. de Veer AJ, Fleuren MA, Bekkema N, Francke AL. Successful implementation of new technologies in nursing care: a questionnaire survey of nurse-users. BMC Med Inform Decis Mak [Internet]. 2011;11(1):67. Available from: 10.1186/1472-6947-11-67

23. Jacobs SR, Weiner BJ, Reeve BB, Hofmann DA, Christian M, Weinberger M. Determining the predictors of innovation implementation in healthcare: a quantitative analysis of implementation effectiveness. BMC Health Serv Res. 2015;15(1):6.

24. Flottorp SA, Oxman AD, Krause J, Musila Nyokabi R, Wensing M, Godycki-Cwirko M, et al. A checklist for identifying determinants of practice: A systematic review and synthesis of frameworks and taxonomies of factors that prevent or enable improvements in healthcare professional practice. Implement Sci [Internet]. 2013;8(53). Available from: 10.1186/1748-5908-8-35

25. Nilsen P, Pratkanis A, Leippe M, Baumgardner M, Hardeman W, Jonston M. Making sense of implementation theories, models and frameworks. Implement Sci. 2015;10(1):53.

26. Grol R, Wensing M. Effective implementation of change in healthcare: a systematic approach. In: Grol R, Wensing M, Eccles M, Davis D, Bosch M, editors. Improving Patient Care: The Implementation of Change in Health Care. 2nd ed. Nijmegen: John Wiley & Sons, Ltd; 2013. p. 2205–14.

27. Fleuren M, Wiefferink K, Paulussen T. Determinants of innovation within health care organizations: Literature review and Delphi study. Int J Qual Heal Care [Internet]. 2004 Apr 1;16(2):107–23. Available from: 10.1093/intqhc/mzh030

28. Thomassen J-P, Ahaus K, Van De Walle S. Developing and implementing a service charter for an integrated regional stroke service: an exploratory case study. BMC Health Serv Res [Internet]. 2014;14. Available from: 10.1186/1472-6963-14-141

29. Michel P, Roberts T, Porro Z, Es-seddiqi H, Quenon J, Bréchet HM, et al. What are the Barriers and Facilitators to the Implementation and/or Success of Quality Improvement and Risk Management in Hospitals: A Systematic Literature Review. 2016;1(4).

30. Perla RJ, Bradbury E, Gunther-Murphy C. Large-Scale Improvement Initiatives in Healthcare: A Scan of the Literature. J Healthc Qual [Internet]. 2013;35(1):30–40. Available from: 10.1111/j.1945-1474.2011.00164.x

31. Hupkens S. Implementation of complementary interventions in the Netherlands: Experiences of pioneers. Patient Educ Couns [Internet]. 2012;89:411–6. Available from: 10.1016/j.pec.2011.11.001

32. Fleuren MAH, Paulussen TGWM, Van Dommelen P, Van Buuren S. Towards a measurement instrument for determinants of innovations. Int J Qual Heal Care [Internet]. 2014 Oct;26(5):501–10. Available from: 10.1093/intqhc/mzu060

33. Davy C, Bleasel J, Liu H, Tchan M, Ponniah S, Brown A. Factors influencing the implementation of chronic care models: A systematic literature review. BMC Fam Pract [Internet]. 2015;16(1):102. Available from: 10.1186/s12875-015-0319-5

34. Schoenfelder T, Klewer J, Kugler J. Determinants of patient satisfaction: a study among 39 hospitals in an in-patient setting in Germany. Int J Qual Heal Care. 2011 Oct 1;23(5):503–9.

35. Williams B, Perillo S, Brown T. What are the factors of organisational culture in health care settings that act as barriers to the implementation of evidence-based practice? A scoping review. Nurse Educ Today [Internet]. 2015;35(2):e34–41. Available from: http://dx.doi.org/10.1016/j.nedt.2014.11.012

36. Aldridge MD, Hasselaar J, Garralda E, van der Eerden M, Stevenson D, McKendrick K, et al. Education,

implementation, and policy barriers to greater integration of palliative care: A literature review. Palliat Med. 2016 Mar;30(3):224–39.

37. Plakas S, Mastrogiannis D, Mantzorou M, Adamakidou T, Fouka G, Bouziou A, et al. Validation of the 8-Item Morisky Medication Adherence Scale in Chronically Ill Ambulatory Patients in Rural Greece. Open J Nurs [Internet]. 2011;6(6):158–69. Available from: 10.4236/ojn.2016.63017

38. Tavakol M, Dennick R. Making sense of Cronbach's alpha. Int J Med Educ [Internet]. 2011;2:53–5. Available from: 10.5116/ijme.4dfb.8dfd

39. Bryson JM, Humphrey HH. What to do When Stakeholders Matter: Stakeholder Identification and Analysis Techniques. Public Manag Rev [Internet]. 2004;6(1):29–30. Available from: 10.1080/14719030410001675722

40. Harpe SE. How to Analyze Likert and other Rating Scale Data. Curr Pharm Teach Learn [Internet]. 2015;7(6):836–50. Available from: 10.1016/j.cptl.2015.08.001

41. CBS. Standaard Onderwijsindeling 2006 [Internet]. Centraal Bureau voor de Statistiek. 2014. Available from: https://www.cbs.nl/-/media/imported/onze diensten/methoden/classificaties/documents/2012/05/2006-pub-soi-2014-15.pdf

42. World Health Organization. Patient empowerment and health care [Internet]. World Health Organization; 2009. Available from: https://www.ncbi.nlm.nih.gov/books/NBK144013/pdf/Bookshelf_NBK144013.pdf

43. Leys S. Meten van patiënttevredenheid op een dienst medische beeldvorming: Ontwikkeling van een instrument [Internet]. Gent; 2012. Available from: http://lib.ugent.be/fulltxt/RUG01/001/459/298/RUG01-001459298_2011_0001_AC.pdf

44. Grol R, Bosch M, Wensing M. Development and selection of strategies for improving patient care. Improv Patient Care Implement Chang Heal Care [Internet]. 2013;167–84. Available from: 10.1002/9781118525975.ch10

45. Cardoen B, Gemmel P, Robberecht R. Witboek ziekenhuisapotheek: positie van de ziekenhuisapotheek in de zorgketen [Internet]. 2013. Available from: http://www.bemedtech.be/wp-content/themes/twentyeleven-child/pdf/info/20062013_1371739245_fr.pdf

Appendix I: Questionnaire Medication Use

Beste meneer/mevrouw,

Naar aanleiding van uw verblijf op de afdeling Oncologie van het Medisch Spectrum Twente ontvangt u deze vragenlijst. Voor een onderzoek betreft het doorgebruiken van thuismedicatie in het ziekenhuis zijn wij geïnteresseerd in uw medicatiegebruik. Hiervoor vragen wij u om deze korte vragenlijst in te vullen en retour te sturen. Het invullen van de vragenlijst zal maximaal vijftien minuten in beslag nemen. Uw gegevens worden vertrouwelijk behandeld en zijn voor anderen op geen enkele manier herleidbaar naar personen.

Voor vragen of onduidelijkheden over de vragenlijst kunt u mailen naar het volgende mailadres: L.Aalderink@mst.nl

De vragenlijst bestaat uit drie delen. Deel één bevat vragen over uw algemene gegevens en deel twee over uw medicatiegebruik sinds uw opname op de afdeling Oncologie in het MST. Deel drie gaat over de tevredenheid van uw medicatiegebruik. Gelieve deze vragen naar waarheid in te vullen.

Deel 1: Algemene gegevens

Leeftijd: ____ Datum van invullen vragenlijst: ___-___-_____

Geslacht:
- □ Vrouw
- □ Man

Aantal medicijnen die u per dag gebruikt: ____

Bent u de afgelopen twee weken, sinds uw ontslag van de afdeling Oncologie binnen het MST, zelf verantwoordelijk geweest voor het innemen van uw medicatie?
- □ Ja
- □ Nee

Wat is uw hoogste genoten opleiding (met diploma)?
- □ Basisonderwijs
- □ LBO, vmbo basis of kader, MAVO, MULO, vmbo gemengd of theoretisch
- □ MBO, HAVO, HBS
- □ VWO, HBO, WO

Deel 2: Medicatiegebruik

Hieronder staan zeven vragen betreft uw medicatiegebruik sinds uw opname op de afdeling Oncologie in het MST. Deze vragen zijn alleen met ja of nee te beantwoorden, kruis aan wat voor u van toepassing is.

Vragen	Ja	Nee
1. Vergeet u wel eens uw medicatie in te nemen?		
2. Heeft u in de afgelopen twee weken wel eens uw medicatie niet ingenomen?		
3. Heeft u wel eens uw medicatie geminderd of gestopt omdat u zich er slechter door voelde, zonder het uw behandelaar te vertellen?		
4. Vergeet u wel eens uw medicatie mee te nemen als u op reis gaat of weg van huis bent?		
5. Heeft u in de afgelopen week uw medicatie volgens schema ingenomen?		
6. Wanneer u het gevoel heeft dat u uw aandoening onder controle heeft, stopt u dan wel eens met het nemen van uw medicatie?		
7. Voor veel mensen is het nemen van medicatie volgens een vast schema een last. Is het voor u wel eens lastig om u te houden aan het voorgeschreven medicatieschema?		

Ten slotte nog een vraag over hoe vaak u uw medicatie vergeet om in te nemen, om wat dan ook voor reden. Gelieve een antwoord aan te kruisen dat voor u van toepassing is.

Hoe vaak vergeet u uw medicatie?

- □ Altijd
- □ Meestal
- □ Soms
- □ Zelden
- □ Nooit

Deel 3: Tevredenheid medicatiegebruik

Hieronder staan acht stellingen over de tevredenheid van uw medicatiegebruik. Deze stellingen kunt u beantwoorden door aan te geven of u het er helemaal mee oneens bent of helemaal mee eens en de tussenliggende antwoorden.

<u>Als u het cijfer 1 of 2 heeft aangekruist dan graag een toelichting waarom u het er mee oneens bent of helemaal me oneens bent.</u>

		1= helemaal mee oneens, 5 = helemaal mee eens	
1.	**Mijn medicatie inname, voordat ik werd opgenomen in het ziekenhuis verliep goed.**	**1 2 3 4 5 Toelichting:**	**Nvt**
2.	**Ik ondervond geen problemen met het gebruiken van mijn medicatie tijdens mijn opname.**	**1 2 3 4 5 Toelichting:**	**Nvt**
3.	**Bij het gebruiken van de medicijnen werd er voldoende rekening gehouden met mijn wensen.**	**1 2 3 4 5 Toelichting:**	**Nvt**
4.	**In het ziekenhuis ondervond ik geen andere nadelige effecten van de medicijnen op mijn gezondheid dan thuis.**	**1 2 3 4 5 Toelichting:**	**Nvt**
5.	**De manier waarop de verpleegkundigen met de medicatie omgingen was goed.**	**1 2 3 4 5 Toelichting:**	**Nvt**

6. Bij de bespreking van mijn medicatie bij ontslag uit het ziekenhuis kreeg ik goede informatie.	**1 2 3 4 5** **Toelichting:**	**Nvt**
7. Ik heb voldoende informatie om mijn medicatie na ontslag thuis goed te gebruiken.	**1 2 3 4 5** **Toelichting:**	**Nvt**
8. Ik vind het prettig dat de verpleegkundige in het ziekenhuis mijn medicatie gebruik regelt (en ik daar dus zelf niet aan hoef te denken).	**1 2 3 4 5** **Toelichting:**	**Nvt**

Hartelijk dank voor het invullen van de vragenlijst!

Appendix II: Stakeholder Analysis

First a network of actors is described with the current roles of each stakeholder involved. Second, the stakeholder analysis is executed in two phases. The first phase is the identification of the components, second is the identification of the stakeholders. For the identification of the stakeholders two techniques are executed because they are the most relevant.

Network of actors

The stakeholders and their current roles in the medication process are described in Table 11.

Table 11 Stakeholders and their current roles in the medication process

Stakeholder	Current role
Hospital pharmacist	- Responsible for medication supply. - Drug monitoring
Physician	- Admission interview with patient and requests medication outside office hours. - Prescribes medication in EVS - Drugs monitoring - Discharge interview with patient, prescribing new medication. - Responsible for medication policy and MA. - Responsible for registering changes in medication overview.
Nurse	- Admission interview with patient, requesting current list of home medication. - Notes if there is home medication in DSV. - Administration of medication per round. - Keeps list dispatch medication for any questions after discharge.
Pharmacy assistant - *MA*	- Executes physicians' MA. Checks this and completes assignment. - Puts medication for 24 hours in COW. - Checks imported MA's medication monitoring. - Modifications of MA's because of RDR-administration registration. - Refill of the storage cabinets. - Distribution of medication by name. - Processing returns of department.
- *MV*	- Asks for home medication and verifies this. - Imports home medication in Pharma. - Discuss discrepancies with physician. - Imports medication at discharge in Pharma and asks the physician for any complications in complex situations. - Sends medication at discharge to the patients' desired pharmacy. - Performs medication verification at hospital admission by conducting a conversation with the patient. - Asks for patients' medication profile and verifies this with patient. After verification, this is checked by colleague. - Performs medication verification at discharge from the hospital by checking if it corrects what the physician has prescribed.
Patient	- Responsible for complying with medication regulations.
Outpatient pharmacy	- Provides medication at discharge and performs medication monitoring.
Public pharmacy	- Provides medication at discharge and performs medication monitoring.
Logistics	- Provides supplies, and distribution of medication.
Pharmaceutic companies	- Produces packaged medication. - Research and development in pharmacology.

Ministry of VWS	-	As a policymaker of healthcare, the government is responsible for the budget allocation. The government determines the legal and financial conditions under which the hospital pharmacy can operate (45).
Insurers	-	Take care of the financial flow between RIVM and the hospital (45).

Two phases stakeholder analysis

Phase 1: Identification of components

The components were already identified as follows:

- Development of the project: everything that comes to mind when setting up UHDH.
- Care internal: all care provided to the patient from the hospital.
- Care external: all care provided to the patient of the hospital outside of the hospital.
- Financial: all financial aspects important in setting up and running the project.
- Laws and regulations: all regulations affecting the project.

Phase 2: Identification stakeholders

Basic stakeholder analysis

The first technique is the basic stakeholder analysis (39).This technique is executed with the stakeholders described in Table 11 and are divided into the components established in phase 2 of the stakeholder analysis. The interests of stakeholders in the project UHDH and the extent to which they can influence this project is considered. This is judged by a scale from 1 to 5, where 1 is 'no influence' or 'no interest' and 5 'has a lot of influence' or 'extensive interest'. The results, as can be seen in *Table 12*, are derived from conversations with stakeholders and available literature.

Table 12 Basic stakeholder analysis with their interest and degree of influence per component

Stakeholders UHDH		
Component	**Interest**	**Degree of influence**
Development of the project		
Hospital (board)	5	4
Hospital pharmacy	5	5
Logistics	2	2
Care		
Patients and family	5	4
Care Internal		
Physician	4	4
Pharmacy assistant MA	5	4
Pharmacy assistant MV	5	5
Nurse	5	5
Outpatient pharmacy	3	2
Care external		
Public pharmacy	1	1
Financial		
Healthcare insurer	3	2
Subsidy provider	3	4
Laws and regulations		
Ministry of VWS	2	5

Power versus interest grid

The second technique used is the power versus interest grid (39). Based on the interests of the stakeholders and their possible influence on the project UHDH, which is analyzed in technique 1, it is possible to classify the stakeholders on the power versus interest grid (as can be seen in Figure 2). As can be seen, there are no context setters. Reason is that there were no stakeholders who determined the whole situation. The hospital can determine its own path. The public pharmacy and logistics are included in the crowd quadrant: this group of stakeholders are affected by the project and should adapt to the project. In addition, they are not directly affected by the purposes of the project. Subjects include the patient, pharmacy assistants, nurses, physician, and the healthcare insurer. They need sufficient information about the project because they are interested in the project or because the project is important to them. They are the foundation of the project. The project does not directly affect the healthcare insurer, but the project affects the financial part of paying the medication to the hospital. Among players the hospital pharmacist, the hospital board, and Ministry of VWS are included. These stakeholders are funding the players in the project.

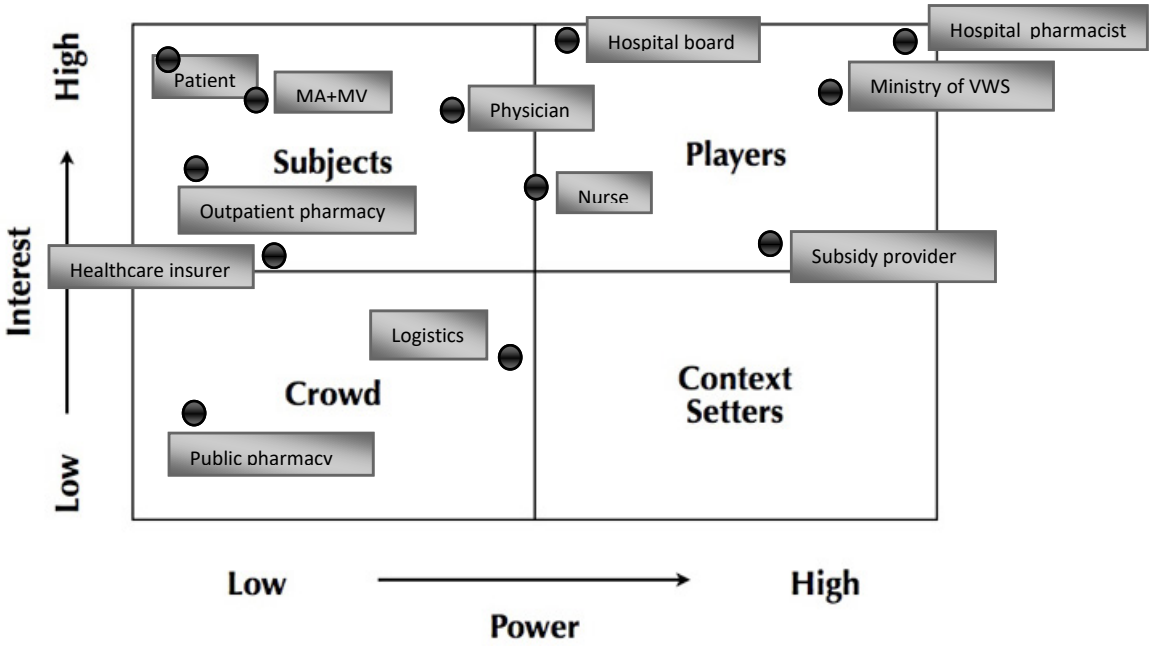

Figure 2 Edited power versus Interest grid (39)

By finding out where the stakeholder gets their ability to influence the project and what goals they pursue, it is possible to further develop Table 12 of technique 1. This is not the interest or degree of influence, but the kind of interest and influence. In this way, it becomes clear how the stakeholder depends on the project or how the project depends on the stakeholder. The results are shown in Table 13

Table 13 The kind of interest and source of influence per stakeholder.

Stakeholder	Interest	Source of influence
Hospital board	Less costs, less medication errors (good name), patient satisfaction	Approval of data entry
Hospital pharmacy	Less costs, less medication errors (good name), patient satisfaction	Driving staff, proper medication counseling, delivery of knowledge
Logistics	Good storage of medication	Supply
Patients and family	Diligent care / pleasant hospital stay	-
Physician	Patients receive well prescribed medication	Offering customized care, delivery of knowledge

Pharmacy assistant MA	Less medication errors	Delivery of labor, additional check
Pharmacy assistant MV	More work and patient satisfaction	Additional knowledge, information for physician is now completely understood
Nurse	Administrate right medication to patient, patient satisfaction	Delivery of labor
Outpatient pharmacy	Provide proper medication	Medication in stock
Public pharmacy	Provide proper medication	Medication in stock
Pharmaceutic companies	Make profit	Financing
Subsidy providers	Risk due to investment	Provide subsidy
Ministry of VWS	Successful project (health gain)	Paying the subsidy providers / checking for the care provided

Conclusion

Hospital pharmacist: is completely involved in the project UHDH and it is important that this remains the way it is. The hospital pharmacist supports the project and is important for the project because they take the decisions.

Hospital board: not directly involved in the project UHDH, but it is important to keep the management informed of the project. They are ultimately the deciding factor if the project is going to be introduced in the hospital. The name of project is attached to the project, which makes it important that the project is successful.

Ministry of VWS: not directly involved in the project UHDH, but is an important stakeholder. They decide the laws and regulations in the Netherlands and determine if this project can be executed in the rest of the country.

Subsidy providers: are involved because they connect they project to their name because of the subsidy given. This makes it important that the project is successful.

Healthcare insurer: not directly involved in the project UHDH. But as a financer for the hospital this stakeholder can be important in the future. However, for now, it is not a relevant stakeholder.

Physician: not involved before the implementation but is involved during the implementation, because of the medication assignment.

Nurse: not involved before the implementation, but is directly involved during the implementation because of the administration of medication.

Pharmacy assistants: not involved before the implementation but is directly involved during the implementation because of the screening of all home medication.

Outpatient pharmacy: not involved in the project UHDH. This will change when the outpatient pharmacy delivers the home medication to the patient. This stakeholder is excluded during the implementation.

Logistics: not involved in the project UHDH. But logistics should change after implementation.

Family: not directly involved in the project UHDH. Family is only involved when they are asked to bring forgotten home medication.

Appendix III: Questionnaire Process Evaluation – UHDH-Q

Geachte heer/mevrouw,

Begin april startte het project “doorgebruik van thuismedicatie (DGTM)” gedurende de opname van patiënten op de Interne Geneeskunde in het Medisch Spectrum Twente (MST). Patiënten mochten hun medicatie van thuis meenemen en deze in het ziekenhuis doorgebruiken. De meegebrachte medicatie hoefde niet meer opnieuw voorgeschreven te worden in het ziekenhuis, ook niet bij ontslag.

Het streven is om dit project in de toekomst ook op uw afdeling in te voeren. Om dit te kunnen bereiken moet een project zoals dit natuurlijk goed worden uitgevoerd. We zijn daarom benieuwd naar uw verwachtingen met DGTM. We willen graag uw mening weten over wat sterke en verbeterpunten zijn naar uw oordeel. Hiervoor willen wij u vragen een vragenlijst in te vullen. Met de antwoorden op de vragenlijsten kunnen, waar mogelijk, verbeteringen worden aangebracht in het project zodat het in de toekomst nog beter aansluit bij de behoefte en wensen van alle betrokkenen.

Het invullen van de vragenlijst duurt maximaal 15 minuten. De antwoorden worden vertrouwelijk en anoniem behandeld en zijn voor anderen op geen enkele manier herleidbaar naar personen.

Als u nog vragen heeft, kunt u contact opnemen via l.aalderink@mst.nl

Hartelijk dank voor uw medewerking.

Esther Groot Wassink-Sportel (ziekenhuisapotheker)
Larissa Aalderink (projectmedewerker DGTM)

Informatie over DGTM:

Doelen en beoogde effecten

Het uiteindelijk doel van dit project is om medicatie (nog) veiliger te gebruiken, patiënten te ondersteunen bij het voeren van de eigen regie en het vergroten van de zelfredzaamheid en therapietrouw. Beoogde effecten van DGTM zijn tijdswinst tijdens de medicatietoedieningen, minder medicatiefouten in het gehele proces en minder verspilling van medicatie.

Activiteiten

Elke discipline heeft zijn of haar eigen, extra, activiteiten (taken) in het proces. De verpleegkundige heeft de volgende taken als DGTM wordt ingevoerd:

- Het bellen naar de medicatieverificatie (MV) van de apotheek bij een nieuwe opname;
- Thuismedicatie opslaan in gastrobakken;
- En de medicatieronde met twee personen uitvoeren om de dubbele check te waarborgen.

Algemene vragen

1. Wat is uw functie?

Verpleegkundige	Arts	Apothekersassistent(e) MV	Apothekersassistent(e) MO	Lid van bestuur/managementteam
☐	☐	☐	☐	☐

2. Op welke afdeling bent u werkzaam?

Interne Geneeskunde	Neurologie	Beide	Anders
☐	☐	☐	☐

3. Bent u betrokken geweest bij DGTM op de bedden 102-109 op de afdeling Interne Geneeskunde?

Ja	Nee
☐	☐

4. Wat is uw leeftijd?

5. Wat is uw geslacht?

Man	Vrouw
☐	☐

De volgende 31 stellingen gaan over de innovatie Doorgebruik van Thuismedicatie (DGTM).

Geef aan in hoeverre u het eens/oneens bent met de stelling die gesteld wordt.

#	Stelling	Helemaal mee oneens	Mee oneens	Noch mee oneens, noch mee eens	Mee eens	Helemaal mee een0s
1	**In zijn algemeenheid, ben ik bij mijn weten, voldoende op de hoogte van DGTM.**	☐	☐	☐	☐	☐
2	**Ik denk dat voor iedereen die info heeft gehad het doel van DGTM te begrijpen is.**	☐	☐	☐	☐	☐
3	**Ik denk dat ik voldoende vaardigheden en kennis van DGTM heb om de activiteiten te kunnen uitvoeren op de afdeling.** *Toelichting: Activiteiten die u, als verpleegkundige, krijgt voor DGTM zijn a. Het bellen naar de medicatieverificatie (MV) van de apotheek bij een nieuwe opname, b. thuismedicatie opslaan in de gastrobakken en c. De medicatieronde met 2 personen uitvoeren om de dubbele controle te waarborgen.*	☐	☐	☐	☐	☐
4	**Ik denk dat het mij lukt om de volgende activiteiten uit te voeren:**					
4a	Bellen naar MV van de apotheek bij een nieuwe opname.	☐	☐	☐	☐	☐
4b	De thuismedicatie in de gastrobakken opslaan.	☐	☐	☐	☐	☐
4c	De medicatieronde uitvoeren met twee personen om de dubbele check te waarborgen.	☐	☐	☐	☐	☐
5	**Ik vind het tot mijn functie behoren om:**					
5a	De MV te bellen als er een nieuwe patiënt met thuismedicatie op de afdeling wordt opgenomen.	☐	☐	☐	☐	☐
5b	De thuismedicatie in gastrobakken opslaan.	☐	☐	☐	☐	☐
5c	De medicatieronde uit te voeren met twee personen om de dubbele check te waarborgen.	☐	☐	☐	☐	☐

#	Stelling	Helemaal mee oneens	Mee oneens	Noch mee oneens, noch mee eens	Mee eens	Helemaal mee eens
6	**Ik vind het belangrijk om met DGTM de volgende doelstellingen bij mijn patiënt te bereiken:**					
6a	Meer medicatieveiligheid.	☐	☐	☐	☐	☐
6b	Een hogere mate van autonomie van de patiënt.	☐	☐	☐	☐	☐
6c	Hogere mate van zelfredzaamheid van de patiënt.	☐	☐	☐	☐	☐
6d	Verhoogde mate van therapietrouw van de patiënt.	☐	☐	☐	☐	☐
7	**Ik denk dat ik op voldoende hulp kan rekenen om de activiteiten van DGTM uit te kunnen voeren op de afdeling van:**					
7a	Collega-verpleegkundigen.	☐	☐	☐	☐	☐
7b	Projectteam van de apotheek.	☐	☐	☐	☐	☐
8	**Over het algemeen heb ik de volgende gevoelens over DTGM.** *Meerdere antwoorden mogelijk.*					
8a	Enthousiasme	☐				
8b	Motivatie	☐				
8c	Tevredenheid	☐				
8c	Sceptisch	☐				
8d	Frustratie	☐				
8e	Stress	☐				
9	**Ik denk dat DGTM voor mij persoonlijk de volgende voor- of nadelen kan bieden:**					
9a	DGTM draagt eraan bij dat ik minder tijd kwijt ben aan de medicatieronden.	☐	☐	☐	☐	☐
9b	DGTM draagt eraan bij dat ik minder medicatiefouten maak gedurende het medicatieproces. *Toelichting: medicatiefouten kunnen zijn: tijd van toedienen, verkeerde medicijn, verkeerde hoeveelheid.*	☐	☐	☐	☐	☐

#	Stelling	Helemaal mee oneens	Mee oneens	Noch mee oneens, noch mee eens	Mee eens	Helemaal mee eens
10	**Ik denk dat patiënten over het algemeen tevreden zullen zijn over DGTM.**	☐	☐	☐	☐	☐
11	**Ik denk dat patiënten, naar verwachting, ondanks hun leeftijd en ziekte/aandoening over het algemeen goed meewerken aan DGTM.**	☐	☐	☐	☐	☐
12	**Ik ben bereid om actief mee te werken aan de invoering van DGTM**	☐	☐	☐	☐	☐
13	**DGTM sluit goed aan bij hoe ik gewend ben om te werken.**	☐	☐	☐	☐	☐
14	**Ik denk alle informatie en materialen van DGTM nodig te hebben om de activiteiten goed uit te kunnen voeren.** *Toelichting: Informatie en materialen zijn richtlijnen, protocollen of andere beschrijvingen om DGTM te kunnen uitvoeren.*	☐	☐	☐	☐	☐
15	**Ik denk dat de nieuwe werkwijze volgens DGTM te ingewikkeld is om mee te werken op de afdeling.**	☐	☐	☐	☐	☐
16	**Ik denk dat DGTM geschikt is voor de patiënten op mijn afdeling.**	☐	☐	☐	☐	☐
17	**Ik denk dat de beoogde effecten van DGTM duidelijk zichtbaar moeten zijn.** *Toelichting: De beoogde effecten van DGTM zijn tijdswinst tijdens de medicatietoedieningen, minder medicatiefouten in het gehele proces en minder verspilling van medicatie.*	☐	☐	☐	☐	☐

#	Stelling	Helemaal mee oneens	Mee oneens	Noch mee oneens, noch mee eens	Mee eens	Helemaal mee eens
18	**Ik denk dat de volgende activiteiten die bij DGTM horen, aansluiten bij bestaande wetten en regels:**					
18a	De MV bellen als er een nieuwe patiënt met thuismedicatie op de afdeling wordt opgenomen.	☐	☐	☐	☐	☐
18b	De thuismedicatie in gastrobakken opslaan.	☐	☐	☐	☐	☐
18c	De medicatieronde uit voeren met twee personen om de dubbele check te waarborgen.	☐	☐	☐	☐	☐
19	**Ik denk dat binnen het ziekenhuis, afspraken over het DGTM formeel vastgelegd worden door het management.** *Toelichting: bijvoorbeeld in beleidsplannen, werkplannen en dergelijke.*	☐	☐	☐	☐	☐
20	**Er worden, bij mijn weten, voldoende maatregelen getroffen om medewerkers die werken met DGTM en de organisatie verlaten, te vervangen met medewerkers die voldoende zijn/worden ingewerkt met betrekking tot DGTM.**	☐	☐	☐	☐	☐
21	**Ik denk dat er voldoende personeel op de afdeling beschikbaar is om de activiteiten van DGTM uit te kunnen voeren.**	☐	☐	☐	☐	☐
22	**Ik denk dat er, behalve de eventuele invoering van DGTM, tegelijkertijd andere veranderingen zijn waar ik mogelijk mee te maken krijg binnen het MST.** *Toelichting: Bijvoorbeeld een reorganisatie, fusie, bezuinigingen, personeelsverloop, andere innovaties.*	☐	☐	☐	☐	☐
23	**Ik denk voldoende tijd beschikbaar te hebben om DGTM te integreren in mijn dagelijks werk.**	☐	☐	☐	☐	☐

#	Stelling	Helemaal mee oneens	Mee oneens	Noch mee oneens, noch mee eens	Mee eens	Helemaal mee eens
24	**Ik denk dat er voldoende materialen en voorzieningen beschikbaar zijn om DGTM zoals bedoeld uit te kunnen voeren.** *Toelichting: Materialen en voorzieningen kunnen het volgende zijn: tijd, personeel, capaciteit, of ruimte om thuismedicatie op te bergen.*	☐	☐	☐	☐	☐
25	**Ik denk dat ik extra cursussen en trainingen nodig zal hebben om DGTM zoals bedoeld uit te kunnen voeren.**	☐	☐	☐	☐	☐
26	**Ik denk dat er één of meerdere personen in het ziekenhuis aangewezen zijn om de implementatie van DGTM te coördineren.**	☐	☐	☐	☐	☐
27	**Ik denk dat de timing van belang is bij het introduceren en implementeren van DGTM.** *Toelichting: gebeurt de implementatie op het juiste moment? Is de situatie binnen het ziekenhuis meer of minder dan normaal geschikt voor de introductie van DGTM.*	☐	☐	☐	☐	☐
28	**Ik denk dat het makkelijk is om informatie te vinden om DGTM zoals bedoeld uit te kunnen voeren.**	☐	☐	☐	☐	☐
29	**Ik denk dat voor een goede uitvoering van DGTM er regelmatig terugkoppeling nodig is over de voortgang van DGTM.**	☐	☐	☐	☐	☐
30	**Ik denk dat er voldoende communicatie over DGTM tussen de betrokken afdelingen/disciplines zal zijn.** *Toelichting: de betrokken afdelingen zijn onder andere: de verpleegafdeling, de apotheek en artsen.*	☐	☐	☐	☐	☐

31	**Zijn er nog aspecten niet aan bod gekomen die u wel graag wilt benoemen? Dan kunt u dat in het onderstaande vak invullen.**

Hartelijk dank voor het invullen van de vragenlijst!