



MASTER THESIS

# Service Designs for Rijnstate@home

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## Abstract

Healthcare in the Netherlands faces several challenges, such as the growth of healthcare expenses and technological developments. Solutions are developed around the world to limit expenses, increase capacity, prevent admissions, or shorten admissions.[1] Rijnstate has started the project Rijnstate@home with the aim to move clinical care from the hospital to the home of the patient.

The aim of this study was to give insight on how to organize hospital care at home and describe multiple alternative designs with their facilitators and barriers. These facilitators and barriers can be used to make decisions during the implementation of Rijnstate@home. A literature study was performed to give insight on the current state of the literature. Stakeholders were interviewed to investigate their views on how hospital care at home should be organised.

No clear definitions were found for hospital care at home. The motivation for choosing a certain service design is often not mentioned in the literature. Another observed problem during this research was the scale of the available programs. Stakeholders of Rijnstate could not decide about which service design is favourable. Costs were seen as an important factor in the decision for a service design. Collaboration between departments was considered as an important factor for the success of the service.

Barriers and facilitators were collected to be able to give advice on how to make a decision for a service design. Recommendations for choosing a service design were given as well as recommendations on how to scale up.

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# 1 Introduction

Healthcare in the Netherlands faces several challenges, such as the growth of healthcare expenses and technological developments. Also, health care organisations are experiencing problems with their capacity due to the aging population. Solutions are developed around the world to limit expenses, increase capacity, prevent admissions, or shorten admissions.[1] One of the ideas that is being developed is to move clinical care from the hospital to the home of the patient. Rijnstate, a hospital in the Netherlands, is an example of that trend. This chapter will start with background information about hospital care at home, followed by context information about Rijnstate and will finish with the aim of the study and research questions.

## 1.1 Background

In 2018 the 'hoofdlijnenakkoord' was signed in the Netherlands by the Dutch minister of Medical care and Sport and other parties involved in the provision of specialized medical care. The agreement involves the limited growth of specialized medical care expenses from 0.8% in 2019 to 0.0% in 2022. The aim of the agreement is to keep care accessible for everyone, while at the same time limit growth of healthcare expenses. One of the provisions of the agreement is to provide more care at the home of the patient.[2-4]

Patients are currently admitted to the hospital for shorter periods in comparison to 20 years ago. This is mainly due to the improvement of healthcare technology and hospital logistics. It is presumed by some that 46% of patients in the Netherlands could receive their care at home instead of at the hospital.[5] Shifting to care at the home of the patient has a number of advantages: Saving time (less travel time and hospital time for the patient), prevention of hospital infections, and less inconveniences for the patient.[5, 6] Some insurance companies in the Netherlands are already stimulating care at home, because it probably saves money [7].

A possible barrier for setting up a hospital at home model are the details of the implementation. A whole infrastructure needs to be set up. Organizations may see this as a problem.[6, 8] Other obstacles in the implementation are the mind-sets of stakeholders, availability of data and financial conditions [6]. Beforehand recognizing and reacting on these barriers is important to make the introduction less complicated.

Despite these barriers, multiple projects in many countries have started in this field [9-11]. An example of an initiative in the Netherlands is the hospital at home initiative in Groningen. Multiple partners work together to deliver hospital care at home for elderly patients with a cognitive impairment.[10] This patient group is vulnerable to hospital-related complications like infections and falls. Therefore this group, as well as other elderly who have a high risk of hospital admission, is often a target group for this kind of programs.[10-12] Smaller scale initiatives in the Netherlands include immunotherapy or chemotherapy at the home of the patient [13-15].

Outside the Netherlands are multiple organizations who deliver some kind of hospital at home care. The NHS in the United Kingdom delivers care at home for elderly people who are at risk for (re)admission. Social care workers, GP, physicians, nurses, and NHS work together to deliver care at the home of the patient.[11] Other countries who provide some kind of hospital care at home are Norway, Australia, and the United States [16-18].

Outcomes of healthcare at home have been studied by multiple systematic reviews and results are often contradictory. Mortality rate was not found to be reduced in systematic reviews on COPD, heart failure, and acute medical conditions.[9, 19, 20] However, one study in patients aged 18 years and older with various diagnoses, did find a lower mortality rate at six months follow-up and a non-significant reduction of mortality at three months [21]. Other outcomes like number of readmissions, complications, quality of life, and patient satisfaction are also studied. They are comparable with in-hospital care or slightly favourable for hospital care at home services.[9, 17, 19-21] Too little data is available about the costs of hospital care at home in comparison with care at the hospital [8, 12]. One study on multiple patient groups mentioned a cost saving of \$2000 per patient in comparison with in-hospital admittance [9].

A limitation of these studies is the inconsistent use of terms like 'hospital at home' and 'hospital in the home'. Studies use the same terms for different services; examples of the various terms are: Hospital in the home, hospital at home, virtual ward and home hospital services. These terms have no clear definitions, which is necessary to be able to compare interventions.[8, 22] In this paper the term "hospital care at home" is used to describe the four categories as described in section 2.4. Another problem is that the above-mentioned results are not necessarily the same for each patient group [12, 17]. Patients who have had a stroke are an exception. These patients have the best outcomes when treated in a stroke unit instead of at home. This is probably because of the high expertise at these units.[12] This should be kept in mind when choosing a target group for the service.

## 1.2 Context

Rijnstate is a hospital with locations in Arnhem, Arnhem-Zuid, Velp and Zevenaar. Rijnstate employs around 5000 people and delivers care to a region with around 470.000 citizens. 40.000 patients are each year hospitalized for diagnostics or treatment. The clinical wards at the location of Arnhem will be renewed in the coming years. Parallel to this renewal the hospital aims to reduce the length of stay of patients by delivering hospital care (partly) at home or by preventing hospital care through the project Rijnstate@home. The project for this thesis was embedded in the department capacity management of Rijnstate.

The speciality piloting Rijnstate@home is bariatric surgery. The care is provided by Vitalys, a hospital owned treatment centre specialized in the treatment of morbid obesity. Vitalys treats almost 1300 patients from around the Netherlands each year. The percentage of patients of Vitalys who are eligible to go home sooner is presently 25%. Patients have to meet a number of criteria: No comorbidities, living close to the hospital and having a partner at home. Bariatrics@home is the project that started in 2018. The goal of this project is to discharge patients directly after recovery instead of after 2 days.

The staff of Vitalys welcomes the project. The only fear is that the workload will increase, because of additional tasks. Therefore, they would like to start with someone who is only responsible for the patients at home to be able to determine the effect on the workload. An advantage for this department is not only that patients go home sooner, but also the possibility to monitor patients for a longer period. A pilot has started to investigate the use of a (Philips) biosensor with the aim to be able to safely monitor patients at home. The sensor measures multiple aspects like temperature,

heart rate, and the position of the patient. The sensor will first be tested in a hospital setting with double monitoring and move towards monitoring in a fictive living room setting.

### **1.3 Problem description**

How best to organise hospital care at home for Rijnstate is yet unknown. Multiple factors have to be taken into account when providing care at the home of patients. An example is the organization of the technical infrastructure and the use of telemonitoring. The scope of this study will be about the organization of resources when delivering hospital care at home.

Within the scope of this study the following considerations need to be made:

- Cooperation with an external organization?
- Patient visits hospital or staff visits patient?
- Combine services in the hospital with hospital care at home services?
- Combining medical specialities?

Decisions need to be made about these considerations at the start of the new service Rijnstate@home. Decisions can only be made based on knowledge of the barriers and facilitators of the multiple options. Therefore, as much knowledge as possible needs to be collected to be able to make an informed decision.

### **1.4 Aim of the study and research question**

The aim of the study is to give insight on how to organize hospital care at home and describe multiple alternative designs with their facilitators and barriers. These facilitators and barriers can be used to make decisions during the implementation of Rijnstate@home. A literature study and interviews will be used with this goal. This will result in recommendations on how this new process should be organized. Therefore the research question is: Which design should be chosen when delivering hospital care at home for patients of Rijnstate?

A number of sub questions will be examined to be able to answer the research question. The sub questions are based on the considerations as provided in section 1.3.

- What are the facilitators and barriers for cooperation with an external organization?
- In what instances should the patient visit the hospital and in what instances should the staff visit the patient?
- Should services in the hospital be combined with hospital care at home services?
- Should specialities be combined within the service?

In chapter 2 the results of a literature study is presented which will describe what methods other organisations use for the provision of hospital care at home and the reported facilitators and barriers. Chapter 3 describes the opinion of stakeholders in Rijnstate about the possible designs of Rijnstate@home. Also, a description is given about how hospital care at home is organized in other programs. These results will lead to recommendations in the final chapter.

## 2 Literature study

A literature study was performed to give insight on the available articles about the implementation of hospital care at home. The first section will describe the methods on how this literature study was conducted. Next, the results will be presented and insight will be given on the current state of the literature. Last, an overview is given of the possible service designs.

### 2.1 Methods

A literature study was performed using the databases Scopus, Google Scholar and Web of science, to give insights on the current developments and designs in hospital care at home. Additionally, grey literature was used to follow current trends on this subject in the Netherlands. Solutions were not only sought in current designs in hospital care at home models, but also in other fields such as house calls and salesmen.

Table 1 gives a description of the search terms that were used, as well as combinations of search terms, to answer the research questions. Results were sorted on relevance if possible. Additional search terms were used when a paper mentioned another term for this kind of service. Table 2 gives the exclusion and inclusion criteria of the literature study. The year 2014 was chosen, because after this year the service is being used by more organisations and technology becomes more advanced for this kind of care. Appendix A shows the search strategy.

Subject	Search terms
Hospital care at home	Hospital at home (schemes) Hospital in the home Home-based care Integrated model Merging services Outreaching services Virtual ward Home hospitalization (Early) supported discharge (Early) assisted discharge Patient-centred medical home Home health care Home hospital services Advanced home hospital services Hospital services at home Home supervision Hospital care at home Transitional care model Home treatment team Acute home care Home care services, hospital-based
Service designs	Organisation Service Management Implementation Operations management Operations research/Operational research



	Service design Logistics
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Table 1: Description of search terms

Inclusion criteria	Exclusion criteria
<ul style="list-style-type: none"> <li>Article about the service design of some kind of hospital care at home initiative</li> <li>Article about operations management problem related to logistics in home health care</li> </ul>	<ul style="list-style-type: none"> <li>Article not available (within the rights of the University of Twente library)</li> <li>Article not in English or Dutch</li> <li>Articles published before 2014</li> <li>Duplicates</li> </ul>

Table 2: Description of criteria

## 2.2 Results of the literature study

A total number of 224994 articles were found. Only the first 50 per set of search terms were selected. After this 2329 articles remained to be scanned on title. Four articles were found by snowballing. In the end, 48 articles were included. 30 articles focused on the outcomes of a service. 18 other articles described something about organisation, structure, or facilitators and barriers. Figure 1 shows the flowchart of the literature search. In the next section the results of the literature search are described.

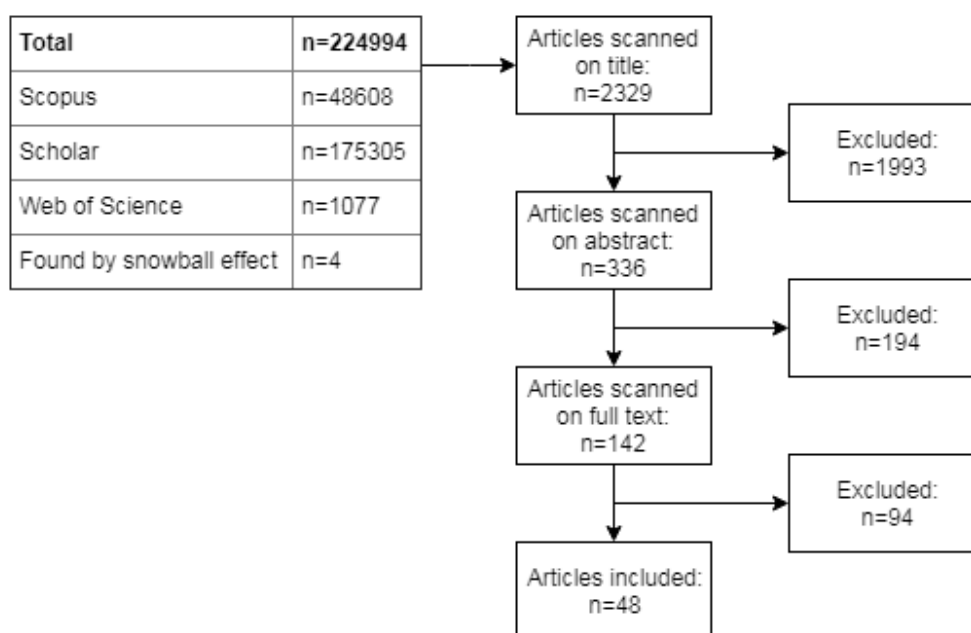


Figure 1: Flow chart of the literature search

## 2.3 Definitions of hospital care at home

A variety of terms was used to describe hospital care at home in the available literature. These terms are not consistently used. Besides, programs have different goals, depending on multiple factors, like the health care system in a country [23]. Another faced problem is that hospital care at home and home care are often mixed up between articles [24]. Sometimes it is not immediately clear from the article which kind of care is meant or one term is used to describe multiple services [25].

A virtual ward, for example, has multiple uses. The first to use the term virtual ward to describe a kind of hospital care at home services was Lewis [26]. A virtual ward was described as a model that

*“provides Multidisciplinary case management services to people who have been identified, using a predictive model, as high risks for future emergency hospitalization. Virtual wards use the systems, staffing, and daily routine of a hospital ward to deliver preventive care to patients in their own homes—rather than waiting for patients to come to the hospital as costly emergencies.”*[27] However, the term virtual ward was already in use in 2003, in which it was used to describe work of nurses outside the ward, like making a phone call or discussing a patient in a meeting.[28] At the moment the term virtual ward is also used to describe an e-learning tool for students [29]. This makes the use of the term for a literature review more difficult.

The same problem arises with the use of the term hospital at home. This term has also no clear definition [8]. A definition set up by Shepperd et al. of hospital at home is: *“A hospital-at-home program is a service that can avoid the need for hospital admission through the provision of active treatment (but not long-term care) by health care professionals in the patient’s home for a condition that would otherwise require inpatient care in an acute care hospital.”* [21] Something similar is mentioned by Voudris et al. Hospital at home needs to meet three criteria according to their paper. It should be able to replace inpatient acute hospital admission, the intensity of the care should be similar to care provided at the hospital, and home care services in the community are not able to provide this kind of care. Palliative care and rehabilitation do not meet these criteria and therefore are not included in the hospital at home definition. [30] Not all organisations use the same definition, although these definitions are available. The term hospital at home is in some organisations used to describe admission avoidance, while in other organisations it means a higher level of care in comparison with early supported discharge [31]. Therefore, the comparison of hospital at home programs is difficult, due to the use of suboptimal definitions of the interventions and heterogeneities of the populations [32].

This problem was also experienced in a review performed for hospital in the home programs in Victoria, Australia. They categorised hospital in the home in two broad types: admission avoidance and early discharge. They stated that hospital in the home was meant for acute care. Their aim was to review the outcomes of hospital in the home. However, hospitals blurred the distinction between hospital in the home and post-acute care. This was done by overlap of staffing, organisation, funding and structure. This made it difficult to categorize the programs and therefore to review the outcomes. [33]

## **2.4 Categories of hospital care at home**

Taking the points of section 2.2 into consideration and reading additional papers, we observe that health care services at home can globally be divided into four categories, however, combinations or deviations are possible. These categories are:

1. Admission avoidance
2. Early discharge
3. Supported discharge
4. Home hospitalization

The services can be similar, however, the goals of the service are not the same. A further explanation of the services is given below with an example of each service. Table 3 shows the number of times a service was used by the included papers. Two papers described two services, therefore the total number of papers in table 3 is higher than the number of papers included.

Service	Number of papers
Admission avoidance (AA)	6
Supported discharge (SD)	2
Early discharge (ED)	13
Home hospitalization (HH)	11

*Table 3: Categories of hospital care at home*

### 2.4.1 Admission avoidance

Admission avoidance has the goal to prevent hospital admission. The intended groups are mostly elderly or patients with a chronic disease, so persons who are at a high risk of hospital admission. The patients are often selected by the use of a model or tool to predict the risk of the person to become hospitalized. The community is often involved in the care for the patients.[34]

An example is a program set up in Washington. Elderly were enrolled in the program after multiple assessments. Patients were visited at least once a month by one of the team members. Nurses, social workers, pharmacists, dental hygienist etc. were all involved in the program. This study found a non-significant reduction of hospital admissions.[35]

### 2.4.2 Early discharge

Early discharge is in general for patients who have had some kind of surgery and need to be hospitalized for a certain time. The goal of early discharge is to shorten this period. Patients who meet certain criteria are sent home with some kind of care at home. The service is preferably no longer than the expected hospital stay.[32, 36]

Multiple hospitals in Spain have an early discharge service for patients after an operation. University hospital Arnau de Vilanova delivers such a service. Patients with acute calculous cholecystitis are able to receive care at home after an open or laparoscopic cholecystectomy. Patients are only eligible when they met certain criteria. Patients are sent home with a drain and need wound care and antibiotics. Nurses have experience with working at a ward and were therefore able to detect early complications. A home care nurse visits every day to start and stop perfusion of antibiotics and to take care of the drain and wound. Also, vital signs are checked. If blood samples are needed, the nurse will take a sample at home. Patients will visit the hospital in case imaging is needed. The patient waits at home for the results. The home care physician receives a daily update and the surgeon is alerted in case of an emergency.[37]

The process shortened the hospital stay, but prolonged the total days of care. The patients were longer monitored than patients at the hospital. An explanation was the lack of need to free a hospital bed. The average saving per patient was two days.[37]

### 2.4.3 Supported discharge

Supported discharge or transitional care makes the transition from hospital care to the home situation without care smaller. Patients are not sent home earlier, but are supported at home with the aim to help the patients with the transition from hospital to home.[38, 39]

In New Zealand, a supported discharge team is set up to help patients with the transition from hospital to home. The target population is patients above 65. A study was set up to investigate if the team helped to reduce hospital readmission, length of stay, and healthcare costs. A member of the team visited the patient up to four times a day, seven days a week. Patients were helped by the activities of daily living (ADL). Patients were admitted to a maximum of six weeks, however, exceptions were made if this was beneficial for a patient. They found that the groups who were included, spend less time in the hospital in 6 months after discharge from the hospital.[38]

#### **2.4.4 Home hospitalization**

Home hospitalization is care that would usually be given at the hospital, but is now given at home [36]. Examples are immunotherapy or dialysis at home. Home hospitalization is often used for emergency patients as well [32]. The patients are assessed at the hospital, but are sent home to receive care.

Brigham and Women's hospital have a program that provides care to patients at home. Multiple conditions are treated at the home, for example infections and complications from diabetes. Every day the patients are visited by a physician and twice a day by a nurse. Patients wear a patch and can have a tablet to communicate with the home care team. The teams delivers care within a radius of five miles from two locations. A study has started with 50 patients, however, no results are available at the moment.[40]

### **2.5 Barriers and facilitators in literature**

Studies on barriers and facilitators of service designs are limited, but some papers were found about the organisation of hospital care at home services. These were used to investigate facilitators and barriers related to hospital at home services. Although the number of papers about this subject is limited at the moment, some useful experiences are written down.

The Icahn School of Medicine at Mount Sinai has set up the Hospital at Home-plus program in collaboration with multiple hospitals. This program consists of multiple services all related to care at home, for example palliative care at home, rehabilitation at home and hospital at home.[41] Nurses from an external organisation were hired. In 2019, they performed a study to investigate the facilitators and barriers to implementation of hospital at home, because they found little research on the implementation of hospital at home programs. Focus groups and individual interviews were used to investigate the barriers and facilitators of the service.[42]

Immediately at the start the first barrier was met. Not all of the eligible patients for the service were known. They started with a group of which they knew were eligible and added patients groups when another eligible group was determined. Another problem at the start was the availability of nurses. Only specific nurses could perform certain services, which lowered the capacity of the hospital at home and resulted in lower ability to give infusion therapy on time. The solution was to change policy and give training to nurses. This was time consuming. A third problem was sceptical physicians, physicians did send too little patients to the service. This would be unsustainable over time. To solve this problem, hospital at home clinicians were set up in the emergency department. Also, education of staff and sharing of experiences was used to solve this problem.[42]

Several considerations were mentioned in the same paper about the collaboration with an external organisation. Many organisations do not have the necessary resources to set up a hospital at home.

It is important to know this beforehand and determine what should be performed by an external organisation. These partnerships should be developed with clear guidelines. This is easier with existing partnerships. An advantage of working with an external organisation is the reduction of time to implement the program. Their experience was that the services provided by an external organisation lowered costs and start up time, however, services were less timely, because of undedicated staff. Besides this, working with multiple partners makes coordination and communication more difficult. Clear protocols need to be in place as well as regular checks with partners to be sure no problems exist. Poor communication and coordination can affect quality and safety. Slowly expanding the service can help to identify problems and retain continuous quality improvement. Placing response time in contracts is important. Another problem with multiple partners and an often rotating group of staff is that it is more challenging to build a stable team. [42]

Two other papers have reported on the facilitators and barriers of collaborating with an external organisation. An advantage is the possible increase of potential customers [43]. A disadvantage is hospital staff being reluctant with sending patients to the service because of a lack of knowledge of the processes and outcomes of the service. This can result in unnecessary hospital admissions.[44]

Scott et al. reported some barriers and facilitators among 22 health care organisations in the United States who delivered transitional care. The approaches and target groups were not uniform. A number of organisations did not have a formal approach and relied on the staff for the coordination of the service. This led to confusion about responsibility. Another problem among organisations was the fragmentation of the service. Units used various strategies and coordination was lacking. The sites with the most success have a clear strategy. Collaboration was seen as a facilitator for transitional care. Smooth communication, efficient information management and face-to-face communication between departments were important to succeed.[45]

Services were more likely to succeed when patients and caregivers were involved in the adaptation and evaluation of the service and received training. Unmet patient or caregiver needs and suboptimal training of caregiver and patient, on the other hand, resulted in less chance to succeed. The engagement of staff was also important. Individual ownership and staff engaging other staff helped in making the service a success.[45]

Table 4 gives an overview of the facilitators and barriers found in the literature.

<b>Subject</b>	<b>Facilitator</b>	<b>Barrier</b>
General	Smooth communication	Unknown target group
	Unified approach	Availability nurses
	Engagement staff and patients	Sceptical physicians
		Fragmentation of service
External organisation	Less time needed to implement service	Undedicated staff
	Increase potential customers	Coordination and communication
		More difficult to have a stable team
		Unnecessary hospital admission due to reluctant staff

Table 4: Overview facilitators and barriers in literature

## 2.6 Service designs

In total 30 papers were found which describe something about the way they organised care at home. Some describe to a certain degree how they organise care, however not the reason for choosing a specific design. Also, almost no articles describe what problems they faced regarding the organisation. Some do mention that processes did change over time, but not why and how. This makes it difficult to conclude the best way to organise care. One study on geriatric care mentioned the importance of investigating how this should be organized.[42]

Most of these programs are set up in the United Kingdom, United States, Australia, and Spain. Some do only address one kind of patient group, however, often multiple patient groups are admitted. Elderly are often the target group, regardless of the disease they have. The goal of these studies is often to determine patient outcomes or experiences from staff and patients rather than to clarify process or organization aspects. Appendix B shows the results of the literature search.

A wide variation in the way organisations implement a hospital at home program was found in the papers. For example in some papers only nurses were involved in the care, while in other programs a team with a variety of disciplines was involved. Sometimes it is mentioned that a problem was noticed and that a service was designed to tackle this problem. However, why they choose a certain design is not mentioned in these articles. Another problem is the lack of description about how they decided how many patients they could serve and how large the teams were. Table 5 has a summary of the results provided in appendix B.

Subject	Summary of the results
Number of patients	20 patients a year in COPD patients to over 80 home visits a day for all kinds of patients.
Length of stay	3 days to 223 days on average over 18 papers
Staff	9 papers: Nurse and physician, but also by other disciplines like social workers and physiotherapists. 5 papers: Both physician and nurse did visit the patient 4 papers: Only nurses visited the patient 2 papers: Only by physicians 2 papers: Described as trained hospital personnel 7 papers: Not mentioned
Referred by	9 papers: The patient was referred from somewhere in the hospital 7 papers: ED 2 papers: A certain ward in the hospital 2 papers: GP 13 papers: Not described who was responsible for referring the patient
Communication	13 papers: Telephone service 1 paper: Tablet, patch to monitor heart rate etc 1 paper: Patch, telephone, encrypted video and encrypted short message service 1 paper: Medical alert device 1 paper: Various digital health devices 14 papers: No communication method was mentioned
Catchment area	1 paper: 15 km 1 paper: 15-20 km 1 paper: 25 km 1 paper: 30 km 1 paper: 5 miles

	1 paper: 25 miles 1 paper: 35 miles 1 paper: Half hour drive 1 paper: No more than 1 hour drive 1 paper: Catchment area hospital 22 papers: Not mentioned
Travel method	5 papers: car, own vehicle or bike 27 papers: not mentioned

Table 5: Summary of the results per subject

## 2.7 Scaling

One of the problems experienced by organisations is scaling up of the program. Most programs accommodate only a few patients a day. The number of patients included in the papers ranged from a mean of 20 patients a year in COPD patients to over 80 home visits a day for all kinds of patients. The organisation of a few patients at home seems not problematic, but when scaling up the program to accommodate more patients, problems arise. Almost no studies are found with a large number of patients included over a short time period, however some studies were found which can give inside in how to scale up a hospital care at home program.

In Europe, the ACT@Scale programme has started to address this problem. Organisations from around Europe collaborate in this project to implement improvements. The project had a target group of frail elderly and patients with chronic conditions.[1] Within this program a handbook was set up with recommendations of scaling of integrated care, which involves the use of telehealth.[46]

Four drivers were described which were regarded as most important in case of scaling up. The drivers were citizen empowerment, service selection, stakeholder and change management, and sustainability and business models. Recommendations were given for all drivers. The most important recommendations were to involve patients and staff in the service, and identify the population that will benefit from the service.[46]

Other studies which are able to give inside in how to scale up a service are the services that accommodate larger patient groups. One of the largest hospital care at home service could serve 140-160 patients a day. They had 4 teams with a total of 32 nurses. Each team took care of one geographic area.[47] Dividing the total area into 4 smaller areas, facilitates serving to a larger area.

Another paper which included a large patient group describes more about the organisation of such a large service. 335212 home visits were performed in 11 years, this means more than 80 patients a day are served. This service does not have admitted patients, but physicians serve patients when a patient calls. Although this is not the definition of a hospital at home or a virtual ward, still we can learn something. The program consists of physicians of all specialities and serves the areas of Athens, Thessaloniki, and to a lesser extent other areas just outside these areas. A patient calls the service. A physician performs the first assessment and decides which speciality is the appropriate speciality. The service is available 24/7. The physician visits the patient and a consult is performed. After examination, a plan is set up for follow up. Physicians use their own vehicle and have to have medical supplies according to their speciality. Additionally, three vehicles are available with therapeutic and diagnostic devices. Specialized homecare nurses were available to support the physician when needed.[48] The physicians are on standby. An appointment can be made, but they also have the possibility to come in case of an emergency. More than 100 doctors of 20 different specialities

participate in the project. They also have a service to provide ultrasound and X-rays at home.[49] The organisation is independent and does not collaborate with a hospital.[48, 49]

The organisation did not change much in ten years. Only more physicians were added to the service. This service provides care to a lot of patients, however, the areas at which they operate is also large. Athens has a population of more than 4 million and Thessaloniki has a population of 0.8 million. It is not clear how many physicians work per area.[48] Another important factor is the coordination centre. The staff here can decide which physician has the right speciality and is in the neighbourhood to serve a patient.[48]

In short, little evidence is available with regard to how to scale up a hospital care at home program. Possible facilitators are involved patients and staff, having a large target population, and dividing the service area in several segments. These facilitators can be used to scale up the program. Other facilitators are not yet known in the literature.

## 2.8 Mathematical scope

The service designs can be qualitative described, as in the literature above, but can also be described using a mathematical description. The subjects of the qualitative description can be used to further investigate a convenient service design. Mathematical descriptions can be used to search the most profitable routes. This can be used in the decision of the service design. Routes can be modelled with geographic areas or by specialty. The costs and travel time can be compared to decide on the optimal design.

A way to do this is by using the Graph theory or theories derived from this theory. This theory describes, in short, the joining of points. Examples are the traveling salesman problem and the vehicle route problem. In some of these problems, customers have special needs that can only be met by resources with specific skills.[50] These models aim to minimize costs, serve all customers and satisfy a number of operational constraints.[50, 51]

The travelling salesman problem describes the problem of planning to send a resource (salesman, technician, caregiver etc.) to a certain location. Goal is to find the shortest or least costly route and to have each location just visited once.[52] Variations of this problem are among others the multiple travelling salesman problem, the clustered travelling salesman problem, and the travelling salesman problem with time windows.[53-55]

The basis of vehicle routing problems (VRP) is to describe problems on how to supply customers by a number of vehicles. These vehicles are located at a depot and need to follow a certain route so every customer requirement is fulfilled. The vehicles can also be substituted for other resources, like caregivers, to describe a similar problem.[50, 51] Multiple variations on this problem are available, like the multiple depots VRP (MDVRP), capacitated VRP (CVRP) and VRP with time windows (VRPTW).[51] Other problems in the field of routing and scheduling are the technician routing and scheduling problem, skill VRP, and the home care crew scheduling and routing problem.[50]

The problem of assigning caregivers to patients and defining a route can be mathematically described. This description is based on multiple papers.[50, 51, 56]

The network can be described by the graph  $G = (V', E)$ .



$V' = \{0, 1, \dots, n\}$  is the set of vertices or nodes, which describe the patients and depot. Vertex 0 describes the depot. The vertex set  $V = V' \setminus \{0\}$  describes the  $n$  customers or patients.

Each node  $j$  represent a patient who needs a service,  $j \in V$ . Node  $i$  represents the starting point or a patient already served so,  $i \neq j$ . Since node 0 represent the depot,  $j \neq 0$ .

$E$  is the set of edges and is used to describe the route,  $(i, j) \in E$ .

The resources or caregivers are assembled in  $t \in T$ .

Each of the patients requires a set of skills,  $S_j$ , and each caregiver has a set of skills,  $S_t$ .

The skills of the caregiver need to be sufficient in order for a caregiver to serve the patient according to  $S_j \subseteq S_t$ . This means that  $(S_i \cup S_j) \subseteq S_t$ , in order for the caregiver to travel between patients.

The objective function is to minimize overall routing costs using:

$$\sum_{(i,j) \in A} \sum_{t: (S_i \cup S_j) \subseteq S_t} c_{ij}^t x_{ij}^t$$

With  $c_{ij}^t$  representing the cost of caregiver  $t$  travelling from  $i$  to  $j$  and

$$x_{ij}^t = \begin{cases} 1, & \text{if } (i, j) \text{ belongs to the tour of caregiver } t \\ 0, & \text{Otherwise} \end{cases}$$

The variables need to satisfy the following constraints:

$$\sum_{i \in V'} \sum_{t: (S_i \cup S_j) \subseteq S_t} x_{ij}^t = 1 \quad j \in V$$

$$\sum_{i \in V': S_i \subseteq S_t} x_{ij}^t = \sum_{i \in V': S_i \subseteq S_t} x_{ji}^t \quad j \in V, t: S_j \subseteq S_t$$

These constraints represent the flow on the path followed by the caregiver and make sure that each patient is served by exactly one caregiver. Additional constraints can be used, depending on the model used.

## 2.9 Overview

An overview of the service designs was set up after reviewing the literature. This resulted in a decision tree with seven possible service delivery scenarios. The service delivery scenarios were adapted over time. The final tree with service design options is shown in figure 2. An overview of the final barriers and facilitators for these service designs are given in chapter 4

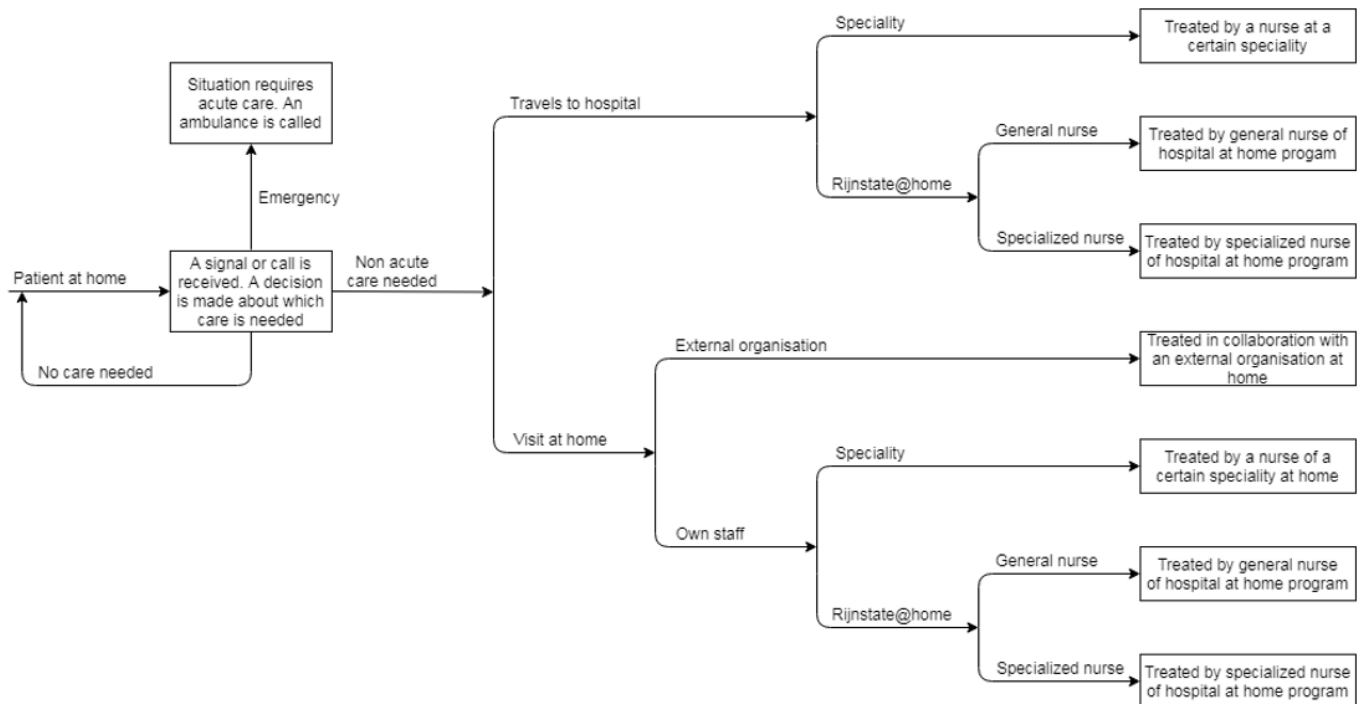


Figure 2: Overview of the service designs

## 2.10 Conclusions

An overview of the available literature was presented in this chapter. Hospital care at home care can roughly be divided into four categories: Admission avoidance, early discharge, supported discharge, and home hospitalization. The motivation for choosing a certain service design is often not mentioned in the literature. Barriers for setting up a hospital at home program are among others, availability of nurses and fragmentation of the service. Facilitators for a unified approach and engagement of patients and staff. These facilitators and barriers can be used for choosing a service design. An observed problem during this research is the scale of the available programs. Most programs only serve a limited number of patients, however, some papers about scaling are available, which can give inside on how to scale up a program. A mathematical programming-based optimization problem can give inside in an optimal solution regarding costs and travelling time.

### 3 Interviews

This chapter describes the interviews that were conducted to provide insight on the views of stakeholders of the implementation of Rijnstate@home. The first section describes how the questionnaires were set up. The other sections present the results of these interviews.

#### 3.1 Methods

Several stakeholders in Rijnstate were interviewed in addition to the literature study to investigate their views on how Rijnstate@home should be implemented. A questionnaire was set up and the decision tree as shown in figure 2 with seven possible service delivery scenarios was discussed during the interviews. The considerations as shown in section 1.3 are taken into account while setting up the questionnaires. The service delivery scenarios were validated using interviews and adapted over time. The final tree with service design options is shown in figure 2.

Rijnstate already provides immunotherapy at home in collaboration with an external organisation. A stakeholder of this project was interviewed to give insight into how the care is organised. Additional information was received by email. A stakeholder at Isala was also interviewed to give insight into the chance@home program, which provides care to a number of heart and lung patients.

The framework for healthcare planning and control as described by Hans et al. (2012). was used to set up these questionnaires.[43, 57] Four managerial areas can be used for health care planning and control: financial planning, medical planning, materials planning and resource capacity planning. The areas can further be divided into four hierarchical levels: online operational level, offline operational level, tactical level and strategic level. Internal and external factors affect the organization. An example of the framework is shown in figure 3.[57] Matta et al. used the four hierarchical levels to describe the decisions that are OM related in the set-up of home care [43]. The framework was validated with interviewed staff at Rijnstate. Appendix C shows the questionnaires.

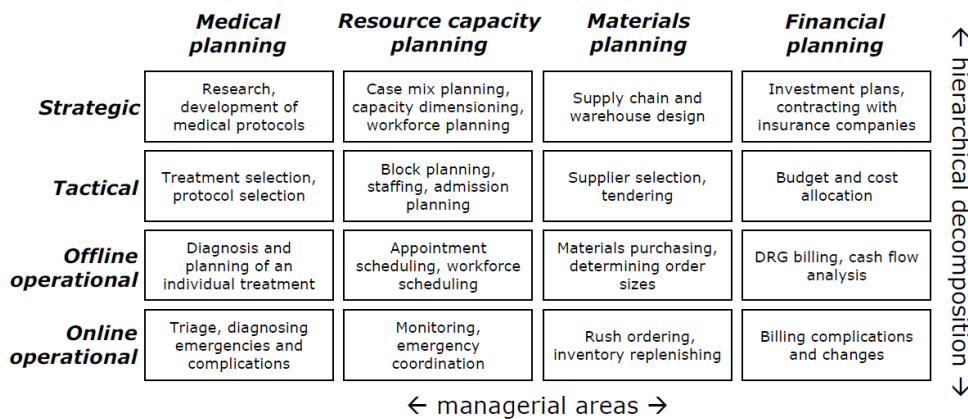


Figure 3: Example of a framework by Hans et al.[57]

#### 3.2 Rijnstate

Three stakeholders in Rijnstate involved in Bariatrics@home were interviewed to describe the current situation and investigate what the thoughts of the stakeholders were about the way things should be organised. The service designs as shown in figure 2 were discussed and the decision tree was adapted with the use of the received feedback. A service design should meet certain criteria. It

should be safe, cheaper (or qualitative better), good for the patient and the patient should be satisfied with the care.

At this moment, bariatric patients are checked every hour after the surgery. This frequency is reduced after a few hours. 16 patients can be served at the ward. 4 nurses are present during the day, 3 in the evening and 1,5 at night. The patients are divided over the nurses into three groups, the intensity of care per patient is taken into account when making this deviation. The fourth nurse focuses on the admission of patients, help others when needed, etc. The nurses are also able to care for other patient groups.

In case the ward at the hospital would still be faced with 16 patients, an extra nurse will be necessary. If this is not the case, no extra nurse would be needed, but the current team could manage the patient at home. Stakeholders agreed on that it was not important that a patient would see the same nurse. Some patients would possibly prefer this, but most would not expect this.

### **3.2.1 Strategic questions**

Forming a partnership with an external organisation was seen as an option. Multiple requirements were thought to be needed. The skills of the nurses should be sufficient to take care of the patient. The delivered care should be available 24/7. It should be known beforehand what a particular external organisation can do as well as the requirements they cannot fulfil. Costs were seen as important in the decision. One stakeholder was more sceptical about the use of an external organisation. This had to do with the specialized care of bariatrics. Currently it is experienced that other hospitals do not always know how to act when a patient of Vitalys is presented, due to the nature of care.

All the stakeholders thought it could be an advantage to collaborate with other specialities at the hospital. This could prevent from units to invent the same service twice. In this case, it would be important for the staff to always be able to reach someone in case of a problem. For example, if monitoring is done together, the nurse that monitors the patient should be able to reach a nurse or physician of the specialty to decide together what the best course of action is. Other factors for working together are the quantity of specialities that are involved, the nature of the specialities involved and common denominators. One stakeholder thought it could also be an option for specialities to start with working separately and later collaborate so problems were easily noticed.

### **3.2.2 Tactical questions**

The patients who will be selected for this service are able to travel to the hospital by themselves. However, this is not the case for everyone. One stakeholder mentioned that in case patients go to the hospital, it will be more logic to send them to the speciality instead of a general nurse.

If general nurses were to be involved, they should have all the skills necessary to take care of the patients. At bariatrics, the nurses follow courses and have certificates related to specialised care. A general nurse should also have these certificates, however, in this case a general nurse would not really be a general nurse anymore. In case the nurses have all the necessary skills, they still would need training to adapt to the home monitoring setting; Having to assess a patient at a distance is different from seeing a patient in person. Also giving information to the caregiver at home is important, they need to know what to look at and what to do.

### **3.2.3 Offline and online operational questions**

A part of the protocol should be what to do in case of an emergency. It is important to know who to send, a nurse or a physician and how many persons to send. A possibility can be a nurse with a car who is ready in case of an emergency. Another possibility is to send an ambulance. This is possibly the quickest solution. The opinion of the patient is important in the decision of who to send. The chosen service design can change over time when more departments are involved.

## **3.3 Immunotherapy**

Rijnstate provides immunotherapy to patients at their home. An external organisation was deployed, due to the need of patients. More patients were in need of immunotherapy and it was difficult to hire new staff on a short notice, because of a tight labour market. Rijnstate is still responsible for the care for the patient.

The external organisation has set up protocols and compared these with the protocols at Rijnstate to make a final protocol. Contact between Rijnstate and the external organisation is organised every month. The staff of Rijnstate is able to access patient information through a digital platform.

### **3.3.1 Strategic questions**

The service is available for all patients who receive some kind of immunotherapy. The external organisation has arranged for the use of vehicles by their staff. Nurses and physicians at the hospital are still involved with the care. Information is shared and patients still have appointments in the hospital. The nurses who deliver care at the home are nurses deployed by the organisation.

No area is determined at which the patient should live, however, the way medication is delivered to the patient depends on the location of the patient. If a patient lives within a radius of 25 km from the hospital, the nurse will get the medication at the pharmacy on the day of the treatment. If the patient lives further away, a medical courier will get the medication the day before treatment and deliver it at the home of the patient at the day of treatment.

### **3.3.2 Tactical questions**

The scheduling of nurses depends on a number of factors. An important factor is the expiration date of the medicines. Also, medicines need to be checked by four different persons. At the pharmacy by a pharmacist, a nurse of the hospital, at the home of the patient by the nurse, and through facetime a fourth person can be asked to do the fourth check. The staff was trained to be able to give the therapy to patients.

Patients are being selected after they have no side effects from the drug within 3 months. The physician decides together with the patient if the patient is admitted to the service or not. Patients will receive a folder with information about the service.

### **3.3.3 Offline and online operational questions**

Around 16 to 17 patients are at home, sometimes up to 30. The number of patients a nurse has to visit depends on the distance and the length of treatment at the home of the patient. The treatment takes around 1 hour, depending on the drug. A cycle of four weeks is in place. Within this time the patient is visited twice by a nurse and has to go twice to the hospital to receive treatment. Beforehand an appointment is made with the patient. The physician at Rijnstate is still responsible

for the patient. The service is palliative, so the length of the service depends on the condition of the patient.

No emergencies have been experienced yet. This is due to following the patient for three months before giving the treatment at home. In case something does happen, the nurse at the home can immediately decide what the best course of action is. A physician can be noticed, or in acute situations an ambulance can be called. The nurse is always able to contact the hospital.

### **3.4 Isala**

The Chance@home project started with the arrival of the mobile era. In 2002 the development of the project was started, it took a few years to make sure everything went smooth. The program was meant as a solution for the aging population. In 2005 a pilot was started with heart patients who received diuretics. The results showed that the intervention was safe and feasible. In 2009 the service became available for all patients. Patients with lung embolism who needed anticoagulation were added to the program in a later stage. More patient groups followed.

An advantage of the service is a smoother transition between hospital and home for patients, because they are in contact with someone regularly. Also, if the patient has home care, the home care nurses are able to follow the patient during the whole treatment which is positive for the continuity of care. A recent problem was the outage of a telecom provider. The solution was to use phones from another provider to still be reachable for patients.

Scaling the service up was seen as a problem. At the moment another team has to be set up in case of scaling up the program. It is important to have a plan beforehand. A start is made with the development of a scheme about this subject.

#### **3.4.1 Strategic questions**

The service is available for 6 patients a day. 8 patients is the maximum a nurse can serve, however, in this case, the nurse will be very busy. On average 4.7 patients are served a day. 5000 patients have been served by Chance@home over ten years. At the moment 700 to 750 patients a year are helped.

The catchment area of the service has a radius of 30 km. This area is chosen by using the graph theory. One van is available for one nurse to travel to the patients. In the van are all the necessary equipment and materials.

The team has 19 members. The nurses like to work at the ward as well as at home. They have more freedom working for Chance@home. At the hospital are a lot of protocols and patients are more active at home.

#### **3.4.2 Tactical questions**

The service is available for multiple patient groups, these include heart failure, acute infarct, lung embolism and pneumothorax. Patients need intravenous treatment with diuretics, antibiotics or other drugs, or have a drain. Patients have to meet certain criteria. They have to live within the catchment area, have someone who can help at home and are stable enough to go home. The patient has to agree on the intervention. At the moment they are looking at other patients who are possible eligible for the service. For example, they want to have a kind of lab in the van for blood diagnostics. The patient cannot leave the house during the treatment. The hospital needs to know where the patient is at all times. The nurse can decide in cooperation with the physician to admit the

patient to the hospital if necessary. Patients are visited once a day and can call 24/7. Patients and their caregivers receive information from the nurses at the ward as well as folders with information. The care path depends on the patient. The nurses are trained to work in this way.

### **3.4.3 Offline and online operational questions**

The duration of the treatment depends on the time it takes to reach the predetermined goals. In case of heart failure is the maximum length of stay 2 weeks. In case a palliative treatment is set in place in collaboration with GP and physician, the service will also end.

Specialized intensive care (IC) and cardiac care (CC) nurses deliver the care to the patient. These nurses work shifts at Chance@home, but also work at the wards in the hospital. The physician is responsible for the care of the patient. If necessary the nurse can discuss with the physician to admit the patient to the hospital. The physician is responsible for the treatment. The nurses are able to make their own schedule. For example, if a patient wants to take a shower first, the nurse can decide to go to another patient. The nurse is scheduled a whole day at the service and is responsible for all patients. A shift of a nurse consists of a dayshift and availability in the evening and at night. They receive almost no calls at night. The nurse can decide to call an ambulance or to travel to the patient themselves. Patients call the nurse they have seen during the day.

## **3.5 Conclusions**

Multiple stakeholders in Rijnstate were interviewed as well as stakeholders related to immunotherapy at home and Chance@home. Stakeholders of Rijnstate could not decide about which service design is favourable. Costs were seen as an important factor in the decision for a service design. Collaboration between departments was considered as an important factor for the success of the service. Stakeholders thought the service design should also depend on the wishes and abilities of the patients. Immunotherapy at home and Chance@home do not have the same service design. Immunotherapy at home collaborates with an external organisation, while Chance@home does not. The services include different patient groups and the time frame in which the service was set up is not the same. Immunotherapy at home of Rijnstate serves more patients, however, Chance@home is able to deliver a wider variety of treatments.

## 4 Conclusions and recommendations

A literature study was performed and stakeholders were interviewed. Both results were used to gain insight on how to implement Rijnstate@home. Some results of the interviews agree with the results of the literature study, although new results were found as well. Knowledge is lacking about the best method to implement a hospital care at home service. Table 7 provides an overview of the results per service design as well as the influence on scaling. These subjects are elaborated in section 4.2 and 4.3.

### 4.1 Summary of the results

The literature study included 48 articles. A limited number of these papers report about the facilitators and barriers of hospital care at home. 30 articles out of 48 articles describe something about the way they deliver care, but these do not describe why certain decisions were made.

Seven possible service delivery scenarios were set up as shown in figure 2. The service delivery scenarios were discussed with stakeholders and some adaptations were made. A summary of the facilitators and barriers found in the literature and through interviews are described below. A summary of these considerations for the multiple decisions is shown in table 6. These considerations are used for recommendations in paragraph 4.2.

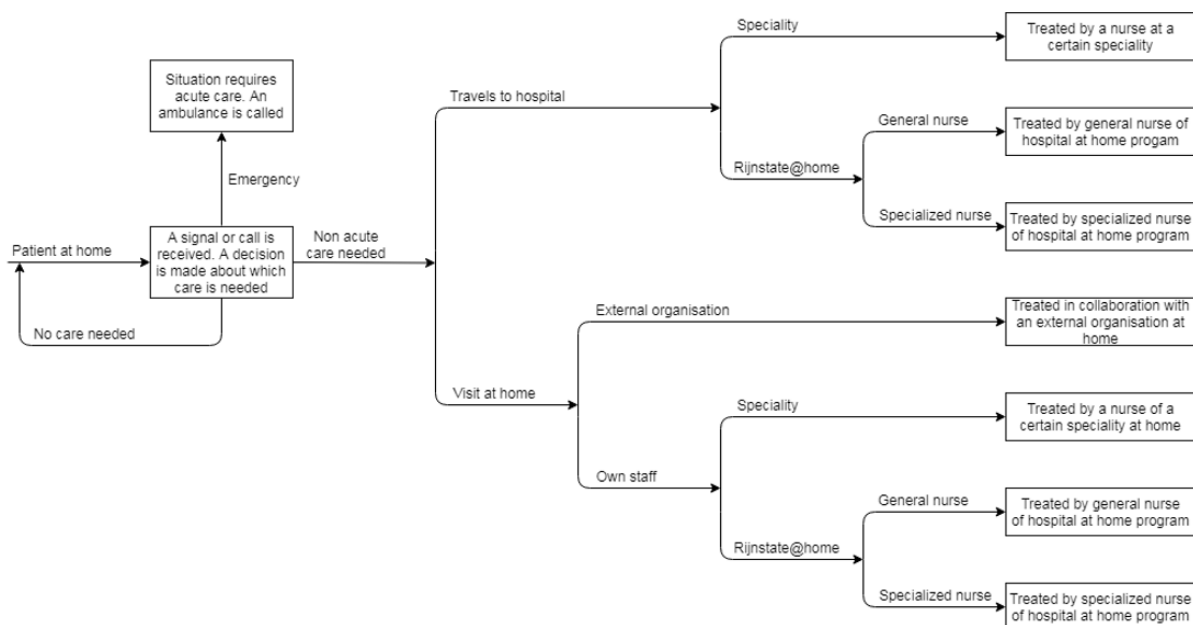


Figure 2: Overview of the service designs

#### 4.1.1 Strategic

Involving an external organisation is an option when the service needs to be set up in a limited timeframe or when knowledge or skills are lacking. Possible barriers for collaboration are difficulties with coordination and communications, reluctant staff at the hospital, undedicated staff of the external organisation, and difficulties with setting up a stable team. Also, staff of an external organisation should have all the necessary skills to be able to deliver the care.



### 4.1.2 Tactical

Another consideration is the collaboration of specialities. In literature, it was found that fragmentation of the service was a barrier for success. Also, stakeholders thought it beneficial to collaborate. Therefore it is advised to at least communicate about the service and have the same service design in all departments. It is important to keep in mind the skills of the staff if specialities are combined in one service. Staff should always be able to reach someone, like a physician, in case of any issues.

An advantage of the use of a general (and not a specialised) nurse for all involved specialities, is the simplification of scheduling nurses. However, using specialized nurses guarantees knowledge and skills to care for a specific patient group. The skills of a general nurse should be sufficient to be able to take care for the included patients. Another option is to combine specialities with comparable skills.

### 4.1.3 Offline and online operational

Another consideration is patient visits hospital or staff visits patient. No defined barriers and facilitators were found for this consideration.

### 4.1.4 Scaling

Delivering hospital care at home at a high scale is experienced as a problem, which yet has to be solved. A higher scale requires a higher demand to be economical sufficient. The demand is often too low for one hospital to make the service economical sufficient. One large service was found in the literature. This service has a catchment area with 4 million people and another one of 0.8 million [48, 49]. Therefore they are able to deliver care for multiple specialities, the demand is high and therefore they are able to make the service economical sufficient. Recommendations for scaling up the service are given in paragraph 4.2.2.

Decision	Considerations (literature and interviews)
General nurse	Skills nurse should be sufficient General nurse should especially be able to reach a physician in case of lack of knowledge
Specialized nurse	Specialized nurse lowers scale Patients with certain needs can be served
External organization	Skills nurse should be sufficient Which requirements can the organization (not) fulfil? Possibility to set up service on short notice More difficult to have a stable team Undedicated staff Unnecessary hospital admissions due to reluctant staff at the hospital Increase potential customers
Home	Nurse can decide on the spot what best course of action is
Hospital	All services are available at hospital Patient still needs to travel to hospital
Combine specialties in Rijnstate@home	Unified approach facilitates service
No combined services	Possible fragmentation of service

Table 5: Summary of the considerations per decision

## 4.2 Conclusions and recommendations

The results as presented above are used to give advice on which service design to choose for Rijnstate@home, although knowledge gaps still exist. This section is divided into two subsections to answer the research question. The first subsection will give advice on how to choose a service design for Rijnstate@home. The second subsection will give recommendations on how to scale up the service.

### 4.2.1 Choosing a service design

The four considerations as provided in section 1.3 are discussed to answer the research question. In table 7 the considerations per hierarchical level for each service design are given. The article of Hulshof et al. is used to make this overview more complete. They describe the decisions to be made in operation research for multiple services [58]. A combination of home care services and inpatient care services is used to facilitate a more comprehensive overview. This overview can be used for choosing a service design. The scale of the service is influenced by the service design. Therefore, the preferred scale of the service needs to be taken into account when deciding on the service design.

The chosen service design could change over time when more departments are collaborating. At the start, one will probably choose the option to let the patient travel to the hospital and be treated by a nurse of that speciality or send a specialized nurse to the patient. In case more departments want to set up the same kind of service, it would be more convenient to collaborate and share nurses.

Several decisions need to be made in case one department starts with the service. In this case, bariatrics is the first to set up the service in Rijnstate. It is recommended to set up the service without an external organisation, because of the barriers and the specialized care of Vitalys. The next decision is who travels to who. This depends on the number of patients that will be included in the service. It is unsustainable to send a nurse to patients when only one patient at a time is at home. In this case, it is advised for the patient to travel to the hospital and visit the department.

In the future, more departments shall want to set up this hospital care at home service. In this case, it is also not advised to hire an external organisation, because of the possible barriers. Staff will be more willing to collaborate when they are actively engaged in the service.

The decision whether a patient visits the hospital or a nurse visits the patients, in case more departments are involved, depends on a number of factors. It is not convenient for the patient to visit the hospital every day and some patients will be less able to do so. The number of patients has to be taken into account. It will not be feasible to travel to one patient, so in this case, the decision should be made to let the patient travel to the hospital. In case of an emergency, the decision will be made by the one who reacts on the call or signal from the patient. In some cases, an ambulance should be called, because of urgency. If it is less urgent multiple options are in place: A nurse visits, the patient goes to the hospital, or a physician is called.

It is advised to send a nurse to the patient in case of daily visits. The number of patients at home will grow when more departments are involved or when just one other department is involved with more eligible patients. In this case, it will be feasible to send a nurse to the patients.

The use of a general nurse for all is convenient for planning, however, such a nurse should be trained to be able to provide all kinds of care. This problem will not be faced in case specialized nurses are

used. Specialities should consult with each other to decide which departments can share nurses and which not. Less extra training for nurses is needed and scheduling nurses will be easier in case specialties are able to share nurses.

#### 4.2.2 Scaling

As mentioned in the results, an often faced problem is the scale of the program. A program with a limited number of patients is often successful, but the programs are not expanded to accommodate more patients. Several options for scaling up the service can be explored, with keeping considerations as mentioned in the results in mind:

- Collaborate with other organisations in the region. This will enlarge the catchment area and facilitates the use of staff from multiple partners. A joint coordination centre can be set up and resources can be shared.
- Lower the number of occupied beds in the hospital. This prevents the need to hire additional nurses.
- Set up a team that delivers care to the patient with nurses that can cover multiple issues. Physicians of a certain specialty are still responsible and send the patient to the service. The service will become less depending on the target group, because all kinds of patients are served [42]. Explore which departments can share nurses, for example, bariatrics with gastrointestinal surgery.
- Set up multiple teams which work independently, but have the same service model. Divide the teams per specialty or per area. Dividing the team per area can enlarge the catchment area, because less time is needed for travelling [47]. In this case, it would be less convenient to use specialized nurses, because more nurses are needed for small areas.
- Use annexes of the hospital to enlarge the area. Nurses can travel from the annexes instead of from the main building, which lowers travel time. This makes it easier to serve a certain area.
- Set up one control centre which can decide who to send. A control centre lowers the working pressure on the departments and can decide who to send.
- Choose a large target group. A large target group will lower the chance of difficulties with scaling up [46].
- Use technology to lower the number of visits per nurse. Less staff is needed outside the hospital if patients do not need a daily visit and actively monitor their own health or report through calls, a forum, or by sending a video.

<b>Service design</b>	<b>Strategic</b>	<b>Tactical</b>	<b>Offline/Online operational</b>
Treated by a nurse at a certain specialty at the hospital	<p>Eligible patients should be able to travel to the hospital.</p> <p>The medical specialty has to correspond with the patient</p> <p>Specialized nurse lowers number of potential patients</p>	<p>Number of nurses needs to be decided. Investigate if current staff is sufficient to provide service or not</p> <p>Staff needs to be divided over the shifts</p>	<p>Patient still needs to travel to hospital</p> <p>All services are available at hospital in case something happens</p>
Treated by a general nurse of <i>hospital at home program</i> at the hospital	<p>Patients are eligible when general nurse is able to provide the correct care. Eligible patients should be able to travel to the hospital</p> <p>Unified approach facilitates service</p> <p>A unit has to be set up for the patients to go to</p>	<p>Number of nurses needs to be decided. Investigate if current staff is sufficient to provide service or not</p> <p>Staff needs to be divided over the shifts</p>	<p>General nurse should especially be able to reach a physician in case of lack of knowledge</p> <p>Patient still needs to travel to hospital</p> <p>All services are available at hospital in case something happens</p>
Treated by specialized nurse of <i>hospital at home program</i> at the hospital	<p>Eligible patients should be able to travel to the hospital.</p> <p>The medical specialty has to correspond with the patient</p> <p>Specialized nurse lowers number of potential patients</p> <p>Unified approach facilitates service</p> <p>Patient visits a certain speciality or a shared unit</p>	<p>Number of nurses needs to be decided. Investigate if current staff is sufficient to provide service or not</p> <p>Staff needs to be divided over the shifts</p>	<p>Patient still needs to travel to hospital</p> <p>All services are available at hospital in case something happens</p>
Treated in collaboration with an external organization at home	<p>Patients are eligible when external organisation is able to provide the correct care and when patient is able to stay at home</p> <p>External organisation increases the number of potential patients</p>	<p>Resources need to be divided over patients and districts. Arranged in collaboration with external organisation</p>	<p>Nurse should be able to reach a physician in case of lack of knowledge</p> <p>Nurse can decide on the spot what best course of action is</p> <p>Route of nurse needs to be decided on. Arranged in collaboration with</p>

	<p>Overview of which requirements external organisation can (not) fulfil</p> <p>Possibility to set up service in short notice</p>		external organisation
Treated by a nurse of a certain specialty at home	<p>Patient is eligible when able to stay at home. The medical specialty has to correspond with the patient</p> <p>Specialized nurse lowers number of potential patients</p> <p>Number and location of depots need to be decided on</p>	Resources need to be divided over patients and districts. Staffing levels per district	<p>Nurse can decide on the spot what best course of action is</p> <p>Route of nurse needs to be decided on</p>
Treated by a general nurse of <i>hospital at home program</i> at home	<p>Patients are eligible when general nurse is able to provide the correct care. Patient is eligible when able to stay at home</p> <p>Number and location of depots need to be decided on</p> <p>Unified approach facilitates service</p>	Resources need to be divided over patients and districts. Staffing levels per district	<p>General nurse should especially be able to reach a physician in case of lack of knowledge</p> <p>Nurse can decide on the spot what best course of action is</p> <p>Route of nurse needs to be decided on</p>
Treated by specialized nurse of <i>hospital at home program</i> at home	<p>Patient is eligible when able to stay at home. The medical specialty has to correspond with the patient</p> <p>Specialized nurse lowers number of potential patients</p> <p>Number and location of depots need to be decided on</p> <p>Unified approach facilitates service</p>	Resources need to be divided over patients and districts. Staffing levels per discipline and district	<p>Nurse can decide on the spot what best course of action is</p> <p>Route of nurse needs to be decided on</p> <p>The correct nurse should be assigned</p>

Table 7: Considerations per hierarchal level for each service design

### 4.3 Further research

In this paper, multiple designs are qualitatively explored. The next step is to quantitatively test multiple designs by investigating the cost-effectiveness of the designs. Cost-effectiveness is an important factor in the decision of which service design to choose. A design should not be chosen when the costs are too high to make it sustainable.

One of the stakeholders mentioned that a pilot would be a good way to investigate what the best design is. This could be performed in collaboration with other organisations, because according to the article by Scott et al.[45] it is not preferable for one organisation to have multiple service designs. An alternative is to retrospectively contact organisations about how they organised the care and compare the results.

Another option is to further investigate how organisations outside The Netherlands organise their care. One of the problems faced during this research was the lack of information about how and why certain service designs were chosen. This can be solved by contacting organisations outside the Netherlands who provide the service to more patients and inquire for this information.

Several service designs can be mathematically modelled to investigate which design minimizes costs and lowers traveling time. Further research in this field can focus on multiple subjects. Multiple aims can be used to choose the optimal route. The aims can for example be to find the shortest route, the route with the lowest costs, or lowest workload for the staff. Also, research can focus on the optimal number of depots or how to divide the total area among the depots [59]. These mathematical models can also be used to choose how many different nurses to embed. One can model what the costs are in case of the use of only general nurses, only specialized nurses, or something in between. Another option is to investigate how to change the route in case of an emergency. An example for this is disaster management. During a disaster, one has to quickly decide who to send and what priority a case has. This can be used as an example of how to solve this problem [60].

## References

1. ACT programme. *What does it take to make integrates care work?* 2015.
2. Rijksoverheid. *Hoofdlijnenakkoord medisch-specialistische zorg 2019-2022 ondertekend.* 2018; Available from: <https://www.rijksoverheid.nl/actueel/nieuws/2018/06/04/hoofdlijnenakkoord-medisch-specialistische-zorg-2019-2022-ondertekend>.
3. Aartsen, C.v. *Hoofdlijnenakkoord medisch specialistische zorg is af.* 2018; Available from: <https://www.zorgvisie.nl/hoofdlijnenakkoord-medisch-specialistische-zorg-is-af/>.
4. Rijksoverheid, *Bestuurlijk akkoord medisch-specialistische zorg 2019 t/m 2022.* 2018.
5. Gupta strategics, *No place like home.* An analysis of the growing movement away from hospitals towards providing medical care to patients in their own homes, 2016.
6. Gupta strategics, *No place like home.* An analysis of medical care at home-Revised edition, 2017.
7. Bassant, E. *Zilveren Kruis wil meer zorg thuis.* 2018; Available from: <https://www.zorgvisie.nl/zilveren-kruis-wil-meer-zorg-thuis/>.
8. Leff, B., *Defining and disseminating the hospital-at-home model.* CMAJ : Canadian Medical Association journal = journal de l'Association medicale canadienne, 2009. **180**(2): p. 156-157.
9. Conley, J., et al., *Alternative Strategies to Inpatient Hospitalization for Acute Medical Conditions: A Systematic Review* *Alternative Strategies to Inpatient Hospitalization* *Alternative Strategies to Inpatient Hospitalization.* JAMA Internal Medicine, 2016. **176**(11): p. 1693-1702.
10. Pouw, M.A., et al., *Hospital at Home care for older patients with cognitive impairment: a protocol for a randomised controlled feasibility trial.* BMJ Open, 2018. **8**(3): p. e020332.
11. NHS England. *Older people living with frailty on 'virtual ward' keeps them well at home and out of hospital.* Available from: <https://www.england.nhs.uk/integratedcare/case-studies/older-people-living-with-frailty-on-virtual-ward-keeps-them-well-at-home-and-out-of-hospital/>.
12. Huntley, A.L., et al., *A systematic review to identify and assess the effectiveness of alternatives for people over the age of 65 who are at risk of potentially avoidable hospital admission.* BMJ Open, 2017. **7**(7): p. e016236.
13. Erasmus MC. *Kankerpatiënt krijgt chemokuur thuis.* 2015; Available from:

<https://www6.erasmusmc.nl/perskamer/archief/2015/5344154/?reason=404>.

14. Antoni van Leeuwenhoek. *Immuuntherapie óók mogelijk in thuissituatie*. 2017; Available from: <https://www.avl.nl/topmenu/over-avl/nieuws/immuuntherapie-ook-mogelijk-in-thuissituatie/>.
15. Skipr. *Rijnstate start met immunotherapie aan huis*. 2017; Available from: <https://www.skipr.nl/actueel/id31679-rijnstate-start-met-immunotherapie-aan-huis.html>.
16. Viana, J., et al. *Optimizing home hospital health service delivery in norway using a combined geographical information system, agent based, discrete event simulation model*. in *2017 Winter Simulation Conference (WSC)*. 2017.
17. Varney, J., T.J. Weiland, and G. Jelinek, *Efficacy of hospital in the home services providing care for patients admitted from emergency departments: an integrative review*. *Int J Evid Based Healthc*, 2014. **12**(2): p. 128-41.
18. Lewis, G., L. Wright, and R. Vaithianathan, *Multidisciplinary case management for patients at high risk of hospitalization: comparison of virtual ward models in the United kingdom, United States, and Canada*. *Popul Health Manag*, 2012. **15**(5): p. 315-21.
19. Qaddoura, A., et al., *Efficacy of Hospital at Home in Patients with Heart Failure: A Systematic Review and Meta-Analysis*. *PLOS ONE*, 2015. **10**(6): p. e0129282.
20. McCurdy, B.R., *Hospital-at-home programs for patients with acute exacerbations of chronic obstructive pulmonary disease (COPD): an evidence-based analysis*. *Ontario health technology assessment series*, 2012. **12**(10): p. 1-65.
21. Shepperd, S., et al., *Avoiding hospital admission through provision of hospital care at home: a systematic review and meta-analysis of individual patient data*. *Cmaj*, 2009. **180**(2): p. 175-82.
22. Montalto, M. and B.A. Leff, *"Hospital in the home": a lot's in a name*. *Medical Journal of Australia*, 2012. **197**(9): p. 479-480.
23. Duke, M. and A. Street, *Tensions and constraints for nurses in hospital-in-the-home programmes*. *International journal of nursing practice*, 2005. **11**(5): p. 221-227.
24. Rest, K.-D., A. Trautsamwieser, and P. Hirsch, *Trends and risks in home health care*. *Journal of Humanitarian Logistics and Supply Chain Management*, 2012. **2**(1): p. 34-53.
25. Sahin, E. and A. Matta, *A contribution to operations management-related issues and models for home care structures*. *International*



- Journal of Logistics Research and Applications, 2015. **18**(4): p. 355-385.
26. Kirkcaldy, A., B.A. Jack, and L.C. Cope, *Health care professionals' perceptions of a community based 'virtual ward' medicines management service: A qualitative study*. Research in Social and Administrative Pharmacy, 2018. **14**(1): p. 69-75.
  27. Lewis, G., *Predictive modeling in action: how 'Virtual Wards' help high-risk patients receive hospital care at home*. New York: The Commonwealth Fund, 2010.
  28. Deacon, M., *Caring for people in the 'virtual ward': the practical ramifications for acute nursing work*. J Psychiatr Ment Health Nurs, 2003. **10**(4): p. 465-71.
  29. Storck, M. and F. Uckert, *Virtual ward round*. Stud Health Technol Inform, 2011. **169**: p. 213-7.
  30. Voudris, K. and M. Silver. *Home hospitalization for acute decompensated heart failure: opportunities and strategies for improved health outcomes*. in *Healthcare*. 2018. Multidisciplinary Digital Publishing Institute.
  31. Echevarria, C., et al., *Early supported discharge/hospital at home for acute exacerbation of chronic obstructive pulmonary disease: a review and meta-analysis*. COPD: Journal of Chronic Obstructive Pulmonary Disease, 2016. **13**(4): p. 523-533.
  32. Hernández, C., et al., *Implementation of home hospitalization and early discharge as an integrated care service: a ten years pragmatic assessment*. International journal of integrated care, 2018. **18**(2).
  33. Montalto, M., *The 500-bed hospital that isn't there: the Victorian Department of Health review of the Hospital in the Home program*. Medical Journal of Australia, 2010. **193**(10): p. 598-601.
  34. Lewis, C., et al., *A community virtual ward model to support older persons with complex health care and social care needs*. Clinical interventions in aging, 2017. **12**: p. 985.
  35. Chang, C., et al., *Impact of a home-based primary care program in an urban Veterans Affairs medical center*. Journal of the American Medical Directors Association, 2009. **10**(2): p. 133-137.
  36. Hernandez, C., et al., *Integrated care services: lessons learned from the deployment of the NEXES project*. International journal of integrated care, 2015. **15**.
  37. Escartín, A., et al., *Home hospitalization for the surgical and conservative treatment of acute calculous cholecystitis*. Surgical Practice, 2018. **22**(2): p. 52-59.

38. Parsons, M., et al., *Supported Discharge Teams for older people in hospital acute care: a randomised controlled trial*. *Age and ageing*, 2017. **47**(2): p. 288-294.
39. Rezapour-Nasrabad, R., *Transitional care model: managing the experience of hospital at home*. *Electronic Journal of General Medicine*, 2018. **15**(5).
40. Chakradhar, S., *Homeward bound*. 2018.
41. DeCherrie, L.V., et al., *Hospital at Home-Plus: A Platform of Facility-Based Care*. *Journal of the American Geriatrics Society*, 2019. **67**(3): p. 596-602.
42. Brody, A.A., et al., *Starting up a hospital at home program: facilitators and barriers to implementation*. *Journal of the American Geriatrics Society*, 2019. **67**(3): p. 588-595.
43. Matta, A., et al., *Modelling home care organisations from an operations management perspective*. *Flexible Services and Manufacturing Journal*, 2014. **26**(3): p. 295-319.
44. Chouliara, N., et al., *Implementing evidence-based stroke Early Supported Discharge services: a qualitative study of challenges, facilitators and impact*. *Clinical rehabilitation*, 2014. **28**(4): p. 370-377.
45. Scott, A.M., et al., *Understanding facilitators and barriers to care transitions: Insights from Project ACHIEVE site visits*. *The Joint Commission Journal on Quality and Patient Safety*, 2017. **43**(9): p. 433-447.
46. Schonenberg, H., et al., *Act@scale Handbook*. 2019.
47. Cœugnet, S., et al., *Time pressure and regulations on hospital-in-the-home (HITH) nurses: An on-the-road study*. *Applied ergonomics*, 2016. **54**: p. 110-119.
48. Theocharis, G., et al., *Patient house calls in Attica and Thessaloniki, Greece (2005-2015): a model for out-of-hospital multispecialty emergency medicine*. *BMC health services research*, 2018. **18**(1): p. 304.
49. SOS IATROI. 2019; Available from: <https://www.sosiatroi.gr/en/faq/>.
50. Paraskevopoulos, D.C., et al., *Resource constrained routing and scheduling: Review and research prospects*. *European Journal of Operational Research*, 2017. **263**(3): p. 737-754.
51. Baldacci, R., et al., *An exact solution framework for a broad class of vehicle routing problems*. *Computational Management Science*, 2010. **7**(3): p. 229-268.
52. Dorigo, M. and M. Birattari, *Ant Colony Optimization*, in *Encyclopedia of Machine Learning*, C. Sammut and G.I. Webb, Editors. 2010, Springer US: Boston, MA. p. 36-39.

53. Kitjacharoenchai, P., et al., *Multiple traveling salesman problem with drones: Mathematical model and heuristic approach*. Computers & Industrial Engineering, 2019. **129**: p. 14-30.
54. Chisman, J.A., *The clustered traveling salesman problem*. Computers & Operations Research, 1975. **2**(2): p. 115-119.
55. Marcon, E., et al., *A multi-agent system based on reactive decision rules for solving the caregiver routing problem in home health care*. Simulation Modelling Practice and Theory, 2017. **74**: p. 134-151.
56. Cappanera, P., L. Gouveia, and M.G. Scutellà, *Models and valid inequalities to asymmetric skill-based routing problems*. EURO Journal on Transportation and Logistics, 2013. **2**(1): p. 29-55.
57. Hans, E.W., M. van Houdenhoven, and P.J.H. Hulshof, *A Framework for Healthcare Planning and Control*, in *Handbook of Healthcare System Scheduling*, R. Hall, Editor. 2012, Springer US: Boston, MA. p. 303-320.
58. Hulshof, P.J.H., et al., *Taxonomic classification of planning decisions in health care: a structured review of the state of the art in OR/MS*. Health Systems, 2012. **1**(2): p. 129-175.
59. Benzarti, E., E. Sahin, and Y. Dallery, *Operations management applied to home care services: Analysis of the districting problem*. Decision Support Systems, 2013. **55**(2): p. 587-598.
60. Altay, N. and W.G. Green, *OR/MS research in disaster operations management*. European Journal of Operational Research, 2006. **175**(1): p. 475-493.
61. Isala. 2019; Available from: <https://www.isala.nl/specialismen-entra/harthuis/over-isala-harthuis/chance-home/>.
62. UMCG. 2019; Available from: <https://hospitalathome.nl/>.
63. Klein, S., M. Hostetter, and D. McCarthy, *The Hospital at Home Model: Bringing Hospital-Level Care to the Patient*. Commonwealth Fund, August, 2016. **22**.
64. Pajarón-Guerrero, M., et al., *Early discharge programme on hospital-at-home evaluation for patients with immediate postoperative course after laparoscopic colorectal surgery*. European Surgical Research, 2017. **58**(5-6): p. 263-273.
65. Aasen, L., I.G. Ponton, and A.K.M. Johannessen, *Being in control and striving for normalisation: A Norwegian pilot study on parents' perceptions of hospital-at-home*. Scandinavian journal of caring sciences, 2019. **33**(1): p. 102-110.
66. Sánchez-Polo, M.T. and J.G. Cegarra-Navarro, *Implementing knowledge management practices in hospital-in-the-home units*. Journal of nursing care quality, 2008. **23**(1): p. 18-22.

67. Rodríguez-Cerrillo, M., et al., *Home treatment of patients with acute cholecystitis*. European journal of internal medicine, 2012. **23**(1): p. e10-e13.
68. Nancarrow, S., *Dynamic role boundaries in intermediate care services*. Journal of Interprofessional Care, 2004. **18**(2): p. 141-151.
69. Utens, C.M., et al., *Patient preference and satisfaction in hospital-at-home and usual hospital care for COPD exacerbations: results of a randomised controlled trial*. International journal of nursing studies, 2013. **50**(11): p. 1537-1549.
70. Edmond, C., G.A. Pryor, and M.J. Parker, *Hospital at home—a review of our experience*. SICOT-J, 2017. **3**.
71. Closa, C., et al., *Hospital-at-home integrated care program for older patients with orthopedic processes: an efficient alternative to usual hospital-based care*. Journal of the American Medical Directors Association, 2017. **18**(9): p. 780-784.
72. Levine, D.M., et al., *Hospital-level care at home for acutely ill adults: a pilot randomized controlled trial*. Journal of general internal medicine, 2018. **33**(5): p. 729-736.
73. Kameshwar, K., et al., *False economies in home-based parenteral antibiotic treatment: a health-economic case study of management of lower-limb cellulitis in Australia*. Journal of Antimicrobial Chemotherapy, 2015. **71**(3): p. 830-835.
74. Lee, G.A. and K. Titchener, *The Guy's and St Thomas's NHS Foundation Trust@ home service: an overview of a new service*. London journal of primary care, 2017. **9**(2): p. 18-22.
75. Lippert, M., et al., *The Hospital at Home program: no place like home*. Current Oncology, 2017. **24**(1): p. 23.
76. Lemelin, J., et al., *Patient, informal caregiver and care provider acceptance of a hospital in the home program in Ontario, Canada*. BMC health services research, 2007. **7**(1): p. 130.
77. Goossens, L.M., et al., *Should I stay or should I go home? A latent class analysis of a discrete choice experiment on hospital-at-home*. Value in Health, 2014. **17**(5): p. 588-596.
78. Quantrill, S.J., et al., *Survey of early discharge schemes from the 2003 UK National COPD Audit*. Respiratory medicine, 2007. **101**(5): p. 1026-1031.
79. Santana, S., et al., *Early home-supported discharge for patients with stroke in Portugal: a randomised controlled trial*. Clinical rehabilitation, 2017. **31**(2): p. 197-206.
80. Melnick, G.A., L. Green, and J. Rich, *House calls: California program for homebound patients reduces monthly spending, delivers meaningful care*. Health Affairs, 2016. **35**(1): p. 28-35.

81. Utens, C.M., et al., *Informal caregiver strain, preference and satisfaction in hospital-at-home and usual hospital care for COPD exacerbations: results of a randomised controlled trial*. International journal of nursing studies, 2014. **51**(8): p. 1093-1102.
82. Aldahmash, A.M., et al., *Implementing a connected health intervention for remote patient monitoring in Saudi Arabia and Pakistan: explaining 'the what' and 'the how'*. Globalization and health, 2019. **15**(1): p. 20.
83. Jester, R., et al., *The development of an evaluation framework for a Hospital at Home service: Lessons from the literature*. Journal of Integrated Care, 2015. **23**(6): p. 336-351.
84. Goossens, L.M., et al., *Cost-effectiveness of early assisted discharge for COPD exacerbations in The Netherlands*. Value in Health, 2013. **16**(4): p. 517-528.
85. Hayashi, J. and B. Leff, *Medically oriented HCBS: house calls make a comeback*. Generations, 2012. **36**(1): p. 96-102.
86. Chahed, S., et al., *Operations management related activities for home health care providers*. IFAC Proceedings Volumes, 2006. **39**(3): p. 641-646.
87. Chahed, S., et al. *Improving operations management practices in home health care structures by using patients' activity projects*. in *2006 International Conference on Service Systems and Service Management*. 2006. IEEE.
88. Di Mascolo, M., M.-L. Espinouse, and Z. El Hajri, *Planning in home health care structures: A literature review*. IFAC-PapersOnLine, 2017. **50**(1): p. 4654-4659.
89. Couture, M., M. Sasseville, and V. Gascon, *Facilitators and Barriers to Implementing Transitional Care Managers Within a Public Health Care System*. Journal of gerontological social work, 2016. **59**(4): p. 364-377.

## Appendix A: Search strategy

### WEB OF SCIENCE

Search term	Results	Selected on title	Selected on abstract	Final selection
TOPIC: ("hospital at home")	241	32	14	8
TOPIC: ("hospital in the home")	96	47	20	8
TOPIC: ("Early supported discharge")	291	20	1	1
TOPIC: ("home hospital services")	2	1	1	0
TOPIC: ("operations management" AND ( "hospital at home" OR "hospital in the home" OR "virtual ward" OR "home hospital services" OR "home based care" OR "home hospitalization" OR "early supported discharge" OR "Patient centered medical home" OR "home health care" OR "home hospital services" OR "hospital services at home" OR "home supervision" ))	8	4	1	0
TOPIC: ("operations research" AND ( "hospital at home" OR "hospital in the home" OR "virtual ward" OR "home hospital services" OR "home based care" OR "home hospitalization" OR "early supported discharge" OR "Patient centered medical home" OR "home health care" OR "home hospital services" OR "hospital services at home" OR "home supervision" ))	3	2	1	1
TOPIC: ("assisted discharge")	40	6	2	0
TOPIC: ("hospital at home" schemes)	22	3	0	0
TOPIC: ("hospital outreach")	20	4	0	0
"acute high-tech home care"	0	0	0	0
TOPIC: ("acute home care")	8	1	0	0
TOPIC: (home care services hospital-based)	173	2	0	0
TOPIC: (home care services hospital-based) AND TOPIC: (organisat* OR servic* OR Logist* OR manag* OR implement*)	173	0	0	0

### SCOPUS

Search term	Results	Selected on title	Selected on abstract	Final selection
TITLE-ABS-KEY ( "merging services" hospital )	0	0	0	0
TITLE-ABS-KEY ( "merging services" ) AND PUBYEAR > 2003	16	2	1	0
TITLE-ABS-KEY ( "outreaching services" ) AND PUBYEAR > 2003	3	1	0	0
TITLE-ABS-KEY ( "Patient-centred	1803	0	0	0

medical home" ) AND PUBYEAR > 2003				
TITLE-ABS-KEY ( "hospital services at home" )	0	0	0	0
TITLE-ABS-KEY ( "advanced home hospital services" ) AND PUBYEAR > 2003	0	0	0	0
TITLE-ABS-KEY ( "early supported discharge" ) AND PUBYEAR > 2003	130	0	0	0
TITLE-ABS-KEY ( "hospital level care at home" ) AND PUBYEAR > 2003	5	4	3	1
TITLE-ABS-KEY ( "virtual ward" AND "Operations management" )	0	0	0	0
TITLE-ABS-KEY ( "virtual ward" ) AND PUBYEAR > 2003	40	25	13	0
TITLE-ABS-KEY ( "hospital at home" OR "hospital-at-home" ) AND PUBYEAR > 2003	330	0	0	0
TITLE-ABS-KEY ( "hospital at home" OR "hospital-at-home" AND "operations management" ) AND PUBYEAR > 2003	0	0	0	0
TITLE-ABS-KEY ( "hospital in the home" OR "hospital-in-the-home" ) AND PUBYEAR > 2003 AND ( LIMIT-TO ( LANGUAGE , "English" ) )	111	27	15	0
TITLE-ABS-KEY ( "hospital in the home" OR "hospital-in-the-home" AND "operations management" ) AND PUBYEAR > 2003	0	0	0	0
TITLE-ABS-KEY ( "operations management" AND ( "hospital at home" OR "hospital in the home" OR "virtual ward" OR "home hospital services" OR "home based care" OR "home hospitalization" OR "early supported discharge" OR "Patient centered medical home" ) ) AND PUBYEAR > 2003	0	0	0	0
TITLE-ABS-KEY ( "operations management" AND ( "home health care" OR "home hospital services" OR "hospital services at home" OR "home supervision" ) ) AND PUBYEAR > 2003	13	4	2	1
TITLE-ABS-KEY ( "operations research" AND ( "hospital at home" OR "hospital	0	0	0	0

in the home" OR "virtual ward" OR "home hospital services" OR "home based care" OR "home hospitalization" OR "early supported discharge" OR "Patient centered medical home" ) ) AND PUBYEAR > 2003				
TITLE-ABS-KEY ( "operations research" AND ( "home health care" OR "home hospital services" OR "hospital services at home" OR "home supervision" ) ) AND PUBYEAR > 2003	9	6	5	0
TITLE-ABS-KEY ( "Early discharge" AND "hospital at home" ) AND PUBYEAR > 2003 AND ( LIMIT-TO ( LANGUAGE , "English" ) )	27	10	7	2
TITLE-ABS-KEY ( "assisted discharge" ) AND PUBYEAR > 2003 AND ( LIMIT-TO ( LANGUAGE , "English" ) )	51	11	9	6
TITLE-ABS-KEY ( "supported discharge" ) AND PUBYEAR > 2003 AND ( LIMIT-TO ( LANGUAGE , "English" ) OR LIMIT-TO ( LANGUAGE , "Dutch" ) )	173	0	0	0
"acute high-tech home care"	0	0	0	0
TITLE-ABS-KEY ( "acute home care" ) AND PUBYEAR > 2003	8	1	0	0
"service design" AND "hospital at home" OR "hospital in the home" OR "early discharge" OR "early supported discharge" OR "virtual ward" OR "home-based care" OR "early assisted discharge" OR "patient-centred medical home" OR "home health care" OR "home hospital services" OR "hospital services at home" OR "home supervision" OR "hospital care at home" OR "transitional care model" OR "home treatment team" OR "acute home care" AND PUBYEAR > 2003	114	12	1	1
TITLE-ABS-KEY ( "service design" AND "hospital at home" OR "hospital in the home" OR "early discharge" OR "early supported discharge" OR "virtual ward" OR "home-based care" OR "early assisted discharge" OR "patient-centred medical home" OR "home health care" OR "home hospital services" OR "hospital services at home" OR "home	23	2	2	0



supervision" OR "hospital care at home" OR "transitional care model" OR "home treatment team" OR "acute home care" ) AND PUBYEAR > 2003				
TITLE-ABS-KEY ( home AND care AND services AND hospital-based ) AND PUBYEAR > 2012	523	4	1	0
TITLE-ABS-KEY ( transitional AND care ) AND PUBYEAR > 2012	3941	8	3	0
( TITLE-ABS-KEY ( home AND care AND services AND hospital AND based ) AND TITLE-ABS-KEY ( organisat* ) OR TITLE-ABS-KEY ( servic* ) OR TITLE-ABS-KEY ( logist* ) ) AND PUBYEAR > 2012 AND ( LIMIT-TO ( LANGUAGE , "English" ) )	2644	2	2	0
( TITLE-ABS-KEY ( home AND care AND services AND hospital AND based ) AND TITLE-ABS-KEY ( organisat* OR servic* OR logist* OR manag* ) ) AND PUBYEAR > 2012 AND ( LIMIT-TO ( LANGUAGE , "English" ) )	2644	0	0	0
( TITLE-ABS-KEY ( home AND healthcare ) AND TITLE-ABS-KEY ( organisat* OR servic* OR logist* OR manag* ) ) AND PUBYEAR > 2012	6275	0	0	0
TITLE-ABS-KEY ( transitional AND care ) AND PUBYEAR > 2012	3941	6	0	0
( TITLE-ABS-KEY ( transitional AND care ) AND TITLE-ABS-KEY ( organisat* OR servic* OR logist* OR manag* ) ) AND PUBYEAR > 2012 AND ( LIMIT-TO ( LANGUAGE , "English" ) )	2187	6	5	2
( TITLE-ABS-KEY ( house AND calls ) AND TITLE-ABS-KEY ( organisat* OR servic* OR logist* OR manag* OR implement* ) ) AND PUBYEAR > 2012	1154	7	2	2
( TITLE-ABS-KEY ( hospital AND at AND home ) AND TITLE-ABS-KEY ( organisat* OR servic* OR logist* OR manag* OR implement* ) ) AND PUBYEAR > 2012 AND ( LIMIT-TO ( LANGUAGE , "English" ) OR LIMIT-TO ( LANGUAGE , "Dutch" ) )	7929	7	2	1
( TITLE-ABS-KEY ( early AND discharge ) AND TITLE-ABS-KEY ( organisat* OR servic* OR logist* OR manag* OR implement* ) ) AND PUBYEAR > 2012 AND ( LIMIT-TO ( LANGUAGE , "English" ) OR LIMIT-TO ( LANGUAGE ,	5515	7	5	1

"Dutch" ) )				
( TITLE-ABS-KEY ( patient-centered AND medical AND home ) AND TITLE-ABS-KEY ( organisat* OR servic* OR logist* OR manag* OR implement* ) ) AND PUBYEAR > 2012 AND ( LIMIT-TO ( LANGUAGE , "English" ) )	1677	6	3	0
( TITLE-ABS-KEY ( advanced AND home AND care ) AND TITLE-ABS-KEY ( organisat* OR servic* OR logist* OR manag* OR implement* ) ) AND PUBYEAR > 2012 AND ( LIMIT-TO ( LANGUAGE , "English" ) OR LIMIT-TO ( LANGUAGE , "Dutch" ) )	1252	0	0	0
TITLE-ABS-KEY ( implementation AND hospital AND at AND home ) AND PUBYEAR > 2012 AND ( LIMIT-TO ( LANGUAGE , "English" ) OR LIMIT-TO ( LANGUAGE , "Dutch" ) )	818	4	2	2
TITLE-ABS-KEY ( implement* AND telemedicine ) AND PUBYEAR > 2012 AND ( LIMIT-TO ( LANGUAGE , "English" ) OR LIMIT-TO ( LANGUAGE , "Dutch" ) )	2938	0	0	0
( TITLE-ABS-KEY ( connected AND care ) AND TITLE-ABS-KEY ( organisat* OR servic* OR logist* OR manag* OR implement* ) ) AND PUBYEAR > 2012	2314	1	1	1

#### SCHOLAR

Search term	Results	Selected on title	Selected on abstract	Final selection
"operations management" AND "hospital at home" OR "hospital in the home" OR "virtual ward" OR "home hospital services"	95	10	2	0
"hospital at home"	6450	0	0	0
"hospital in the home"	2120	0	0	0
"virtual ward"	1010	0	0	0
"home-based care"	19000	0	0	0
"advanced home hospital services"	2	1	1	1
"home hospital services"	36	11	4	3
"hospital services at home"	20	5	2	1
"early supported discharge"	3450	0	0	0
"patient centered medical home"	16500	0	0	0
"merging services" hospital	76	16	4	0
"acute high-tech home care"	2	0	0	0
"acute home care"	306	2	1	0
"service design" AND "hospital at home" OR "hospital in the home" OR "early discharge" OR "early supported	518	0	0	0

discharge" OR "virtual ward" OR "home-based care" OR "early assisted discharge" OR "patient-centred medical home"				
"service design" AND "home health care" OR "home hospital services" OR "hospital services at home" OR "home supervision" OR "hospital care at home" OR "transitional care model" OR "home treatment team" OR "acute home care"	328	0	0	0
"service design" AND "home hospital services" OR "hospital services at home" OR "home supervision" OR "hospital care at home" OR "transitional care model" OR "acute home care"	17	3	2	1
"service design" AND "hospital at home" OR "hospital in the home" OR "early discharge" OR "early supported discharge" OR "virtual ward" OR "early assisted discharge" OR "patient-centred medical home"	375	0	0	0
Home care services hospital based	125.000	3	2	0

## Appendix B: Results literature search

### HOSPITAL CARE AT HOME INITIATIVES

Reference	Organisation	Year of publication	Type of study
[61]	Zwolle, Chance at home		
[62]	Groningen, hospital at home		Protocol for RCT
[40]	Brigham and Women's hospital	2018	News article
[63]	Presbyterian's Hospital at Home program	2016	Case study
[35]	HBPC Washington DC	2009	Retrospective review
[32]	Hospital Clínic de Barcelona	2018	Prospective study with pragmatic assessment
[64]	Hospital Universitario Marqués de Valdecilla (HUMV)	2017	Prospective study
[65]	Paediatric clinic in a university hospital located in Eastern Norway	2018	Pilot study
[47]	Santelys Association	2015	Interviews
[66]	HHU "Virgen de la Arrixaca" University	2008	Descriptive
[67]	San Carlos Clinico Hospital	2011	Prospective study
[37]	University Hospital Arnau de Vilanova	2018	Retrospective analysis
[44]	(Urban) Two Early Supported Discharge services in Nottinghamshire	2014	Qualitative study
[44]	(Rural) Two Early Supported Discharge services in Nottinghamshire	2014	Qualitative study
[68]	a rapid response team	2004	Case study, semi-structured interviews
[69]	5 hospitals, 3 home care organisations	2013	Part of RCT
[38]	Waikato, New Zealand	2017	RCT
[70]	Peterborough City Hospital	2017	Review service
[71]	An acute care hospital, an intermediate care hospital, and the community of an urban area in the North of Barcelona	2017	Quasi-experimental longitudinal study
[72]	Brigham and Women's Hospital +faulkner hospital to increase sample size	2018	Pilot Randomized Controlled Trial
[73]	Western health Hith	2015	Retrospective cohort study

[74]	GSTT @homeservice	2016	Evaluation
[75]	Alberta Children's Hospital Foundation	2017	Data collection and surveys
[76]	province of Ontario, Canada	2007	Evaluation
[77]	Go AHEAD trial (Catherina hospital, Erasmus University, Maastricht University)	2014	DCE (pilot)
[78]	multiple in the UK	2006	Survey
[41]	multiple hospitals, Icahn School of Medicine at Mount Sinai (ISMMS)	2019	Retrospective review
[79]	Aveiro Portugal, Hospital Infante D. Pedro Stroke Unit	2015	RCT
[80]	HealthCare Partners Affiliates Medical Group Southern California	2016	
[81]	6 teaching hospitals in the South-east of the Netherlands and 3 home care organisations	2014	RCT
[48]	SOS doctors in the areas of Attica and Thessaloniki, Greece	2018	retrospective analysis
[82]	Saud University Medical City Hospital (KSUMC)	2019	Description

Reference	ED/AA/SD/HH	Number of patients	Patient group
[61]	HH	6 a day	Heart/lung
[62]	HH	143 expected	Elderly with defined acute illness
[40]	HH	Pilot with 20, expanded study with 50 patients	Multiple conditions, like infection, heart failure, asthma, complications from diabetes and a few Other conditions
[63]	AA	2/day (capacity)	
[35]	AA	183 (2 years)	Multiple
[32]	HH/ED	Increase from 12 to 36 beds/day over 10 years	Acute or exacerbated chronic patients, surgical patients fulfilling criteria for admission in the Hospital Clinic
[64]	ED	50 patients (1 year)	Laparoscopic colorectal surgery
[65]	HH		Children, variable diagnoses
[47]	HH	140-160 (capacity)	Palliative, punctual, rehabilitation
[66]	AA		
[67]	ED	25 (January 2010 to May 2011 )	Acute cholecystitis (treated with antibiotics)
[37]	ED	147 (over 5 years)	Acute calculous cholecystitis (laparoscopy and antibiotics)

[44]	ED	16 (a day?)	Stroke
[44]	ED	16 (a day?)	Stroke
[68]	AA	~13 acute admissions	
[69]	ED		COPD
[38]	SD	103 (18 months)	>65 years old
[70]	ED	1786 (27 years)	Hip fracture (used for this article)
[71]	ED	367 (2 years)	Orthogeriatric conditions
[72]	HH	20 (1month)	Primary diagnosis of any infection, heart failure exacerbation, COPD exacerbation, or asthma exacerbation
[73]	HH	124 (1year)	Lower-limb cellulitis
[74]	Mostly ED and AA	260-280 (per month)(capacity)	Multiple
[75]	HH	136 (2years)	Paediatric haematology, oncology, and blood and marrow transplant
[76]	HH	44 (18 months)	Multiple
[77]	ED		COPD
[78]	ED		AECOPD
[41]	HH	685 (34 months)	Multiple (more than 69 Medicare Severity Diagnosis-Related Groups)
[79]	ED	190 (4 years)	Stroke patients aged 25–85
[80]	SD/AD		Multiple (homebound patients)
[81]	HH	63 (3,5 years)	COPD
[48]	Home assessment	335,212 home visits over 11 years	Multiple
[82]			

Reference	Number of physicians, nurses etc.	Referred by	Area
[61]	Specialized nurses	Physician	30 km
[62]	Nurse, physician, physiotherapist (HaH team)	ED clinician	< 25 km catchment area
[40]		ED	5 miles radius
[63]			25 miles

[35]	Nurse practitioners (NP) (2.0 FTE), registered nurses (RN) (2.0), social workers (2.0 FTE), pharmacists (0.2 FTE), registered dietitian (0.2 FTE), dental hygienist (0.2 FTE)	All services of the medical centre	35 miles
[32]	Trained hospital personnel	ED (HH) and hospital ward (ED)	
[64]			15 km
[65]	1 physician, 4 nurses	Physician at paediatric clinic	No more than 1 hour drive
[47]	32 nurses divided over 4 teams		
[66]	4 internal medicine physicians (make virtual rounds), nurses		
[67]	Nurses and physicians		
[37]			15-20 km
[44]	Multidisciplinary	Hospital with a hyperacute stroke unit and associated stroke specialist rehabilitation wards	
[44]	Multidisciplinary	Hospital with acute stroke unit as well as other community hospital stroke specialist rehabilitation ward	
[68]	Physiotherapist (1X), occupational therapist (1X), support worker (5X), Social worker (1X), Nurses (3.6)	GP and A&E	
[69]	Community nurses	Physician hospital ward	
[38]	Trained health care assistants	Hospital	
[70]	Multidisciplinary (supervision by GP)		
[71]	Multidisciplinary	Recruited in hospital at orthopaedic/traumatology unit	
[72]	General internist, nurses	ED	catchment area hospital
[73]	Nurses	Physician	
[74]	Multidisciplinary	Hospital, GP, London Ambulance service and more	
[75]	2 nurses (worked only at the H@H), physician available when necessary		half hour drive
[76]	Nurses, physician	ED and family medicine service	

[77]			
[78]			
[41]	Nurses, physician, social worker	ED and observation units by program clinicians	
[79]	Community-based team of therapists		
[80]	Multidisciplinary	Multiple possibilities	
[81]		Randomized at ward	
[48]	Physicians from most clinical specialities		
[82]	Physician and nurses		

Reference	Vehicle	Number of visits	Communication
[61]	car	1/day	Telephone
[62]		Starting with 3/day by nurse, 1/day physician (weekends excluded)	Medical alert device
[40]	Car/bike	Physician 1/day, nurse 2/day	Tablet, patch to monitor heart rate etc.
[63]			
[35]		At least 1/month, if needed 1/week	Telephone
[32]		Daily visits by a specially trained for this purpose nurse, physician visits when needed for patient	Telephone (24h)
[64]	Car?	Visit at day 4, 6, 7 after surgery	Telephone
[65]		No more than 3 times a day	Call available between 7.00 and 23.00, at night the paediatric clinic
[47]	Personal professional car		
[66]		Daily visits	Telephone (24h)
[67]		Nurses daily, physician 2-3 visits a week (depending on clinical course patient)	Telephone (24h)
[37]		Nurse visit every day, home care physician got daily update	
[44]		1-2 per day	



[44]		1-2 a day	
[68]			
[69]		every day	Telephone (24h)
[38]		4/day, 7 days a week	
[70]			
[71]		Nurse visits limited to 7 a week, physiotherapy and occupational therapy to 5 a week	
[72]		1/day General internist, 2/day home health registered nurse	patch to monitor heart rate etc., telephone, encrypted video and encrypted short message service
[73]	car	Up to 2/day	
[74]			
[75]		0-6 a day (mean was 3)(in most recent years) (per patient/nurse?)	
[76]		daily by nurse	Telephone (24h)
[77]			
[78]			
[41]		daily visit by nurse(NP) or physician. At least 1 but often 2 daily visits from RN	Telephone (24h)
[79]			
[80]		On average over 12 months 3.6 and 8.1 nonphysician home visits	24/7 telephone
[81]		Max 3 times a day by a nurse	24/7 telephone
[48]	own vehicle	home assessment by physician, when needed specialized nurse available	24/7 telephone
[82]		Tele-consultation sessions (biweekly)	Various digital health devices

Reference	LOS	Results	Notes
[61]	Till 2 weeks		
[62]			

[40]		News article	Results of 50 patients study not yet available
[63]		Benefits and challenges HaH	Staff has to be able to be there within half an hour if something changes, multiple programs available
[35]	6 months	Reduction hospital admissions	
[32]	5-7 days (mean 6), No longer than expected patients DRG in hospital	LOS, readmission rate, mortality, satisfaction	Daily MDO
[64]	Discharge at day 7 (favourable), LOS at home 5.5 on average	Safe and effective, cost savings	
[65]		Parents' perceptions	
[47]		Qualitative and quantitative data, nurses well-being	Nurses divided patients among each other by themselves
[66]		Descriptive	
[67]	11 days (mean)	Safe and effective	
[37]	8.8+ _ 4.3 days of which 3.3+- 2.9 days in hospital	Effects HaH	
[44]	Up to 6 weeks	Challenges, facilitators, impact	
[44]	Up to 6 weeks	Challenges, facilitators, impact	
[68]	7-14 days	Differences between the two services	Services are located at the same hospital
[69]	4 days (after 3 days in hospital)	Satisfaction of patients	
[38]	6 weeks or less	Lower LOS in hospital, cost effective	Primarily to help with ADL
[70]	18 days (mean)	LOS, mortality, readmission rates	
[71]		Compared with hospital-based model	
[72]		Experiences and outcomes	No treatment pathway used, multiple interventions provided, like home radiology
[73]	5.6 (mean in HITH)	Patient outcomes	Patients go to hospital with a frequency specified by the physician
[74]	7 days max	Contribution of GSTT@home service	

[75]		Experiences and outcomes	
[76]		Perspectives from patients and staff	
[77]		Preferences	Preference study, GO AHEAD trial
[78]		Wide variation in schemes	
[41]	depending on treatment+ an additional 30 days follow up	Outcomes per service	Eligible individuals identified in the ED who consented to HaH-Plus care were transported home in an ambulance or car service.
[79]			
[80]			Main goal was To adapt a service model developed and implemented in Denmark to the situation in Portugal
[81]	223 days on average, wide differences	Multiple	Depending on region delivers nurse care to 5-8 patients a day, depending on region patients get a certain time, or a time-window
[48]	3 days after discharge	Experiences	
[82]			Physicians go to patient for assessment. Physicians are required to carry medical supplies and diagnostic tests or devices according to their specialty. Besides this 3 care are available equipped with therapeutic and diagnostic devices
			They have a response centre that receive alarms and decide how to respond

#### ADDITIONAL LITERATURE

Reference	Year of publication	Type of study
[83]	2015	Review
[84]	2013	Cost-effectiveness
[85]	2012	Description models house calls
[86]	2006	Description IDEF0 model
[16]	2017	Simulation
[25]	2014	Interviews and literature

[31]	2016	Review and Meta-analysis
[30]	2018	Descriptive
[39]	2018	Mini-review
[22]	2012	Editorial
[33]	2010	Review
[87]	2006	Descriptive
[88]	2017	Literature review
[23]	2005	Observations and interviews
[89]	2016	Evaluation
[45]	2017	Visitations
[36]	2014	Comparison services
[42]	2019	Focus groups and interviews

## Appendix C: Questionnaires

### Rijnstate

- Mening boom (compleet?)
- Vragenlijst compleet?
- Wat zijn redenen om bepaalde scenario's te overwegen of te schrappen?
- Waar moet het scenario aan voldoen?
- Wat vinden zij belangrijk waar rekening mee moet worden gehouden?
- Zouden jullie willen samenwerken met een andere afdeling? Waarom wel/niet?
- Hoe vaak wordt de patiënt normaal gecontroleerd op de afdeling?
- Is het mogelijk voor een verpleegkundige om verschillende soorten patiënten te zien?
- Vinden jullie het belangrijk dat de patiënt dezelfde verpleegkundige ziet? Waarom wel/niet? Is dit realistisch?
- Zouden jullie willen samenwerken met een externe organisatie? Waarom wel/niet?
- Wat verandert er in de toekomst als er meer services beschikbaar komen? Waarom zou een bepaald scenario er dan boven uitsteken of juist wegvallen?
- 

### Immunotherapie & Zwolle (Chance@home)

#### Algemene vragen:

- Wat vinden patiënten/personeel van de service?
- Tegen wat voor problemen werd/wordt er aangelopen?
- Hoe/Waarom hebben ze voor dit design gekozen?
- Is er een procesbeschrijving?
- Wat is de motivatie voor het werken met een externe organisatie? Hoe is dit onderzocht? (immunotherapie)
- Op wat voor manier wordt het Rijnstate op de hoogte gehouden van de behandeling? (immunotherapie)

- Is het personeel van Rijnstate nog betrokken bij de behandeling? (immunotherapie)
- Zijn er afspraken hoe inkomsten/kosten worden verdeeld? (immunotherapie)
- Hoe verloopt het contact tussen de externe organisatie en de afdeling? (immunotherapie)
- Waarom is er besloten om niet met een externe organisatie samen te werken? (Zwolle)
- Zijn er KPI's opgezet?
- Waar in de boom valt de service onder?

	Medical planning	Resource capacity planning	Materials planning	Financial planning
Strategic	Voor hoeveel patiënten is de service beschikbaar?	Hoe groot is het gebied waar de service wordt aangeboden? (immunotherapie) Waarom is er gekozen voor een afstand van 30 km? (Zwolle) Hoeveel wagens zijn er beschikbaar? Wie hebben er allemaal te maken met de zorg voor de patiënt? Hoeveel verpleegkundigen/artsen zijn beschikbaar? Komt er een arts langs in het @home programma? Waarom wel/niet?		Hoe hebben financiën een rol gespeeld in de beslissing voor het model?
Tactical	Voor welke patiëntengroepen is de service beschikbaar? Hoe worden patiënten geselecteerd? Aan welke eisen moeten patiënten voldoen? Welke behandelingen worden gegeven binnen het @home programma? Komt het programma beschikbaar voor meer patiëntengroepen? Gaat de patiënt op bepaalde momenten terug? Hoe wordt dit	Hoe worden de patiënten in groepen verdeeld? Per groep/behandeling/gebied etc.? Hoe worden de patiënten vervolgens over de verpleegkundigen verdeeld? Zijn er protocollen opgezet? Hoe worden de patiënten gevolgd? Online/bellen? Krijgen de werknemers cursussen om op deze manier te werken? Wie verwijst naar de @home service?	Wie levert het benodigde materiaal?	

	<p>beslist? Wie beslist?</p> <p>Hoe wordt de patiënt de hele dag gevolgd? Wordt de patiënt de hele dag gevolgd? Hoe vaak wordt de patiënt gecontroleerd?</p> <p>Worden de patiënten besproken in een MDO? Hebben anderen dan de verpleegkundige zicht op de patiënt?</p> <p>Hoe wordt de patiënt voorgelicht?</p> <p>Krijgt de patiënt training/uitleg? In hoeverre kan de patiënt kiezen voor de thuis behandeling?</p>			
Offline operational	<p>Hoeveel patiënten worden er per dag geholpen?</p> <p>Zijn er momenten dat de patiënt naar het Rijnstate komt?(immunotherapie)</p> <p>Zijn er momenten dat de patiënt terug naar het ziekenhuis gaat? (Zwolle)</p> <p>Hoe vaak gaat iemand naar de patiënt? (per dag/week)</p> <p>Hoelang is een patiënt onder behandeling van het @home programma?</p>	<p>Wie is er eindverantwoordelijk voor de patiënt?</p> <p>Hoe worden de verpleegkundigen ingeroosterd? Hoe wordt de route bepaald?</p> <p>Is de verpleegkundige die de visite doet ook de verpleegkundig die op de afdeling is gezien? Waarom wel/niet?</p> <p>Hoeveel verpleegkundigen worden ingezet per dienst?</p> <p>Zijn de verpleegkundigen een hele dienst ingepland voor @home service of ook op de afdeling?</p> <p>Wie beslist wanneer een patiënt naar het Rijnstate moet komen? (immunotherapie)</p> <p>Wie beslist wanneer een patiënt terug moet komen naar het ziekenhuis? (Zwolle)</p>	<p>Wat voor materiaal is er nodig?</p> <p>Hoe zorg je ervoor dat er genoeg beschikbaar is? Hoe zorg je ervoor dat de verpleegkundige altijd het juiste materiaal bij zich heeft?</p>	
Online operational	<p>Wanneer is er sprake van een noodgeval? Hoe wordt er onderscheid gemaakt in verschillende soorten spoed?</p>	<p>Wie wordt er gestuurd in geval van nood?</p> <p>Wie beslist dat er een noodsituatie is?</p> <p>Wie reageert in geval van een noodgeval?</p> <p>Hoe wordt er gereageerd op verschillende soorten spoed? Hoe wordt er gereageerd als</p>	<p>Hoe zorg je in geval van een onverwachte situatie ervoor dat het juiste materiaal er op het juiste moment is?</p>	

		er nu hulp nodig is en hoe in het geval er 1 of 2 uur kan worden gewacht? Wat voor invloed heeft dit op de route van de verpleegkundige? Wat gebeurt er op het moment dat de patiënt niet thuis is?		
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