# Organization and Goals of Virtual Care Centres in Dutch Hospitals

Master Thesis in Health Sciences

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# Abstract

**Background** Virtual care involves remote patient monitoring and digital communication between patients and providers and is increasingly integrated into healthcare. In Dutch hospitals, virtual care centres (VCCs) have emerged to provide all digital care services through a centralized department. This approach aims to address healthcare challenges, such as staff shortages, rising costs, and the need for accessible, high-quality care. While VCCs are rapidly developing, little is known about how they are organized and what goals they pursue. This study aimed to explore the structural organization and goals of VCCs in the Netherlands.

**Methods** To gain broad insight into the current organization and goals of VCCs in Dutch hospitals, an online survey combining qualitative and quantitative questions was conducted. The survey, developed based on the Template for Intervention Description and Replication (TIDieR) checklist, was distributed to all 69 Dutch hospitals between May and June 2025. Inclusion criteria ensured respondents had knowledge of their hospital's virtual care approach and proficiency in Dutch. Quantitative data from multiple choice and numeric questions were summarized using descriptive statistics, including frequencies, percentages, means and medians. Qualitative data from open-ended fields were analyzed through coding and categorizing responses related to organizational structure and goals. Additionally, correlation analyses were conducted to explore relationships between variables of interest.

**Results** Of the 37 hospitals included in the analysis (54% of all Dutch hospitals), 15 (41%) reported operating a virtual care centre (VCC). The structural organization of these VCCs included common use of digital applications for remote patient monitoring, with nearly all centres using phone calls, in-app messaging, and automated messages to communicate with patients. (Specialized) nurses were the primary providers of virtual care. Most hospitals provided training to VCC staff and offered patients support in using monitoring technology. Virtual care pathways were mostly disease-specific, developed by multidisciplinary teams, and typically initiated by medical specialists. Integration with electronic medical records varied across VCCs. The number of full-time equivalent staff (FTEs), average monthly patient volumes, number of care pathways, collaborations with external partners, and financing sources showed variation among VCCs. Regarding goals, nearly all VCCs reported ambitions to expand virtual care services, improve collaboration, and scale up capacity. All VCCs used patient and staff feedback to evaluate virtual care delivery.

**Conclusions** The Dutch hospitals showed alignment on several organizational aspects of their VCCs, including technology type, communication channels, implementation of care pathways, and technical support, though the level of technological infrastructure varied. Most hospitals expressed ambitions to expand virtual care, enhance regional collaboration, and scale up their VCCs, reflecting alignment with national digital healthcare goals. These findings provide a basis for hospitals and policymakers to further develop VCCs, with a focus on enhancing technological integration, optimizing resource allocation, strengthening external collaborations and improving financial support.

**Keywords** Digital health, Virtual care centres, Virtual care, Telemonitoring, Remote care

# Contents

# Background

In the Netherlands, there is growing concern about the future of healthcare. This is due to factors such as staff shortages, rising costs, and the aim to maintain care accessible, high-quality, and affordable [1]. The Dutch Integral Care Agreement (*Integraal Zorg Akkoord*) (IZA) [1] addresses these challenges by focusing on health and prevention, with digital care being an important factor. Building on the IZA, the Framework for Appropriate Care (*Kader Passende Zorg*) [2] outlines the government's expectations for all stakeholders to ensure appropriate care in the Netherlands. Their mission for 2040 is healthcare supporting healthy living, while using fewer resources and minimizing environmental impact [2]. To achieve this, technology is needed to enable digital care. Among other steps, healthcare should be digital wherever appropriate and physical care only when necessary [2]. A practical way to implement this principle is through the adoption of virtual care [3–5].

Although virtual care is not a new concept, the meaning of it varies widely [6,7]. Babaei et al. [7] conducted a concept analysis of virtual care and described it as any remote interaction between patients and healthcare providers, or between providers themselves, using various communication technologies. These interactions can happen live (synchronous) or with delay (asynchronous), enabling healthcare services to be provided at any time and place through different methods [7,8]. Methods of delivering virtual care include telephone or video calls, secure messaging, email consulting, telemonitoring and other forms of electronic communication via applications [7]. As virtual care becomes part of everyday healthcare, there is a growing need to move from temporary setups to secure and sustainable solutions [8]. This involves aligning people, processes, and technology within the existing care processes, supported by policies and funding [8]. Virtual care stands out from other remote healthcare methods, like telehealth or telemedicine, by covering a wider range of services [6,7].

As virtual care grows, healthcare systems have developed structured approaches to remote healthcare delivery. One approach is via virtual care centres (VCCs), where hospitals provide all digital care services through a centralized department [5,9]. VCCs can be structured in different ways, depending on the type of care they provide [5]. The structure of VCCs typically consists of three main elements: technology, infrastructure, and service [9]. Remote monitoring can facilitate early hospital discharge, with examples shown in COVID-19 [10] and chronic respiratory disease patients [11], with Peters et al. [9] providing a detailed example of a hospital-based VCC model. The technology consists of wireless wearable sensors and a relay device to monitor patients and transmit data to the hospital [9]. The infrastructure includes servers and software to process the data, along with a remote monitoring centre staffed by nurses trained to monitor the data [9]. The service equips discharged patients with a sensor and relay device, with at least two nurses performing three daily check-ins via calls to assess health, provide advice, conduct home care, or contact a specialist [9].

Virtual care offers several potential advantages, making it a promising concept for the future of healthcare. One of the main benefits is improved access to care [3,7,12–14], as it reduces travel barriers, allowing more patients to receive timely medical attention. Virtual care also supports continuity of care by complementing in-person visits. For healthcare providers, virtual care helps meet patient needs [4], and integrate resources across hospitals and clinics to improve

outcomes [4,15]. It can also be cost-effective, if deployed at sufficient scale [9] by enhancing chronic disease management, shared staffing, and reducing travel, emergency visits and hospital stays [3]. In some cases, virtual care even delivers higher quality care and better patient satisfaction compared to in-person visits, as it reduces stress, travel time, and costs [3,7,16]. However, challenges exist, for instance about data privacy [14], difficulties in maintaining strong patient-provider relationships, or ensuring equitable access to technology, especially among low digital literacy populations [7]. Additionally, not all care services can be provided virtually [7,17]. Overuse or misuse (e.g. treating conditions virtually that require in-person care), could lead to higher costs, patient safety risks and healthcare provider burnout [4,18]. Also, there are questions remaining the overall quality of virtual care services, especially how to measure and standardize this quality [3,14]. Despite these challenges, virtual care has become an essential part of modern healthcare [3,4].

Van Harten et al. [5] outlined relevant factors for organizing virtual care from a hospital's perspective. The factors influencing the organizational development of VVCs include the technology used, supervision, self-management, the relationship between general practitioner (GP) and home care, economics, and the uniformity of remote patient monitoring [5]. Technology includes the type, such as high-tech (e.g. sensors, devices) or low-tech (e.g. applications), infrastructure, relying on integration and connection with other systems, and level of technical support which varies based on the type and infrastructure [5]. Supervision involves the frequency of monitoring and contacts and the type of staff (e.g. physicians, specialized nurses) [5]. Self-management varies in degree and depends on (digital) health literacy and informal caregivers' involvement [5]. The GP and home care relationship differs in type based on their roles and the organization [5]. Economics is affected by hospital finance models and feasibility based on variable factors (e.g. technology costs, number of patients) [5]. Finally, remote monitoring uniformity varies by Dutch region and depends on the cooperation between hospitals and other care providers [5].

While virtual care is important for the future of healthcare, as envisioned by the IZA [1], there is little knowledge about how hospitals in the Netherlands actually deliver and structure it. One emerging approach to delivering virtual care in hospitals is the use of virtual care centres. The way these centres are set up varies depending on factors such as the patient population (e.g., complex or outpatient), type of treatment, and care intensity [5]. Additionally, how a VCC is organized may depend on the specific goals hospitals aim to achieve with virtual care, as different motives can lead to different organizational priorities. However, limited research has explicitly examined the structural setup and underlying goals of VCCs. Gaining insight into these aspects is valuable to assess the current stage of virtual care development in hospitals, enabling comparison across institutions and informing how hospital practices align with national ambitions. Furthermore, such insights can help identify where additional guidance or support is needed to advance the implementation of VCCs across the Netherlands. It is therefore relevant to explore how Dutch hospitals currently organize their virtual care centres and what they aim to achieve with them. By contacting hospitals in the Netherlands, this study aims to provide insight into the structural organization and goals of virtual care centres in Dutch hospitals.

# Methods

An online survey containing both qualitative and quantitative items was used to gain insight into the current organization and goals of virtual care centres in Dutch hospitals. The study was conducted in agreement with the Checklist for Reporting Results of Internet E-Surveys (CHERRIES) (Appendix A) [19].

## Participant selection

To maximize reach, the online questionnaire was distributed using a combination of strategies. A total of 69 Dutch hospitals were contacted, representing all hospitals in the Netherlands.

Recruitment followed a purposive sampling strategy targeting individuals who met two inclusion criteria: (1) having knowledge about the hospital's current virtual care approach, and (2) being able to understand and write in Dutch. Participation was open to anyone meeting these criteria, which was assessed based on their responses.

Initial invitations were sent via invitation-only links, primarily to VCC managers, Chief Nursing Informatics Officers (CNIOs), and Nurse Specialists with policy responsibilities (VSBs). This did not cover all hospitals. To avoid overlap, multiple individuals from the same VCC were generally not approached. Although individuals were the direct respondents, they were expected to complete the survey on behalf of their hospital. Roles were not recorded to avoid implying that responses from certain positions were more valid than others.

Due to limited initial contacts, broader outreach methods were also used to increase participation. Anonymous survey links were shared via LinkedIn, the Dutch Patients' Federation (*Nederlandse Patiëntenfederatie*) and general hospital communication or press email addresses. Where possible, new hospital contacts were approached via email. To enhance participation, reminder messages were sent to all contacts in the weeks following the initial invitation. To avoid duplicate responses, participants selected their hospital from a dropdown list. If a response had already been submitted for that hospital, a notification informed the respondent.

## Data collection

The organization and objectives of virtual care centres in Dutch hospitals were assessed via a Dutch questionnaire (Appendix B), developed based on the Template for Intervention Description and Replication (TIDieR) checklist [20]. The TIDieR checklist is a tool designed to provide a complete description of an intervention, which in our case was the virtual care centres [20].

Survey questions were structured around components of the TIDieR checklist, with adaptations made to fit the context of this study. Related aspects from previous research [5–7] were organized within the questionnaire to provide a comprehensive view of VCCs in Dutch hospitals. All respondents were shown the section on the overall structure of their virtual care approach. For hospitals with a VCC, additional sections, each specifically focused on the VCC context, addressed: motives and objectives for virtual care delivery, materials and procedures, staffing, delivery environments, care duration and frequency, patient-tailored virtual care, implemented changes, and measures of success and challenges.

The questionnaire was presented in a fixed order and included quantitative questions, such as multiple-choice questions allowing single or multiple answers and numeric responses, as well as qualitative open-ended questions. Adaptive questioning was used to tailor the survey based on respondents' answers. Questions were made mandatory where possible. Participants could return to previous pages to change their answers. The estimated time to complete the survey was approximately 20 minutes for hospitals with a VCC, while hospitals without a VCC required less time. At the end of the online survey, participants could leave their email in a separate form to indicate whether they were willing to receive follow-up questions or wished to receive a summary of the results. A pilot test was conducted with representatives from a top-clinical hospital to assess clarity before full deployment.

The survey was conducted via the online questionnaire platform Qualtrics, starting in May 2025 and ending in June 2025.

## Data analysis

Responses were analyzed using Excel (Version 2502). Only data on implemented virtual care initiatives from virtual care centres were included in the main analysis. Other virtual care delivery models and planned centralized virtual care delivery initiatives were analyzed separately, as they fall outside the study's main scope. Only questionnaires with the majority of sections completed were included in the analysis to ensure consistency in the analysis. If multiple questionnaires were submitted by the same hospital, only the first completed survey was included to prevent bias and avoid conflicts when responses differed.

The results were organized around the two study objectives: the structural organization and goals of virtual care centres in Dutch hospitals. Structural organization covered materials and procedures, staff, delivery settings, care duration and frequency, and patient-tailored virtual care within VCCs. The goals addressed motives, objectives, implemented changes, and measures of success and challenges within the VCC context.

Quantitative data from closed-ended questions, including multiple choice and numeric responses related to organization and goals of VCCs, were analyzed using descriptive statistics such as percentages, means, and medians. Qualitative data, from responses under the "Other" option and open-ended questions, were analyzed through coding and categorizing responses to identify recurring themes related to the structural organizational and goals of VCCs. Additionally, correlation analyses were performed to explore relationships between variables of interest, such as the number of full-time equivalent staff (FTEs), patient volume, duration of VCC operation, types of collaborations, financing sources, and reported challenges. These analyses aimed to identify potential associations within the questionnaire data.

## Ethical considerations

Ethical approval for this study was granted by the University of Twente BMS Ethics Committee, Domain Humanities and Social Sciences (HSS) (250679). Participants were asked for informed consent (Appendix C) before accessing the survey. Participation was voluntary, with the option to withdraw at any time. No compensation was provided for participation. Identifiable data were collected separately from the results, securely stored solely for follow-up or sharing a summary, and not included in the reported results.

# Results

A total of 54 survey responses were received, representing 43 hospitals (62% of total hospitals). Of these, 17 responses, representing 14 hospitals, were excluded from the main analysis. 11 out of 17 responses, representing eight hospitals, were excluded, because only the first complete entry was considered. Four responses were excluded, because of a technical issue that left most survey sections incomplete. Two responses were excluded, because of not meeting inclusion criterion 1: having knowledge about the hospital's current virtual care approach. As one respondent did not know the concept of virtual care itself and the other did not recognize the study's definition of virtual care.

One response reported a mixed virtual care model (centralized and decentralized). The centralized data was partly excluded from the main analysis, as the hospital had not yet implemented centralized care and it did not reflect current practice. However, this data is reported separately, as it still provides useful insights for the discussion.

As a result, 37 unique hospital responses (54% of total hospitals) were included in the analysis (Table 1). Hospitals from nearly all provinces are included into the analysis, with the exception of Drenthe (Appendix D)

**Table 1** Distribution of virtual care delivery models by hospital type included in the main analysis.

| | Virtual care delivery model | | | | |
|---|---|---|---|---|---|
| **Hospital type** | Centralized | Decentralized | Outsourced | No virtual care | **Total (unique hospitals)** |
| General | 2 | 13 | 1 | 0 | **16** |
| Top-clinical | 11 | 5 | 3 | 1 | **16*** |
| University Medical Center | 2 | 3 | 0 | 0 | **5** |
| **Total (unique hospitals)** | **15** | **21** | **4** | **1** | **37*** |

*Column sums exceed total unique hospitals as four hospitals use multiple virtual care delivery models.
Mixed models include Centralized + Decentralized (2), Centralized + Outsourced (1), Decentralized + Outsourced (1).

The main analysis concerns the centralized virtual care delivery model. Findings related to other virtual care models than centralized care are presented for completeness but do not address the research question. In the questionnaire multiple responses were allowed, therefore percentages may sum to more than 100%. The original Dutch quotes have been translated into English (Appendix E).

## Structural Organization of Virtual Care Centres

15 of 37 (41%) unique hospitals used a centralized model for virtual care delivery. The structural organization of these centralized models is described, covering materials and procedures, staff, delivery environments, care duration and frequency, and patient-tailored virtual care.

### Materials and procedures of VCCs

All VCCs used applications as home monitoring equipment for virtual care delivery (Table 2). Hospitals frequently utilized multiple brands across applications (e.g., health monitoring apps),

sensors (e.g., vital sign measurement devices), and other home equipment. Common application suppliers included *Luscii, Sananet, Patient Journey app, Happitech, FibriCheck, and BeterDichtbij*. Frequently mentioned sensor brands were *Omron* and *Luscii*. Other home monitoring equipment, often overlapping with sensor answers, included basic devices such as blood pressure monitors, pulse oximeter, weighing scales, and symptom diaries.

**Table 2** Use of home monitoring equipment, communication channels and technological support services in VCCs (n=15).

| Category | Type | Count (n=15) | % (of n=15) |
|---|---|---|---|
| Home monitoring equipment | Applications | 15 | 100% |
| | Sensors | 10 | 67% |
| | Other equipment | 4 | 27% |
| Communication channels | Phone calls | 14 | 93% |
| | Messaging functions (e.g. within application, delayed replies) | 13 | 87% |
| | Automated messages (e.g. reminders) | 13 | 87% |
| | Email | 8 | 53% |
| | Chat functions (e.g. live chat, instant replies) | 7 | 47% |
| | Video consultations | 4 | 27% |
| | Other communication channels | 2 | 13% |
| Technical support services | Support for staff | 15 | 100% |
| | Support for patients | 15 | 100% |

Integration with Electronic Medical Records (EMR) varied, independent of hospital type, equipment category, or supplier. No hospital excluded monitoring data entirely from the EMR. Three hospitals reported full integration, with automatic data entry. Six top-clinical hospitals reported partial integration requiring manual input. One hospital had no sensor data integration, requiring full manual entry. Six hospitals described alternative setups, including viewer-only access, robotic process automation, or the data kept separate from other clinical information within the EMR.

Communication was primarily via phone, in-app messaging, and automated messages (Table 2). Other communication channels included website contact forms and letters. Common platforms for communication were *Luscii, Ancora, BeterDichtbij, Sananet, and Patient Journey app*.

All hospitals provide technical support services for staff and patients (Table 2). Technical support for VCC staff and patients was typically provided during office hours (67% each). Two hospitals offered 24/7 technical support for staff, with one also providing 24/7 support for patients. Other hospitals extended support into the evening. Staff were supported by hospital ICT departments and technology suppliers, while patients received help mainly from suppliers and VCC care staff.

## Expertise and background of staff at VCCs

(Specialized) nurses were predominantly involved in delivering patient care (Table 3). Other reported roles included medical students and alternative titles for nurses, such as e-nurses.

**Table 3** Staff roles delivering direct patient care, training and roles involved in developing virtual care pathways for VCCs (n=15).

| Category | Type | Count (n=15) | % (of n=15) |
|---|---|---|---|
| VCC staff roles delivering direct patient care | (Specialized) nurses | 13 | 87% |
| | Other roles | 4 | 27% |
| | Doctors | 2 | 13% |
| | Nurse practitioners, | 1 | 7% |
| | Medical assistents | 1 | 7% |
| | Medical students | 1 | 7% |
| Training for VCC staff | Technical training | 11 | 73% |
| | Medical training | 11 | 73% |
| | No training | 1 | 7% |
| | Other training | 5 | 33% |
| VCC roles involved in developing virtual care pathways | (Specialized) nurses | 15 | 100% |
| | Project leaders | 15 | 100% |
| | Doctors | 15 | 100% |
| | IT-staff | 11 | 73% |
| | Nurse practitioners | 11 | 73% |
| | Other roles | 9 | 60% |
| | Hospital management | 9 | 60% |
| | Administrative staff | 4 | 27% |

Two hospitals did not report any full-time equivalents (FTEs) dedicated to direct patient care. Among the 13 hospitals that did, (specialized) nurses accounted for the highest average number of FTEs (mean = 4.8; SD = 3.2; range 0-12.1). For the total FTEs per VCC the median number of FTEs was 5 FTE, with the middle 50% of data (IQR) ranging from approximately 3.5 to 8 FTEs (Figure 1).

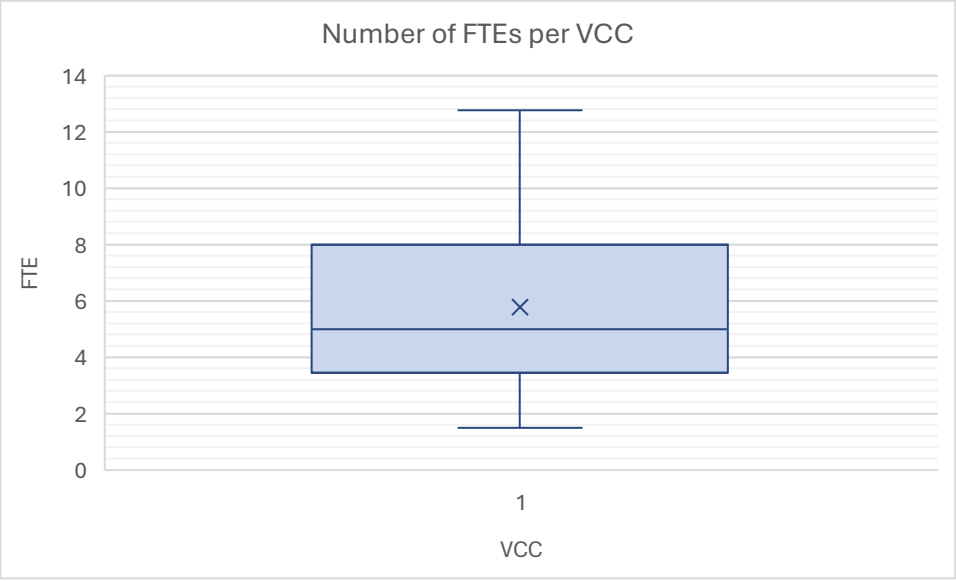



**Figure 1** Boxplot showing the number of FTEs per VCC (n=13). Mean = 5.8 FTEs years; Median = 5 FTEs; Min = 1.5 FTEs; Max = 12.8 FTEs.

During office hours, four of fifteen (27%) hospitals ensured at least two staff members for backup, two (13%) had one care worker per shift, two (13%) based staffing on patient numbers, and seven (47%) reported 2–6 staff depending on the day. Outside office hours, eight (53%) VCCs had no physical staff present, one (7%) maintained a 24/7 presence, and six (40%) offered extended availability in evenings and weekends. After-hours care was typically provided by (specialized) nurses or medical students. One respondent reported referring emergencies to out-of-hours primary care or emergency services.

One hospital did not offer training to VCC staff (Table 3). Technical training focused on platform and device use, particularly during implementation or updates. Medical training covered disease and treatment overviews, care protocols, medication, and clinical decision-making. Other training covered communication, clinical reasoning, education, and department-specific content.

Project leaders, doctors, and (specialized) nurses were involved in care pathway development for all hospitals (Table 3). Other roles included communication advisors, quality managers, and clinical physicists. One respondent noted that anyone involved in the existing care process contributed. Final responsibility for care pathways was most often assigned to doctors (47%), followed by project leaders and other roles (27% each) such as program managers or shared responsibility. One respondent noted that identifying final responsibility was challenging and varied by context.

## Virtual care delivery environments through VCCs

Most virtual care was delivered from a central VCC department (Table 4). One respondent noted the centre had no physical location, with care provided from another building or from home.

**Table 4** Location of virtual care delivery, collaborations, and funding of the VCCs (n=15).

| Category | Type | Count (n=15) | % (of n=15) |
|---|---|---|---|
| Location of virtual care delivery | Central VCC department | 14 | 93% |
| | Remote (home) | 6 | 40% |
| | Hospital department | 1 | 7% |
| | Other location | 1 | 7% |
| Collaborations of the VCC | Both GP and home care | 5 | 33% |
| | GP | 2 | 13% |
| | Home care | 1 | 7% |
| | Other hospitals | 9 | 60% |
| | Other collaborations | 5 (n=14) | 36% (of n=14) |
| | No collaborations | 3 | 20% |
| Funding for the VCC | Internal financing | 13 | 87% |
| | Insurers | 11 | 73% |
| | Subsidies | 4 | 27% |
| | Other fundings | 2 | 13% |

Eight (53%) respondents reported collaborations with GPs and/or home care (Table 4). Among these, agreements varied regardless of collaboration type. Three hospitals had both short- and long-term agreements, two had only short-term contracts, and three described alternative arrangements, such as pilot-phase contracts, regional partnerships and pending strategic

agreements. Four respondents stated GPs and/or home care had direct access to monitoring data and were actively involved. For four hospitals, involvement of GPs and/or home care depended on the patient population, and for three, involvement occurred only in response to relevant deviations.

In collaborations involving both GPs and home care, three respondents said responsibility for patients depended on the specific program, while one assigned it solely to the GP. Among two hospitals collaborating only with GPs, responsibility for patients was either held by the GP or shared. In the single home care collaboration, responsibility for patients was shared.

Of the nine respondents reporting collaborations with other hospitals (Table 4), seven noted shared protocols and expertise exchange, three noted collaboration depended on the patient population, two described joint research projects and one specified alarm takeover.

One respondent did not specify other collaborations (Table 4). Other partnerships included long-term care, rehabilitation services, municipalities, regional exploratory collaborations, transfer bureaus, and pharmacists.

Three out of fifteen respondents reported did not report any collaborations. However, two of them indicated that they are working on initiating such collaboration in the short term.

Most VCCs were funded through internal hospital resources, with other sources including transformation funds (Table 4).

## Duration and frequency of virtual care delivery through VCCs

VCCs were established between January 2018 and January 2024. The number of years VCCs had been in operation ranged from 1.5 to 7.5 years (Figure 2). The median duration was 4.2 years, with IQR ranging from approximately 2.3 to 4.6 years.

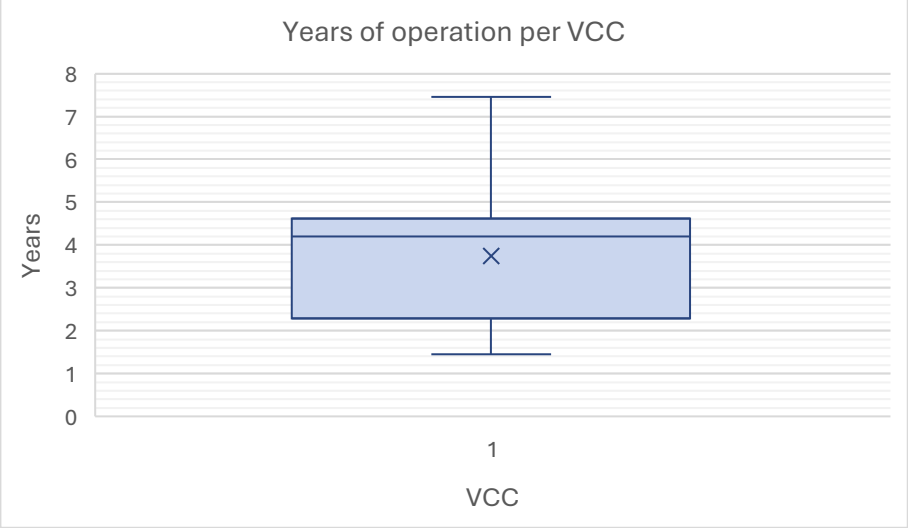



**Figure 2** Boxplot showing the number of years each VCC (n=15) has been in operation. Mean = 3.8 years; Median = 4.2 years; Min = 1.5 years; Max = 7.4 years.

Out of the fifteen responses, two were excluded because the reported patient numbers were zero and did not reflect actual patient volumes. One respondent cited difficulties in tracking patients numbers due to varied platforms and mixed care pathways. Among the remaining thirteen VCCs,

average monthly patient volumes ranged from 500 to 6000 patients (Figure 3). The median was 1600 patients, with an IQR of 1250 to 3600 patients.

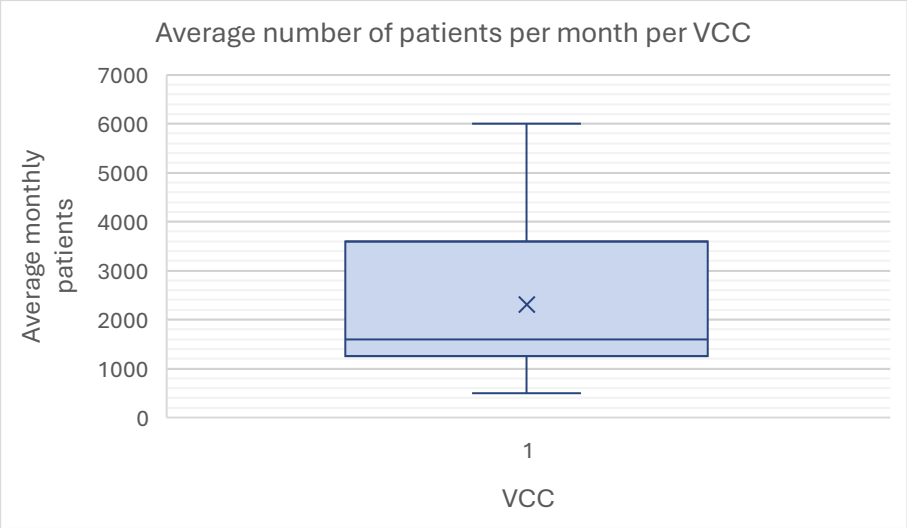



**Figure 3** Boxplot showing average number of patients per month per VCC (n=15). Mean = 2,308 patients; Median = 1600 patients; Min = 500 patients; Max = 6,000 patients. Values are rounded up.

The number of active care pathways per VCC ranged from 5 to 28 pathways within the typical range, with 44 identified as an outlier (Figure 4). The median is 14 pathways and the IQR ranged from 10 to 20 pathways.

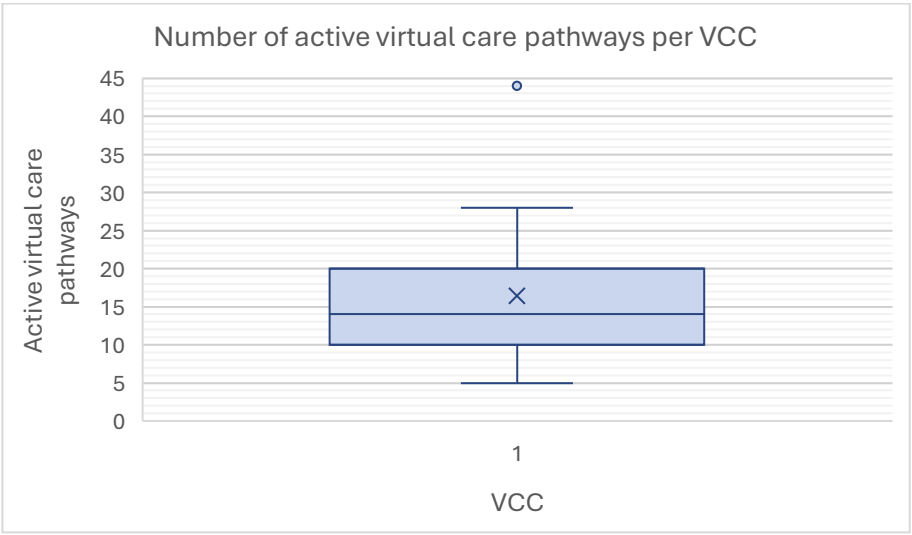



**Figure 4** Boxplot of active virtual care pathways per VCC (n=15). Mean = 17; Median = 14; Min = 5; Max (non-outlier) = 28. Values are rounded up.

Thirteen of fifteen respondents (87%) organized pathways by disease type, followed by specialism (33%), care complexity, and care process (27% each), and care setting (20%). New virtual care pathways were added based on medical specialty requests (100%), hospital policy (47%), technology availability (40%), and data-driven decisions (13%). Three respondents mentioned programs use like *Zorg Bij Jou* and *Quadruple Aim*, while one highlighted impact considerations.

### How virtual care is tailored to patients within VCCs

Patient eligibility for virtual care at the VCC is determined by medical specialists (93%), standardized screening, and patient interest (67% each). One respondent uses only exclusion criteria (e.g., no mobile phone), while another reports varied inclusion routes, from direct referrals by care workers to proactive outreach.

All fifteen hospitals (100%) provide digital tool support for patients, ranging from patient self-learning (47%) to guided support (27%), with some respondents noting variation by condition (27%).

Among the fifteen respondents, most reported that family involvement in patient care pathways is limited to assisting with technical issues (33%) or that family members have no active role (20%). Other respondents (40%) indicated that involvement depends on the patient and care pathway, while one specifically mentioned developing tools to enhance family participation.

## Goals of Virtual Care Centres

The goals of the fifteen hospitals with a centralized virtual care model are presented, focusing on motives, objectives, implemented changes, and measures of success and challenges in virtual care.

### Motives and goals of VCCs

The fifteen respondents providing virtual care via a centralized model selected up to three motivations for offering virtual care. The most common motivations were helping more patients (73%) and applying digital care (67%). Other motivations included reducing costs (33%), reducing waiting times and addressing staff shortages (27% each), and improving collaborations (13%). Seven respondents (47%) added reasons, of which one agreed with all prior motives. One respondent cited *"Improving sustainability (especially travel), enhancing access to care (through reduced travel and serving more patients), and increasing patient and family control."* Four respondents emphasized patient self-management as motivation and one noted that improving collaboration was not a primary goal but a side effect.

The fifteen respondents were allowed to select up to three short-term (within 1 year) and long-term (3–5 years) goals for their VCCs (Table 5). For short-term goals, hospitals prioritized increasing the range of virtual care services offered and expanding virtual care to more patients. One respondent noted that all listed short-term goals (including improving patient satisfaction) were relevant. Other short-term goals included establishing a regional centre, validating programs, and, for two respondents, scaling up regional care pathways. For long-term goals, the main focus was improving collaboration with regional healthcare partners. One respondent noted that all options were relevant. Three respondents reported scaling the VCC regionally, and one cited monitoring external parties, as other long-term goals.

**Table 5** Short-term and long-term goals within the VCCs (n=15). Respondents could select up to three options.

| Category | Type | Count (n=15) | % (of n=15) |
|---|---|---|---|
| Short-term goals | Increasing the range of virtual care services | 14 | 93% |
| | Expanding virtual care to more patient | 12 | 80% |
| | Recruiting and training additional staff | 5 | 33% |
| | Other short-term goals | 5 | 33% |
| | Improve virtual care quality | 1 | 7% |
| Long-term goals | Improve collaboration with regional healthcare partners | 10 | 67% |
| | Reduce workload for healthcare staff | 8 | 53% |
| | Scale up their VCC with the hospital | 7 | 47% |
| | Standardizing virtual care across multiple specialties | 5 | 33% |
| | Other long-term goals | 5 | 33% |
| | Cost savings for the hospital | 3 | 20% |
| | Apply artificial intelligence within the VCC | 1 | 7% |

Ten of fifteen (67%) VCCs serve both outpatient and inpatient populations and the other five (33%) focus only on outpatients. All (100%) hospitals primarily treat chronic conditions, followed by postoperative and rehabilitation care (67%), preventive care (40%), vulnerable patients (33%), and mental health (7%). Eight (53%) respondents reported additional patient groups, such as pre/post-operative patients, non-chronic pathways, GP care, short-term programs (e.g., stroke, atrial fibrillation), outpatient clinics, network care, all specialisms, and acute care.

## Changes affecting VCCs

Of the fifteen respondents, one (7%) reported no knowing changes affecting the operation of their VCC.

Four (27%) respondents cited COVID-19 as a notable change affecting their VCC operations. The respondents described the pandemic as an accelerator of virtual care implementation.

Seven (47%) respondents, including two who also cited COVID-19, mentioned digital transformation as important change impacting their VCC operations. Three respondents cited national digital health programs (e.g. IZA), another the need for innovation due to demographic trends. Two respondent noted strategic shifts at the hospital or regional level, and another said digital transformation offered perspective on scaling up care delivery.

Six (40%) respondents, including one who also cited digital transformation, reported capacity related changes affecting their VCC. Two respondents noted increased patient volumes, with one adding increased project capacity enabling more care pathway development. One respondent highlighted that financing and scalable technology are decisive for increasing capacity. Another respondent mentioned greater capacity for urgent patients. Two respondents reported VCC team growth, of which one emphasizing improved staff capabilities, and the other noting increased capacity to standardize virtual care.

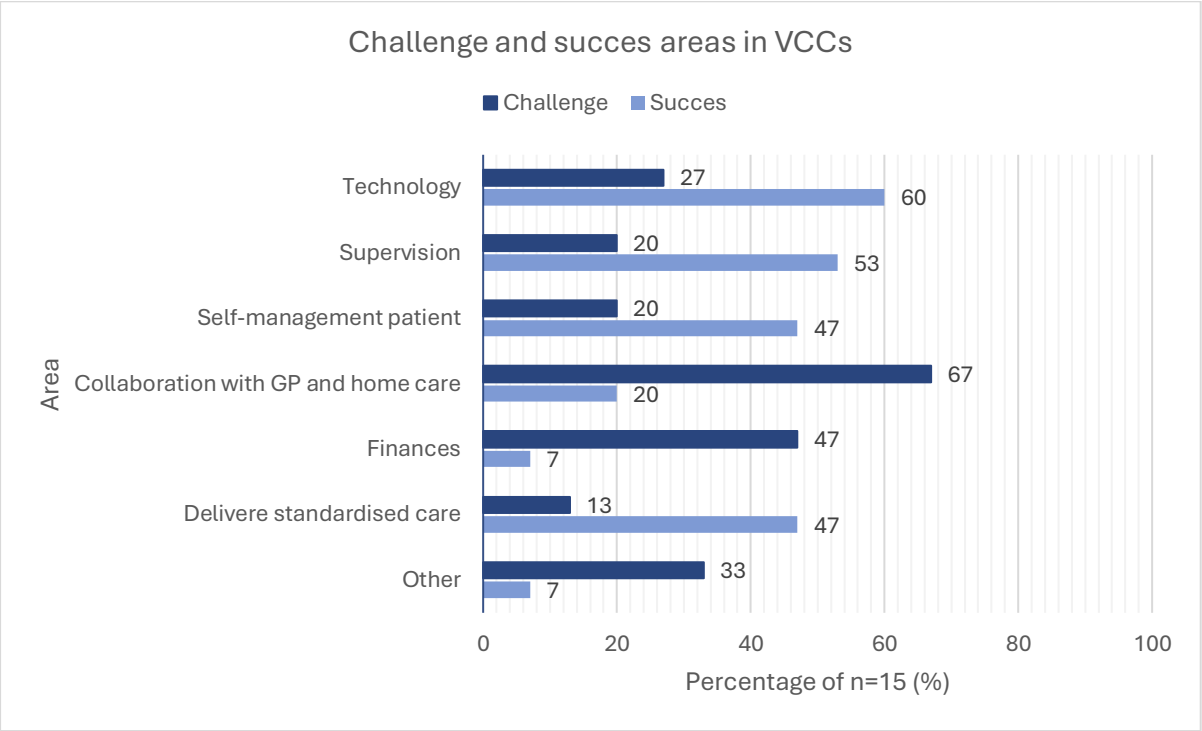
## Measuring success and challenges of VCCs

All fifteen VCCs assess impact of virtual care through patient and healthcare professional feedback (100%), followed by scientific research (47%) and assumptions or estimates (40%).

Other methods include data-driven insights reported by two respondents, while one mentioned they have limited insight into impact from their operational perspective.

Selecting up to three options, the 15 respondents most often reported collaborating with GP and home care, followed by finances as challenging (Figure 5). Other areas mentioned were limited capacity and resources, and challenges with hospital-wide implementation and adoption of virtual care. For instance, one respondent commented: *"Capacity, due to rapid growth, teams also need to expand quickly. Training people takes time."* Also, one respondent did not identify any challenges.

**Figure 5** Horizontal bar plot showing the percentage of the fifteen VCCs reporting each challenge and success area.




One of the strategies of VCCs to address challenges is reorganizing staff and programs, including team expansion, integrating virtual care pathways into regular services, and updating pathways and protocols. Enhancing technological infrastructure is another important approach. Additionally, some focus on researching financial aspects, such as developing business cases, and collaborating with other organizations to leverage combined strengths. Two respondents reported ongoing development efforts, while one noted their strategy is too dynamic to summarize.

Selecting up to three success areas, respondents reported technology, closely followed by supervision, self-management patients and deliver standardised care as main strengths of their VCC. One respondent added as success area the expertise of their VCC team.

One strategy contributing to the successes of the VCCs is the use of protocols, which ensures standardized care and clear team communication. Collaboration with other hospitals promotes uniformity across care pathways, contributing to positive outcomes. Lastly, respondents note that a strategic focus on prevention, positive health, and patient-centred care drives their

successes. Success is further supported by team-building efforts and a bottom-up approach that boosts staff engagement, which enhances patient interaction through a positive work ethic.

## Correlation analysis across VCCs

The Pearson correlation between total FTEs and average monthly patients receiving virtual care is 0.52. However, this value is influenced by one data point that pulls the correlation upward (Figure 6). This correlation is based on data of 11 VCCs, as four respondents had missing values.

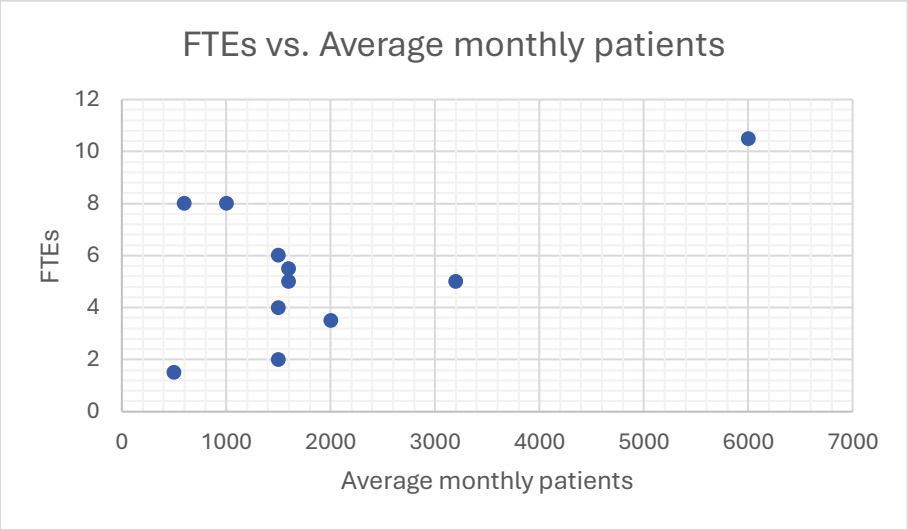



**Figure 6** Scatter plot showing the relationship between staffing (FTEs) and average monthly patients per VCC (n=11).

The correlation between the number of years a VCC has been operating and any collaboration with GPs, home care, other hospitals, or other organizations is 0.05 (Table 6). The correlation between the number of years a VCC has been operating and financing sources ranges from 0.03 to 0.35. The correlation between the number of years a VCC has been operating and areas of challenge ranges from -0.05 to 0.40. The last correlation value is based on 14 VCCs, as one respondent, whose VCC has been operates for 4.6 years, has reported no challenges.

**Table 6** Pearson correlation coefficients between selected variables across VCCs (n = 15). n = 14 for the FTE–active pathways comparison due to missing data.

| Variable 1 | Variable 2 | Type | Pearson r | Count (n=15) |
|---|---|---|---|---|
| Years of VCC operating | Collaborations | Presence of collaboration | 0.05 | 15 |
| Years of VCC operating | Financing | Internal sources | 0.35 | 15 |
| | | Subsidies | 0.25 | 15 |
| | | Insurers | 0.03 | 15 |
| Years of VCC operating | Challenging areas | Technology | 0.01 | 14 |
| | | Supervision | -0.19 | 14 |
| | | Self-management patient | 0.33 | 14 |
| | | Challenge Collaboration with GP and home care | 0.40 | 14 |
| | | Finances | 0.30 | 14 |
| | | Deliver standardised care | -0.05 | 14 |

## Hospital transitioning to a VCC

One hospital is in the transition phase to a centralized virtual care model. This VCC will focus on outpatients with chronic conditions and vulnerable patient care. Short-term goals of the VCC include expanding virtual care, help more patients and training staff. Long-term goals of the VCC involve scaling and collaborations. Virtual care will be delivered by (specialized) nurses during office hours, using *Luscii* and *SanaNet* with partial EMR integration planned. Financing the VCC is through insurers and internal funds. Patient inclusion for virtual care is based on screening protocols and specialist assessments. Lastly, the main driver behind the organizational change to a VCC was as follows: "*Among other things, the region's ambition to monitor centrally has led to the monitoring now being organized internally in a centralized manner. Also, monitoring is no longer decentralized per outpatient clinic in order to achieve economies of scale.*"

## Other virtual care delivery models

21 out of 37 (57%) unique hospitals used a decentralized virtual care model. The most common reason for this virtual care delivery model given by eight (38%) hospitals was organic growth, as decentralized care emerged from department-level initiatives or pilot projects. Another four (19%) respondents cited barriers to centralization such as lack of funding, contracts, or sufficient patient volume. Meanwhile, four (19%) respondents indicated they were actively exploring or planning a centralized model. Three (14%) respondents reported no formal structure or initiative yet in place, and another two (10%) noted that decentralization was a choice based on hospital size or patient group characteristics. One hospital (5%) did not provide an answer. Among the 21 respondents that delivered virtual care, three hospitals already provide virtual care via a centralized model and, except for one hospital, the others were exploring their options. Notably, one respondent from a University Medical Centre stated, "*To continue providing the same level of care, we will eventually need to offer virtual care in collaboration with the region.*" One general hospital did not have plans to provide virtual care via a centralized model. The respondent noted that *"the scale of our hospital and the limited number of staff in supporting roles"* makes it difficult to implement a centralized model.

Four out of 37 hospitals (11%) outsourced their virtual care services. Two top-clinical hospitals collaborated with *Altide*, both aiming to scale up virtual care. One used a mixed model with decentralized care and plans for broader collaboration. The other already operated a centralized model. One had both short- and long-term agreements (e.g., care contracts) with the external party, while the other had only short-term agreements (e.g., temporary needs). In both cases, the external party performed a monitoring function, involving patient data collection and analysis. The hospitals remained responsible for patient care. One general hospital partnered with *Enovation Funatic* due to limited internal expertise and resources. The collaboration included both short- and long-term agreements. The external provider carried out three functions: monitoring, patient empowerment (supporting self-management), and service delivery (handling digital registrations and providing technical support). Patient responsibility was shared between the hospital and the external party. Due to limited internal resources, the hospital has no plans to implement a centralized virtual care model. Another top-clinical hospital collaborated with *Sallend United*, a collaboration they are likely to maintain, to support a shift of chronic care to primary care. The external provider performed four functions: monitoring, patient empowerment,

service delivery, and treatment support (digital treatment in collaboration with healthcare professionals). The partnership was based on short-term agreements, with patient responsibility assigned to the general practitioner.

One out of 37 (3%) unique hospitals did not provide any virtual care delivery. However, the top-clinical hospital plans to implement a centralized model focused on a transmural cardiovascular risk management (CVRM) care pathway.

# Discussion

This study aimed to provide insight into the current organization and goals of virtual care centres in Dutch hospitals. Based on data from 37 hospitals (54% of all Dutch hospitals), including 15 (41%) with an established VCC, the findings offer valuable insight into how VCCs are currently structured and what they aim to achieve. The findings are interpreted by examining common practices and differences regarding the (1) organization and (2) goals across the VCCs.

## Structural organization of VCCs in Dutch hospitals

In this study, the structural organization of VCCs encompassed materials and procedures, staffing, delivery environments, duration and frequency of care, and the provision of patient-tailored virtual care.

### Similarities in structural organization of Dutch VCCs

Common materials and procedures for the VCCs were the use of digital applications for remote patient monitoring, and nearly all centres used phone calls, in-app messaging, and automated messages for communication with the patients. These findings align with the concept analysis of Babaei et al. [7], which highlights a broad spectrum of communication technologies used in virtual care. Also, our findings suggest that certain tools and channels are already widely accepted as the operational baseline for delivering virtual care. Despite the absence of strict national standards, hospitals seem to agree on these methods for remote patient monitoring and communication with the patients. This indicates a shared understanding of what is needed for safe and effective remote monitoring.

In VCCs virtual care was predominantly delivered by (specialized) nurses, as also noted by the respondent transitioning to centralized care. Education and skill development for nurses are critical to ensure effective virtual care delivery as noted by Leenen et al. [21]. Our findings indicate that nearly all hospitals provide medical, technical, or other relevant training for VCC staff. The development of care pathways is consistently multidisciplinary, involving definitely project leaders, physicians, and (specialised) nurses. Moreover, nearly all virtual care pathways are disease-specific and initiated at the request per specialty. Furthermore, patient eligibility for virtual care is generally based on a medical specialist' assessment. These findings reflect a strong clinical foundation in the design of VCCs and suggest that they function as a digital extension of existing hospital infrastructure, rather than operating independently.

All VCCs provide support to help patients use the home monitoring technology, reflecting an awareness of digital literacy barriers. This aligns with findings in a national report Monitoring Digital Care (*Monitor Digitale Zorg)* [22], which emphasizes digital literacy as a success factor for providing virtual care. Similarly, the Dutch report Digital Care Guide (*Wegwijzer Digitale Zorg*) [23], highlights the existence of a Digital Care Helpdesk aimed to lower the barrier to using digital care, so that everyone, regardless of digital skills, has access to virtual care technology. This emphasizes the importance of virtual care centres providing support to patients in using digital tools, as also reflected in our results.

However, it remains unclear to what extent patients with very low digital literacy are considered eligible for virtual care. One respondent reported the use of exclusion criteria such as lack of

mobile phone, which suggests that these vulnerable groups may not be included. This raises an important discussion point regarding the accessibility for patients. Research by Standaar et al. [24] confirms that individuals with lower socioeconomic positions (SEP) have significantly less access to and use of eHealth technologies, underlining the need for tailored support to bridge digital differentiations. These findings emphasize the importance of designing inclusive approaches that do not only support those already enrolled but also reach those who are currently left out.

## Differences in structural organization of Dutch VCCs

Our findings indicate that electronical medical record integration varies widely across VCCs. This suggests that while the ambition for integrated digital care exists, the technological infrastructure is not yet fully aligned across care pathways. This misalignment may partly result from the use of multiple digital platforms within a single VCC, because there is no universal application suitable for all care pathways. The number of applications to choose from is also illustrated in a practical guide for patients by the Dutch Patients' Federation [25]. As a result, care can become fragmented, and tracking data becomes more difficult. Which is also supported by our findings for the number of patients VCC help, as not all respondents could give an answer and one stated "*We lack a proper BI (Business Intelligence) dashboard to visualize this (although we are working on it)*". Such a dashboard would help hospitals clearly monitor care pathways across platforms and support timely, data-driven decisions [26].

Variation in EMR integration and platform usage also further reflects that virtual care remains context-dependent, as also highlighted by Van Harten et al [5]. In some cases, the use of a variety in home monitoring equipment may allow tailoring to specific patient groups, but it also could undermine efficiency. The Dutch Healthcare and Youth Inspectorate (*Inspectie Gezondheidszorg en Jeugd)* (IGJ) observes that not all hospitals have a clear plan for digital care and that IT and healthcare teams often do not collaborate closely [27]. In addition, it could limit opportunities for scaling up the VCC and partnership with other organization. These issues mirror barriers identified in the Dutch report Monitoring Digital Care as well [22]. Furthermore, manual data entry in the EMR could lead to administrative burden. This burden directly contradicts the goal of the Integral Care Agreement, which aims to use digital care to reduce workload [1].

Our findings do not provide a clear relationship between staffing (FTEs) and average monthly patient volume who receive virtual care. For the same patient load, staffing varies, so is for instance for 1,500 patients the range of FTE between two and six. This indicates differences in efficiency and resource allocation across VCCs. However, staff roles and patient complexity were not accounted for in the correlation analysis, which may also contribute to the variation observed.

There is variation in collaborations and financing sources among VCCs. Our analysis found only a very weak relationship between how long a VCC has been operating and its collaboration with other organizations. Similarly, correlations between years of operation and financing sources range from very weak to weak positive. This suggests that factors other than the length of operation, such as management decisions, likely play a larger role in shaping collaborations and funding.

In summary, our findings show agreement on several organizational aspects, such as virtual care delivery materials and procedures, virtual care pathway development, and staff and patient support for the use of virtual care. However, some variability remains, particularly in technology integration, staffing needs, presence of collaborations and funding arrangements.

## Goals of Virtual Care Centres in Dutch Hospitals

This study examined the goals of VCCs, covering their motives, objectives, notable changes made, and the successes and challenges related to virtual care.

### Similarities in goals of Dutch VCCs

Nearly all respondents indicated a short-term goal of increasing the range of virtual care services, which indirectly aligns with the aim of helping more patients which is a common mentioned motive for starting a VCC. This reflects national policies like the Integral Care Agreement, which promotes digital healthcare to address increasing demand and workforce shortages [1].

Another common ambition that hospitals reported is to improve collaborations with external parties. Strengthening collaboration with regional partners is the most frequently mentioned long-term goal by VCCs, including the hospital transitioning to centralized care, and notably, improving collaboration with the GP and home care the most frequently mentioned challenge by VCCs. These findings illustrate that collaboration is an important area of focus for nearly all VCCs, with the exception of one as that respondent did not specifically mention it in any of their responses.

Internationally, the potential of collaborative virtual care delivery is illustrated by the Abu Dhabi Healthcare Company (SEHA) and its SEHA Virtual Hospital [28]. This hospital in Saudi Arabia connects 166 regional facilities and demonstrates the efficiency of a centralized virtual care model [28]. According to Safaa Almajthoub, Chief Strategy Officer of the Virtual Health Centre of Excellence and SEHA Virtual Hospital, the essential prerequisites for an expanding virtual care network include secure digital infrastructure, trained staff, standardized protocols, patient education, technical support, and continuous improvement [28]. These aspects are also covered in this study and, according to our findings, topics that Dutch VCCs are actively working on.

Lastly, scaling up capacity is a recurring theme throughout the open responses, reflected in the objectives, changes, and reported successes and challenges by VCCs. Our results suggest that financial factors are likely not the main motivation for scaling, as they are not prioritized in the stated motives and long-term goals, although finances do remain a challenge. This contrasts with the motivations for scaling up described by Peters et al. [9], who noted that digital care becomes cost-effective only at larger scales. Interestingly, our findings indicate that improving patient access and enhancing collaboration appear to be the driver for scaling rather than cost savings

Enovation group [29] examined the opportunities, the level of awareness among healthcare professionals, and the anticipated challenges associated with scaling digital care within Dutch hospitals. Their results emphasized the need for collaboration, centralized coordination, and staff training to effectively scale digital care in Dutch hospitals [29]. These topics are also addressed in our study, and our findings suggest that Dutch VCCs are currently engaged in these areas.

## Differences in goals of Dutch VCCs

Our findings indicate very weak to weak relationship between the number of years a VCC has been operating and the challenges it faces. This suggests that VCCs may be developing without a clear direction. The apparent ad hoc approach of development suggests that VCCs operate differently regardless of how long they have been established, with many likely still in a developmental phase. One respondent highlighted that all listed challenge areas were relevant to them, further underscoring ongoing organizational growth. This variation aligns with previous research, such as Van Harten et al. [5], which underscores that Dutch hospitals continue to explore and refine virtual care models.

All VCCs rely on patient and staff feedback to measure their impact of virtual care delivery. Pannunzio et al. [30] highlight that while such feedback is valuable, current evaluations of remote patient monitoring often lack standardized methods for measuring feedback and tend to underemphasize staff perspectives. Therefore, although VCCs are measuring their performance of virtual care delivery, there is a need for more systematic approach as. This would also facilitate clearer identification of areas where VCCs face challenges or experience successes.

In summary, our findings show that VCCs focus on expanding virtual care, improving collaboration, and scaling up their VCC operations. However, their efforts seem varied and exploratory, reflecting ongoing development.

# Strengths and limitations

One of the strengths of this study was the structured approach to questionnaire development, which was guided by the TIDieR checklist [20]. By adapting this checklist to the organizational context of VCCs, we were able to comprehensively assess the organization and goals of VCCs in Dutch hospitals. Furthermore, the use of the Qualtrics platform contributed to the accessibility and usability of the online questionnaire. Features such as display logic allowed the questionnaire to be tailored to each respondent's situation. This ensured that only relevant questions were displayed and thereby reduced the cognitive burden on respondents.

Although this study aimed to include all Dutch hospitals, just over half were ultimately included in the analysis, limiting the generalizability of the findings. Hospitals that do not currently offer virtual care may have been less likely to respond due to topic irrelevance. For context, the Dutch Hospital Association (NVZ) [31] recently reported that in the first half of 2024, around two-thirds of hospitals used telemonitoring for Chronic Obstructive Pulmonary Disease (COPD) patients. Despite this, hospitals from nearly all Dutch provinces, except Drenthe, participated in our study (Appendix D). This broad distribution suggests that the results still provide a reasonable national insight.

To increase the response rate, we expanded our recruitment strategy by distributing an anonymous link through multiple networks alongside the initial invitation-only links. While this improved participation, it limited our ability to verify the roles of respondents, which may have affected data accuracy. Although the online questionnaire enabled broad data collection, it limited depth compared to interviews. In addition, as with most online surveys, there were risks such as misinterpretation due to ambiguous questions and bias from forced-choice response

formats [32]. To reduce these risks, we provided clear instructions, included 'Other (please specify)' options, and offered open-ended fields throughout the survey.

## Implications

This study contributes to theoretical knowledge by deepening the understanding of the structural organization and ambitions of VCCs in Dutch hospitals. To our knowledge, previous literature has lacked specificity regarding how VCCs are set up at the organizational level. Our research provides an insight into the organizational structure and goals for a subset of the hospitals in the Netherlands. In doing so, it illustrates the diversity of organizational structures and goals across VCCs in the Netherlands. These insights may provide a foundation for future research on digital transformation for hospitals in the Netherlands.

Our findings provide practical implications for healthcare organizations and policymakers. Hospitals may use the results for internal benchmarking to compare their own VCC setup with national insights and identify areas, such as allocating staff within VCCs or strengthening collaborating with external parties, for further development. Additionally, the research may support virtual care management teams in making more evidence-based decisions, such as prioritizing investments technological infrastructure or implementing more structured methods to assess their VCCs' impact. Policymakers may also use the findings to identify where national guidance is needed to support more consistent VCC development across hospitals.

Further research is recommended to achieve broader outreach, which could involve collaborating directly with healthcare organizations to improve access to relevant respondents. Moreover, if access can be obtained, researchers may consider incorporating secondary data sources, such as internal hospital reports, to enhance data richness. Additionally, we recommend conducting follow-up qualitative interviews to gain deeper insights into the organizational challenges VCCs face, such as barriers related to collaboration and financing. These efforts will help provide direction for the ongoing development and optimization of VCCs.

# Conclusions

This study provides valuable insights into the current organization and goals of virtual care centres in Dutch hospitals. Despite variation in technology integration, hospitals show agreement on organizational aspects, including technology type, communication channels, implementation of care pathways, and support for both staff and patients in using digital care.

The VCCs have shared ambitions to expand virtual care, strengthen collaboration with external partners and scale up their VCC. This reflects the Dutch healthcare priorities focused on digital transformation and regional cooperation. While the sample size limits generalizability, the wide provincial coverage offers a foundation for further research and practical guidance for Dutch hospitals and policymakers.

To optimize virtual care delivery within VCCs, future efforts should focus on improving technological integration, staffing allocation, collaboration between organizations, and funding. Additionally, broader outreach and qualitative follow-up studies are recommended to deepen understanding of challenges, like difficulties with external partnerships and financing, and to develop strategies for the continued development of VCCs.

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# Appendices

## Appendix A CHERRIES checklist

**Appendix Table 1** Checklist for Reporting Results of Internet E-Surveys (CHERRIES). N/A = Not Applicable.

| ***Checklist Item*** | ***Explanation*** | ***Page Number*** |
|---|---|---|
| Describe survey design | Describe target population, sample frame. Is the sample a convenience sample? (In "open" surveys this is most likely.) | 3 |
| IRB approval | Mention whether the study has been approved by an IRB. | 4 |
| Informed consent | Describe the informed consent process. Where were the participants told the length of time of the survey, which data were stored and where and for how long, who the investigator was, and the purpose of the study? | 4 |
| Data protection | If any personal information was collected or stored, describe what mechanisms were used to protect unauthorized access. | 4 |
| Development and testing | State how the survey was developed, including whether the usability and technical functionality of the electronic questionnaire had been tested before fielding the questionnaire. | 3 |
| Open survey versus closed survey | An "open survey" is a survey open for each visitor of a site, while a closed survey is only open to a sample which the investigator knows (password-protected survey). | 3 |
| Contact mode | Indicate whether or not the initial contact with the potential participants was made on the Internet. (Investigators may also send out questionnaires by mail and allow for Web-based data entry.) | 3 |
| Advertising the survey | How/where was the survey announced or advertised? Some examples are offline media (newspapers), or online (mailing lists – If yes, which ones?) or banner ads (Where were these banner ads posted and what did they look like?). It is important to know the wording of the announcement as it will heavily influence who chooses to participate. Ideally the survey announcement should be published as an appendix. | 3 |
| Web/E-mail | State the type of e-survey (eg, one posted on a Web site, or one sent out through e-mail). If it is an e-mail survey, were the responses entered manually into a database, or was there an automatic method for capturing responses? | 3 |
| Context | Describe the Web site (for mailing list/newsgroup) in which the survey was posted. What is the Web site about, who is visiting it, what are visitors normally looking for? Discuss to what degree the content of the Web site could pre-select the sample or influence the results. For example, a survey about vaccination on a anti-immunization Web site will have different results from a Web survey conducted on a government Web site | 3 |

| | | |
|---|---|---|
| Mandatory/voluntary | Was it a mandatory survey to be filled in by every visitor who wanted to enter the Web site, or was it a voluntary survey? | 4 |
| Incentives | Were any incentives offered (eg, monetary, prizes, or non-monetary incentives such as an offer to provide the survey results)? | 4 |
| Time/Date | In what timeframe were the data collected? | 4 |
| Randomization of items or questionnaires | To prevent biases items can be randomized or alternated. | N/A |
| Adaptive questioning | Use adaptive questioning (certain items, or only conditionally displayed based on responses to other items) to reduce number and complexity of the questions. | 4 |
| Number of Items | What was the number of questionnaire items per page? The number of items is an important factor for the completion rate. | N/A |
| Number of screens (pages) | Over how many pages was the questionnaire distributed? The number of items is an important factor for the completion rate. | 3 |
| Completeness check | It is technically possible to do consistency or completeness checks before the questionnaire is submitted. Was this done, and if “yes”, how (usually JAVAScript)? An alternative is to check for completeness after the questionnaire has been submitted (and highlight mandatory items). If this has been done, it should be reported. All items should provide a non-response option such as “not applicable” or “rather not say”, and selection of one response option should be enforced. | 4 |
| Review step | State whether respondents were able to review and change their answers (eg, through a Back button or a Review step which displays a summary of the responses and asks the respondents if they are correct). | 4 |
| Unique site visitor | If you provide view rates or participation rates, you need to define how you determined a unique visitor. There are different techniques available, based on IP addresses or cookies or both. | N/A |
| View rate (Ratio of unique survey visitors/unique site visitors) | Requires counting unique visitors to the first page of the survey, divided by the number of unique site visitors (not page views!). It is not unusual to have view rates of less than 0.1 % if the survey is voluntary. | N/A |
| Participation rate (Ratio of unique visitors who agreed to participate/unique first survey page visitors) | Count the unique number of people who filled in the first survey page (or agreed to participate, for example by checking a checkbox), divided by visitors who visit the first page of the survey (or the informed consents page, if present). This can also be called “recruitment” rate. | N/A |
| Completion rate (Ratio of users who finished the survey/users who | The number of people submitting the last questionnaire page, divided by the number of people who agreed to participate (or submitted the first survey page). This is only relevant if there is a separate “informed consent” page or if the survey goes over several pages. This is a measure | N/A |

| | | |
|---|---|---|
| agreed to participate) | for attrition. Note that "completion" can involve leaving questionnaire items blank. This is not a measure for how completely questionnaires were filled in. (If you need a measure for this, use the word "completeness rate".) | |
| Cookies used | Indicate whether cookies were used to assign a unique user identifier to each client computer. If so, mention the page on which the cookie was set and read, and how long the cookie was valid. Were duplicate entries avoided by preventing users access to the survey twice; or were duplicate database entries having the same user ID eliminated before analysis? In the latter case, which entries were kept for analysis (eg, the first entry or the most recent)? | N/A |
| IP check | Indicate whether the IP address of the client computer was used to identify potential duplicate entries from the same user. If so, mention the period of time for which no two entries from the same IP address were allowed (eg, 24 hours). Were duplicate entries avoided by preventing users with the same IP address access to the survey twice; or were duplicate database entries having the same IP address within a given period of time eliminated before analysis? If the latter, which entries were kept for analysis (eg, the first entry or the most recent)? | N/A |
| Log file analysis | Indicate whether other techniques to analyze the log file for identification of multiple entries were used. If so, please describe. | N/A |
| Registration | In "closed" (non-open) surveys, users need to login first and it is easier to prevent duplicate entries from the same user. Describe how this was done. For example, was the survey never displayed a second time once the user had filled it in, or was the username stored together with the survey results and later eliminated? If the latter, which entries were kept for analysis (eg, the first entry or the most recent)? | N/A |
| Handling of incomplete questionnaires | Were only completed questionnaires analyzed? Were questionnaires which terminated early (where, for example, users did not go through all questionnaire pages) also analyzed? | 4 |
| Questionnaires submitted with an atypical timestamp | Some investigators may measure the time people needed to fill in a questionnaire and exclude questionnaires that were submitted too soon. Specify the timeframe that was used as a cut-off point, and describe how this point was determined. | N/A |
| Statistical correction | Indicate whether any methods such as weighting of items or propensity scores have been used to adjust for the non-representative sample; if so, please describe the methods. | N/A |

This checklist has been modified from Eysenbach G. Improving the quality of Web surveys: the Checklist for Reporting Results of Internet E-Surveys (CHERRIES). J Med Internet Res. 2004 Sep 29;6(3):e34 [erratum in J Med Internet Res. 2012; 14(1): e8.].

## Appendix B Qualtrics questionnaire

This questionnaire is presented in Dutch, which is the language used during data collection.

# Organisatie VZCs def

Start of Block: Informed consent

Beste deelnemer, In opdracht van de ziekenhuizen Isala en Rijnstate, en de Universiteit Twente, willen wij u vragen om deel te nemen aan een onderzoek naar de **organisatie van virtuele zorg in de Nederlandse ziekenhuizen.** Hiermee bedoelen we het bieden van zorg op afstand via verschillende communicatietechnologieën, zodat zorg op elk moment en op elke plaats kan worden geleverd. Dit onderzoek wordt uitgevoerd door Jessica Balm van de Universiteit Twente, als onderdeel van haar Master Thesis voor Gezondheidswetenschappen. Het doel van deze **online vragenlijst** is om een beter beeld krijgen van hoe virtuele zorg momenteel is ingericht en met welk doel. Onze focus ligt op virtuele zorg via een centrale afdeling, waarbij het ziekenhuis zelf alle taken uitvoert, zoals een Virtueel Zorgcentrum (VZC). Voor een compleet beeld van de huidige situatie in de Nederlandse ziekenhuizen, vragen wij **iedereen om de vragenlijst in te vullen**, ook als uw ziekenhuis geen virtuele zorg levert of deze op een andere manier aanbiedt. Het invullen van de vragenlijst duurt **maximaal 20 minuten**. Er zijn **geen risico's** verbonden aan uw deelname. Uw deelname is geheel **vrijwillig**, en u kunt op elk moment stoppen. U ontvangt voor deelname aan dit onderzoek **geen vergoeding.** Alle antwoorden worden **anoniem** verwerkt en **veilig** opgeslagen volgens de richtlijnen van de Universiteit Twente. In de rapportage komen geen gegevens die naar personen te herleiden zijn. Dit onderzoek is goedgekeurd door de ethische commissie (domein Humanities & Social Sciences) van de faculteit Behavioural, Management and Social Sciences van de Universiteit Twente. Heeft u vragen? Neem dan gerust contact op met: Naam: Jessica Balm E-mail: j.w.h.balm@student.utwente.nl Alvast bedankt voor uw deelname! **Informed consent** Heeft u de bovenstaande informatie zorgvuldig gelezen en begrepen, en gaat u akkoord met deelname aan dit onderzoek? (Eén antwoord)

Ja, ik ga akkoord
Nee, ik ga niet akkoord

*Skip To: End of Survey If Beste deelnemer, In opdracht van de ziekenhuizen Isala en Rijnstate, en de Universiteit Twente, w... = Nee, ik ga niet akkoord*

End of Block: Informed consent

Start of Block: Korte benaming

**Inrichting van virtuele zorg** In deze sectie wordt gevraagd naar de inrichting van virtuele zorg. Met virtuele zorg bedoelen we het aanbieden van zorg op afstand via verschillende communicatietechnologieën, zodat zorg op elk moment en op elke plaats kan worden geleverd. Dit kan bijvoorbeeld via een centrale afdeling binnen het ziekenhuis, zoals een Virtueel Zorgcentrum (VZC), een andere vorm hebben, of (nog) niet van toepassing zijn.

In welk ziekenhuis bent u werkzaam?

▼ Hospital name

*Display this question:*

*If In welk ziekenhuis bent u werkzaam? = Hospital name*

*Or In welk ziekenhuis bent u werkzaam? = Hospital name*

*Etc.*

**Bedankt voor uw interesse in onze vragenlijst!** Voor het onderzoek naar de organisatie van virtuele zorg in Nederlandse ziekenhuizen ontvangen wij graag één reactie per ziekenhuis. We zien dat een collega van uw ziekenhuis de vragenlijst al heeft ingevuld. U hoeft de vragenlijst daarom **niet verder in te vullen.**

*Display this question:*

*If Bedankt voor uw interesse in onze vragenlijst! Voor het onderzoek naar de organisatie van virtuel... Not Displayed*

Biedt dit ziekenhuis virtuele zorg aan patiënten? (Meerdere antwoorden)

Ja, op een centrale manier, waarbij het ziekenhuis zelf alle taken uitvoert
Ja, op een decentrale manier
Ja, dit wordt uitbesteed aan: _____
⊗ Er wordt geen virtuele zorg aangeboden

*Display this question:*

*If Biedt dit ziekenhuis virtuele zorg aan patiënten? = Ja, op een decentrale manier*

Waarom kiest het ziekenhuis ervoor om virtuele zorg op een decentrale manier aan te bieden?

_____

*Display this question:*

*If Biedt dit ziekenhuis virtuele zorg aan patiënten? = Ja, op een decentrale manier*

*And Biedt dit ziekenhuis virtuele zorg aan patiënten? = Ja, dit wordt uitbesteed aan:*

Sinds wanneer biedt het ziekenhuis virtuele zorg op een decentrale manier aan? *Vul maand en jaar in als mm/jjjj. Als de exacte maand niet bekend is, mag een schatting worden gegeven.*

_____

*Display this question:*

*If Biedt dit ziekenhuis virtuele zorg aan patiënten? = Er wordt geen virtuele zorg aangeboden*

Waarom biedt het ziekenhuis geen virtuele zorg aan?

_____

*Display this question:*

*If Biedt dit ziekenhuis virtuele zorg aan patiënten? = Ja, dit wordt uitbesteed aan:*

Waarom besteedt het ziekenhuis de virtuele zorg uit aan een externe partij?

_____

*Display this question:*

*If Biedt dit ziekenhuis virtuele zorg aan patiënten? = Ja, dit wordt uitbesteed aan:*

*

Sinds wanneer bestaat de samenwerking tussen het ziekenhuis en de externe partij? *Vul maand en jaar in als mm/jjjj. Als de exacte maand niet bekend is, mag een schatting worden gegeven.*

_____

*Display this question:*

*If Biedt dit ziekenhuis virtuele zorg aan patiënten? = Ja, dit wordt uitbesteed aan:*

Welke afspraken zijn er gemaakt over de samenwerking tussen het ziekenhuis en de externe partij? (Eén antwoord)

Er zijn zowel korte termijn als lange termijn afspraken (bijv. zorgcontracten of bestuurlijke overeenkomsten)
Er zijn alleen afspraken gericht op korte termijn (bijv. incidentele verzoeken of tijdelijke zorgbehoeften)
Er zijn geen formele afspraken over de frequentie of duur van de samenwerking
Anders, namelijk: _____

*Display this question:*

*If Biedt dit ziekenhuis virtuele zorg aan patiënten? = Ja, dit wordt uitbesteed aan:*

Hoe wordt de samenwerking tussen het ziekenhuis en de externe partij in de praktijk uitgevoerd? *Kies alle antwoorden die van toepassing zijn.* (Meerdere antwoorden)

Regiefunctie, waarbij de externe partij patiënten regie geeft over hun zorg en zelfredzaamheid vergroot
Coördinatiefunctie, waarbij de externe partij fysieke zorg coördineert bij onvervulde zorgbehoeften
Servicefunctie, waarbij de externe partij digitale zorgaanmeldingen verwerkt en technische ondersteuning biedt
Monitoringsfunctie, waarbij de externe partij meetsignalen verzamelt en analyseert
Bewakingsfunctie, waarbij de externe partij patiënten 24/7 bewaakt en actie onderneemt bij afwijkingen
Behandelingsfunctie, waarbij de externe partij digitale behandelingen ondersteunt in samenwerking met zorgprofessionals

*Display this question:*

*If Biedt dit ziekenhuis virtuele zorg aan patiënten? = Ja, dit wordt uitbesteed aan:*

Wie is eindverantwoordelijk voor de zorg van de patiënt binnen de samenwerking tussen het ziekenhuis en de externe partij? (Eén antwoord)

Het ziekenhuis
De externe partij
Gezamenlijke verantwoordelijkheid tussen het ziekenhuis en de externe partij
Anders, namelijk: _____

*Display this question:*

*If Biedt dit ziekenhuis virtuele zorg aan patiënten? = Ja, op een centrale manier, waarbij het ziekenhuis zelf alle taken uitvoert*

Hoe heet de centrale afdeling voor virtuele zorg binnen het ziekenhuis?

_____

*Display this question:*

*If Biedt dit ziekenhuis virtuele zorg aan patiënten? = Er wordt geen virtuele zorg aangeboden*

*Or Biedt dit ziekenhuis virtuele zorg aan patiënten? = Ja, op een decentrale manier*

*And Biedt dit ziekenhuis virtuele zorg aan patiënten? != Ja, op een centrale manier, waarbij het ziekenhuis zelf alle taken uitvoert*

*Or Biedt dit ziekenhuis virtuele zorg aan patiënten? = Ja, dit wordt uitbesteed aan:*

*And Biedt dit ziekenhuis virtuele zorg aan patiënten? != Ja, op een centrale manier, waarbij het ziekenhuis zelf alle taken uitvoert*

Heeft het ziekenhuis plannen om virtuele zorg op een centrale manier via het ziekenhuis aan te bieden? (Eén antwoord)

Ja, namelijk: _____
Nee, omdat: _____

*Display this question:*

*If Biedt dit ziekenhuis virtuele zorg aan patiënten? = Ja, op een centrale manier, waarbij het ziekenhuis zelf alle taken uitvoert*

*Heeft u aanvullende opmerkingen over deze sectie?*

_____

*Display this question:*

*If Biedt dit ziekenhuis virtuele zorg aan patiënten? = Ja, op een decentrale manier*

*Or Biedt dit ziekenhuis virtuele zorg aan patiënten? = Ja, dit wordt uitbesteed aan:*

*Or Biedt dit ziekenhuis virtuele zorg aan patiënten? = Er wordt geen virtuele zorg aangeboden*

*And If*

*Biedt dit ziekenhuis virtuele zorg aan patiënten? != Ja, op een centrale manier, waarbij het ziekenhuis zelf alle taken uitvoert*

Aanvullende opmerkingen *Heeft u nog aanvullende opmerkingen die relevant kunnen zijn voor dit onderzoek?*

_____

*Skip To: End of Survey If Condition: Aanvullende opmerkingenHeef... Is Displayed. Skip To: End of Survey.*

**End of Block: Korte benaming**

**Start of Block: Waarom**

**Waarom?** In deze sectie wordt gevraagd naar de achterliggende ideeën en doelstellingen van de centrale afdeling voor virtuele zorg. ***In deze vragenlijst noemen we deze afdeling het Virtueel Zorgcentrum (VZC).***

---

Waarom is het ziekenhuis het VZC gestart? *Kies maximaal drie antwoorden.* (Meerdere antwoorden)

- Digitale zorg toepassen
- Meer patiënten helpen
- Wachttijden verkorten
- Personeelstekorten aanpakken
- Samenwerkingen verbeteren
- Kosten besparen
- Anders, namelijk: _____

---

Wat zijn de korte termijn doelen (binnen één jaar) van het VZC? *Kies maximaal drie antwoorden.* (Meerdere antwoorden)

- Meer zorgaanbod binnen het VZC
- Meer patiënten virtuele zorg bieden via het VZC
- Patiënttevredenheid verhogen binnen het VZC
- Zorgkwaliteit verbeteren binnen het VZC
- Extra personeel werven en trainen voor het VZC
- Anders, namelijk: _____

---

Wat zijn de lange termijn doelen (voor de komende 3-5 jaar) van het VZC? *Kies maximaal drie antwoorden.* (Meerdere antwoorden)

- Werkdruk voor zorgpersoneel verlagen via het VZC
- Kosten besparen voor het ziekenhuis door inzet van het VZC
- Het VZC opschalen binnen het ziekenhuis
- Artificiële intelligentie (AI) toepassen binnen het VZC
- Virtuele zorg via het VZC standaard maken binnen meerdere specialismen
- Beter samenwerken met regionale zorgpartners via het VZC
- Anders, namelijk: _____

---

Voor welk type patiënten wordt het VZC ingezet? (Eén antwoord)

- Poliklinische patiënten
- Klinische patiënten
- Beide

---

Op welke patiëntengroepen richt het VZC zich? *Kies alle antwoorden die van toepassing zijn.* (Meerdere antwoorden)

Chronische zorg
Postoperatieve en revalidatiezorg
Preventieve zorg
Psychische gezondheidszorg
Kwetsbare patiënten, zoals ouderen
Anders, namelijk: _____
Anders, namelijk: _____

*Heeft u aanvullende opmerkingen over deze sectie?*

_____

End of Block: Waarom

Start of Block: Wat

**Wat?** In deze sectie wordt gevraagd naar de materialen en procedures die in het Virtueel Zorgcentrum (VZC) worden gebruikt.

Welke thuismeetapparatuur worden door de patiënten binnen het VZC gebruikt? (Meerdere antwoorden)

Sensoren (bijv. apparatuur om de vitale functies van de patiënt te meten)
Applicaties (bijv. mobiele apps om patiënten te helpen hun gezondheid te monitoren)
⊗ Geen
Anders, namelijk: _____

*Display this question:*

*If Welke thuismeetapparatuur worden door de patiënten binnen het VZC gebruikt? = Sensoren (bijv. apparatuur om de vitale functies van de patiënt te meten)*

Welk type sensor wordt er gebruikt, en wat is het merk?

_____

*Display this question:*

*If If Welk type sensor wordt er gebruikt, en wat is het merk? Text Response Is Displayed*

In hoeverre is de sensortechnologie geïntegreerd in het elektronisch patiëntendossier (EPD) (Eén antwoord)

Volledige integratie met het EPD, gegevens worden automatisch toegevoegd
Gedeeltelijke integratie met het EPD, sommige gegevens worden automatisch toegevoegd, andere moeten handmatig worden ingevoerd
Geen integratie met het EPD, gegevens worden handmatig ingevoerd
Geen integratie met het EPD, gegevens worden niet ingevoerd
Anders, namelijk: _____

*Display this question:*

*If Welke thuismeetapparatuur worden door de patiënten binnen het VZC gebruikt? = Applicaties (bijv. mobiele apps om patiënten te helpen hun gezondheid te monitoren)*

Welke type applicatie wordt gebruikt, en wat is het merk?

_____

*Display this question:*

*If If Welke type applicatie wordt gebruikt, en wat is het merk? Text Response Is Displayed*

In hoeverre is de applicatietechnologie geïntegreerd in het elektronisch patiënten dossier (EPD)? (Eén antwoord)

Volledige integratie met het EPD, gegevens worden automatisch toegevoegd
Gedeeltelijke integratie met het EPD, sommige gegevens worden automatisch toegevoegd, andere moeten handmatig worden ingevoerd
Geen integratie met het EPD, gegevens worden handmatig ingevoerd
Geen integratie met het EPD, gegevens worden niet ingevoerd
Anders, namelijk: _____

*Display this question:*

*If If Welke thuismeetapparatuur worden door de patiënten binnen het VZC gebruikt? = Anders, namelijk:*

Welk type andere thuismeetapparatuur wordt er gebruikt, en wat is het merk?

_____

*Display this question:*

*If If Welk type andere thuismeetapparatuur wordt er gebruikt, en wat is het merk? Text Response Is Displayed*

In hoeverre is de thuismeetapparatuurtechnologie geïntegreerd in het elektronisch patiënten dossier (EPD)? (Eén antwoord)

Volledige integratie met het EPD, gegevens worden automatisch toegevoegd
Gedeeltelijke integratie met het EPD, sommige gegevens worden automatisch toegevoegd, andere moeten handmatig worden ingevoerd
Geen integratie met het EPD, gegevens worden handmatig ingevoerd
Geen integratie met het EPD, gegevens worden niet ingevoerd
Anders, namelijk: _____

Welke communicatiemethoden met patiënten worden door de zorgmedewerkers binnen het VZC gebruikt? *Kies alle antwoorden die van toepassing zijn.* (Meerdere antwoorden)

Telefonisch contact
E-mail
Videoconsult
Chatfunctie (bijv. via een livechat, waarbij berichten direct worden uitgewisseld)
Berichtenfunctie (bijv. via een applicatie, waarbij berichten worden achtergelaten en later beantwoord)
Geautomatiseerde berichten (bijv. herinneringen)
Anders, namelijk: _____

*Display this question:*

*If Welke communicatiemethoden met patiënten worden door de zorgmedewerkers binnen het VZC gebruikt?... = Videoconsult*

Welk platform wordt gebruikt voor *videoconsulten*?

_____

*Display this question:*

*If Welke communicatiemethoden met patiënten worden door de zorgmedewerkers binnen het VZC gebruikt?... = Chatfunctie (bijv. via een livechat, waarbij berichten direct worden uitgewisseld)*

Welk platform wordt gebruikt voor een *chatfunctie*?

_____

*Display this question:*

*If Welke communicatiemethoden met patiënten worden door de zorgmedewerkers binnen het VZC gebruikt?... = Berichtenfunctie (bijv. via een applicatie, waarbij berichten worden achtergelaten en later beantwoord)*

Welk platform wordt gebruikt voor een *berichtenfunctie*?

_____

*Display this question:*

*If Welke communicatiemethoden met patiënten worden door de zorgmedewerkers binnen het VZC gebruikt?... = Geautomatiseerde berichten (bijv. herinneringen)*

Welk platform wordt gebruikt voor *geautomatiseerde berichten*?

_____

*Display this question:*

*If Welke communicatiemethoden met patiënten worden door de zorgmedewerkers binnen het VZC gebruikt?... = Anders, namelijk:*

Welk platform wordt gebruikt voor *andere* communicatiemethoden?

_____

In hoeverre ontvangen *zorgmedewerkers* van het VZC *technische* ondersteuning? (Eén antwoord)

24/7 technische ondersteuning
Alleen ondersteuning tijdens kantooruren (ma-vr)
Geen specifieke ondersteuning
Anders, namelijk: _____

*Display this question:*

*If In hoeverre ontvangen zorgmedewerkers van het VZC technische ondersteuning? = 24/7 technische ondersteuning*

*Or In hoeverre ontvangen zorgmedewerkers van het VZC technische ondersteuning? = Alleen ondersteuning tijdens kantooruren (ma-vr)*

*Or In hoeverre ontvangen zorgmedewerkers van het VZC technische ondersteuning? = Anders, namelijk:*

Wie (bijv. de leverancier of ICT-afdeling) levert de technische ondersteuning aan *zorgmedewerkers*?

_____

In hoeverre ontvangen *patiënten* die zorg ontvangen via het VZC *technische* ondersteuning? (Eén antwoord)

24/7 technische ondersteuning
Alleen ondersteuning tijdens kantooruren (ma-vr)
Geen specifieke ondersteuning
Anders, namelijk: _____

*Display this question:*

*If In hoeverre ontvangen patiënten die zorg ontvangen via het VZC technische ondersteuning? = 24/7 technische ondersteuning*

*Or In hoeverre ontvangen patiënten die zorg ontvangen via het VZC technische ondersteuning? = Alleen ondersteuning tijdens kantooruren (ma-vr)*

*Or In hoeverre ontvangen patiënten die zorg ontvangen via het VZC technische ondersteuning? = Anders, namelijk:*

Wie (bijv. de leverancier of ICT-afdeling) levert de technische ondersteuning aan *patiënten?*

_____

*Heeft u aanvullende opmerkingen over deze sectie?*

_____

End of Block: Wat

Start of Block: Wie

**Wie?** In deze sectie wordt gevraagd naar de expertise en achtergrond van de medewerkers in het Virtueel Zorgcentrum (VZC).

Wie leveren binnen het VZC *direct* zorg aan patiënten? *Kies alle antwoorden die van toepassing zijn*. (Meerdere antwoorden)

(Gespecialiseerde) verpleegkundigen
Verpleegkundig specialisten
Artsen
Doktersassistenten
Coassistenten
Overige functie, namelijk: _____
Overige functie, namelijk: _____

Wat is naar schatting het aantal FTE (Fulltime Equivalent) voor functies die binnen het VZC *direct* zorg aan patiënten leveren? *Gebruik een punt als decimaalteken*.

(Gespecialiseerde) verpleegkundigen : _____
Verpleegkundig specialisten : _____
Artsen : _____
Doktersassistenten : _____
Coassistenten : _____
Overige functie, namelijk: : _____
Overige functie, namelijk: : _____

Total : _____

---

Hoeveel zorgmedewerkers zijn er *tijdens* kantooruren per dienst minimaal nodig binnen het VZC om de zorg goed te laten verlopen? (Eén antwoord)

Eén zorgmedewerker
Minimaal twee, zodat back-up altijd beschikbaar is
Afhankelijk van het aantal patiënten
Anders, namelijk: _____

---

Hoe wordt het VZC bemand *buiten* kantooruren? (Eén antwoord)

Buiten kantooruren is altijd een zorgmedewerker aanwezig in het VZC
Buiten kantooruren is geen zorgmedewerker fysiek aanwezig in het VZC, maar wel bereikbaar (on-call)
Buiten kantooruren leveren zorgmedewerkers van het VZC geen zorg aan patiënten
Anders, namelijk: _____

---

*Display this question:*

*If Hoe wordt het VZC bemand buiten kantooruren? = Buiten kantooruren is altijd een zorgmedewerker aanwezig in het VZC*

*Or Hoe wordt het VZC bemand buiten kantooruren? = Buiten kantooruren is geen zorgmedewerker fysiek aanwezig in het VZC, maar wel bereikbaar (on-call)*

*Or Hoe wordt het VZC bemand buiten kantooruren? = Anders, namelijk:*

Wie levert binnen het VZC zorg aan patiënten buiten kantooruren? *Kies alle antwoorden die van toepassing zijn*. (Meerdere antwoorden)

(Gespecialiseerde) verpleegkundigen
Verpleegkundig specialisten
Artsen
Doktersassistenten
Coassistenten
Overige functie, namelijk: _____
Overige functie, namelijk: _____

---

Welke trainingen ontvangen de zorgmedewerkers binnen het VZC? *Kies alle antwoorden die van toepassing zijn.* (Meerdere antwoorden)

Technische training
Medische training
⊗ Geen training
Anders, namelijk: _____

*Display this question:*

*If Welke trainingen ontvangen de zorgmedewerkers binnen het VZC? Kies alle antwoorden die van toepas... = Technische training*

Wat houdt de *technische* training in die zorgmedewerkers binnen het VZC ontvangen?

_____

*Display this question:*

*If Welke trainingen ontvangen de zorgmedewerkers binnen het VZC? Kies alle antwoorden die van toepas... = Medische training*

Wat houdt de *medische* training in die zorgmedewerkers binnen het VZC ontvangen?

_____

*Display this question:*

*If Welke trainingen ontvangen de zorgmedewerkers binnen het VZC? Kies alle antwoorden die van toepas... = Anders, namelijk:*

Wat houdt de *andere* training in die zorgmedewerkers binnen het VZC ontvangen?

_____

Wie zijn betrokken bij het opstellen van nieuwe zorgpaden binnen het VZC? *Kies alle antwoorden die van toepassing zijn.* (Meerdere antwoorden)

Projectleiders
Ziekenhuis management
(Gespecialiseerde) Verpleegkundigen
Verpleegkundig specialisten
Artsen
IT-personeel
Administratief medewerkers
Overige functie, namelijk: _____
Overige functie, namelijk: _____

Wie is eindverantwoordelijk bij het opstellen van nieuwe zorgpaden binnen het VZC? (Eén antwoord)

Projectleiders
Ziekenhuis management
(Gespecialiseerde) Verpleegkundigen
Verpleegkundig specialisten
Artsen
IT-personeel
Administratief medewerkers
Overige functie, namelijk: _____

*Heeft u aanvullende opmerkingen over deze sectie?*

_____

End of Block: Wie

Start of Block: Waar

**Waar?** In deze sectie wordt gevraagd vanuit welke omgeving virtuele zorg via het Virtueel Zorgcentrum (VZC) wordt aangeboden.

Vanuit waar wordt zorg door het zorgpersoneel van het VZC geleverd binnen kantooruren? *Kies alle antwoorden die van toepassing zijn.* (Meerdere antwoorden)

Het VZC zelf
Binnen een afdeling van het ziekenhuis
Het huis van zorgpersoneel (in het geval van thuiswerken)
Het huis van patiënten (in het geval van huisbezoeken)
Anders, namelijk _____

Werkt het VZC samen met de huisarts of thuiszorg? (Meerdere antwoorden)

Ja, het VZC werkt samen met de huisarts
Ja, het VZC werk samen met thuiszorg
⊗ Nee, het VZC heeft geen samenwerking met de huisarts en thuiszorg

*Display this question:*

*If Werkt het VZC samen met de huisarts of thuiszorg? = Ja, het VZC werkt samen met de huisarts*

*Or Werkt het VZC samen met de huisarts of thuiszorg? = Ja, het VZC werk samen met thuiszorg*

Welke afspraken zijn er gemaakt over de samenwerking tussen het VZC en huisartsen/thuiszorg? (Eén antwoord)

Er zijn zowel korte termijn als lange termijn afspraken (bijv. zorgcontracten of bestuurlijke overeenkomsten)
Er zijn alleen afspraken gericht op korte termijn (bijv. incidentele verzoeken of tijdelijke zorgbehoeften)
Er zijn geen formele afspraken over de frequentie of duur van de samenwerking
Anders, namelijk: _____

*Display this question:*

*If Werkt het VZC samen met de huisarts of thuiszorg? = Ja, het VZC werkt samen met de huisarts*

*Or Werkt het VZC samen met de huisarts of thuiszorg? = Ja, het VZC werk samen met thuiszorg*

Hoe wordt de samenwerking tussen het VZC en de huisarts en/of thuiszorg in de praktijk uitgevoerd? (Meerdere antwoorden)

Huisartsen en/of thuiszorg hebben directe toegang tot monitoringsdata en nemen actief deel
Huisartsen en/of thuiszorg worden geïnformeerd bij relevante afwijkingen
Huisartsen en/of thuiszorg zijn betrokken op aanvraag of bij specifieke verzoeken
De samenwerking is afhankelijk van de patiëntenpopulatie
Anders, namelijk: _____

*Display this question:*

*If Werkt het VZC samen met de huisarts of thuiszorg? = Ja, het VZC werkt samen met de huisarts*

*Or Werkt het VZC samen met de huisarts of thuiszorg? = Ja, het VZC werk samen met thuiszorg*

Wie is eindverantwoordelijk voor de zorg van de patiënt binnen de samenwerking tussen het VZC en de huisarts en/of thuiszorg? (Eén antwoord)

Het VZC
De huisarts
De thuiszorgorganisatie
Gezamenlijke verantwoordelijkheid tussen het VZC, huisarts en/of thuiszorg
Anders, namelijk: _____

Werkt het VZC samen met andere ziekenhuizen? (Eén antwoord)

Ja, met één ziekenhuis
Ja, met meerdere ziekenhuizen
Nee, het VZC heeft geen samenwerking met andere ziekenhuizen

*Display this question:*

*If Werkt het VZC samen met andere ziekenhuizen? = Ja, met meerdere ziekenhuizen*

Waaruit bestaat de inhoudelijke samenwerking tussen het VZC en andere ziekenhuizen? *Kies alle antwoorden die van toepassing zijn.* (Meerdere antwoorden)

Gezamenlijke protocollen
Uitwisseling van expertise
Gezamenlijk gebruik van medische apparatuur of technologie
De samenwerking is afhankelijk van de patiëntenpopulatie
Anders, namelijk: _____

*Display this question:*

*If Werkt het VZC samen met andere ziekenhuizen? = Ja, met één ziekenhuis*

Waaruit bestaat de inhoudelijke samenwerking tussen het VZC en het andere ziekenhuis? *Kies alle antwoorden die van toepassing zijn.* (Meerdere antwoorden)

Gezamenlijke protocollen
Uitwisseling van expertise
Gezamenlijk gebruik van medische apparatuur of technologie
De samenwerking is afhankelijk van de patiëntenpopulatie
Anders, namelijk: _____

Zijn er andere samenwerkingen van het VZC waar in deze vragenlijst nog niet naar is gevraagd? (Eén antwoord)

Ja, namelijk: _____
Nee

Hoe wordt het VZC gefinancierd? *Kies alle antwoorden die van toepassing zijn.* (Meerdere antwoorden)

Via verzekeraars
Via subsidies
Via interne financiering
Anders, namelijk: _____

*Heeft u aanvullende opmerkingen over deze sectie?*

_____

End of Block: Waar

Start of Block: Wanneer

**Wanneer en hoe vaak?** In deze sectie wordt gevraagd naar de duur en frequentie van de levering van virtuele zorg via het Virtueel Zorgcentrum (VZC).

Sinds wanneer bestaat het VZC? *Vul maand en jaar in als mm/jjjj. Als de exacte maand niet bekend is, mag een schatting worden gegeven.*

_____

Hoeveel patiënten maken gemiddeld per maand gebruik van virtuele zorg via het VZC? *Als het exacte aantal niet bekend is, mag een schatting worden gegeven.*

_____

Hoeveel zorgpaden voor virtuele zorg zijn momenteel in gebruik via het VZC? *Als het exacte aantal niet bekend is, mag een schatting worden gegeven*

_____

Hoe zijn de zorgpaden ingedeeld binnen het VZC? *Kies alle antwoorden die van toepassing zijn*. (Meerdere antwoorden)

Per specialisme (bijv. cardiologie, dermatologie, neurologie)
Per ziektebeeld (bijv. diabetes, COPD, hartfalen)
Per zorgproces (bijv. diagnostiek, behandeling, nazorg)
Per zorgzwaarte (bijv. laagcomplex, gemiddeld, hoogcomplex)
Per zorgsetting (bijv. poliklinisch, klinisch, thuiszorg)
Anders, namelijk: _____

Hoe wordt bepaald of een nieuw zorgpad moet worden toegevoegd aan het VZC? *Kies alle antwoorden die van toepassing zijn*. (Meerdere antwoorden)

Verzoek vanuit een specialismen
Beschikbaarheid van de technologie
Beleidsbeslissingen van het ziekenhuis
Datagedreven beslissingen
Anders, namelijk: _____

*Heeft u aanvullende opmerkingen over deze sectie?*

_____

End of Block: Wanneer

Start of Block: Maatwerk

**Maatwerk** In deze sectie wordt gevraagd naar de manier waarop de virtuele zorg binnen het Virtueel Zorgcentrum (VZC) is afgestemd op de individuele behoeften van patiënten.

Hoe wordt bepaald welke patiënten in aanmerking komen voor virtuele zorg via het VZC? *Kies alle antwoorden die van toepassing zijn*. (Meerdere antwoorden)

Via een screeningsprotocol (gestandaardiseerde richtlijnen)
Op basis van inschatting van een medisch specialist
De patiënt kan zelf aangeven deel te willen nemen
⊗ Er zijn geen specifieke criteria voor het includeren van patiënten
Anders, namelijk: _____

Hoe wordt ondersteuning geboden aan patiënten bij het gebruik van digitale hulpmiddelen voor virtuele zorg via het VZC? (Eén antwoord)

Patiënten krijgen vooraf uitgebreide begeleiding in het gebruik van digitale hulpmiddelen
Patiënten leren zelf de digitale hulpmiddelen te gebruiken, waarbij enige ondersteuning beschikbaar is
Patiënten ontvangen geen specifieke ondersteuning bij het gebruik van digitale hulpmiddelen
Anders, namelijk: _____

Hoe worden mantelzorgers en familieleden van patiënten betrokken bij de zorg via het VZC? (Eén antwoord)

Ze ontvangen meldingen en begeleiding vanuit het VZC
Ze ondersteunen alleen patiënten bij technische problemen
Ze hebben geen rol, alleen de patiënt is verantwoordelijk
Anders, namelijk: _____

*Heeft u aanvullende opmerkingen over deze sectie?*

_____

End of Block: Maatwerk

Start of Block: Veranderingen

**Veranderingen** In deze sectie wordt gevraagd naar veranderingen die van invloed zijn geweest op het Virtueel Zorgcentrum (VZC).

Welke ingrijpende veranderingen (bijv. intern, extern, innovaties) hebben het functioneren van het VZC beïnvloed? *Beschrijf kort de impact hiervan.*

_____

*Heeft u aanvullende opmerkingen over deze sectie?*

_____

End of Block: Veranderingen

Start of Block: Hoe goed?

**Hoe goed?** In deze sectie wordt gevraagd hoe wordt gecontroleerd of de zorg in het Virtueel Zorgcentrum (VZC) volgens plan wordt uitgevoerd en welke strategieën worden gebruikt om de verwachte resultaten te behalen.

Hoe heeft het VZC inzicht in de impact van de virtuele zorg? *Kies alle antwoorden die van toepassing zijn.* (Meerdere antwoorden)

Via feedback van patiënten
Via feedback van zorgprofessionals
Via aannames of inschattingen
Via wetenschappelijk onderzoek
Anders, namelijk: _____

In welke gebieden ervaart het VZC momenteel uitdagingen? *Kies maximaal drie antwoorden*. (Meerdere antwoorden)

Technologie
Supervisie
Zelfmanagement van de patiënt
Samenwerking met de huisarts en thuiszorg
Financiën
Gestandaardiseerde zorg leveren
Anders, namelijk: _____
Anders, namelijk: _____

Wat zijn de plannen van het VZC om de uitdagingen op deze gebieden aan te pakken?

_____

In welke gebieden functioneert het VZC juist goed? *Kies maximaal drie antwoorden*. (Meerdere antwoorden)

Technologie
Supervisie
Zelfmanagement van de patiënt
Samenwerking met de huisarts en thuiszorg
Financiën
Gestandaardiseerde zorg leveren
Anders, namelijk: _____
Anders, nameljk: _____

Welke strategieën van het VZC dragen bij aan het succes op deze gebieden?

_____

*Heeft u aanvullende opmerkingen over deze sectie?*

_____

End of Block: Hoe goed?

Start of Block: Extra

**Aanvullende opmerkingen** *Heeft u nog aanvullende opmerkingen die relevant kunnen zijn voor dit onderzoek?*

_____

End of Block: Extra

# Appendix C Informed consent letter

This informed consent letter is presented in Dutch, which is the language used during data collection.

Beste deelnemer,

In opdracht van de ziekenhuizen Isala en Rijnstate, en de Universiteit Twente, willen wij u vragen om deel te nemen aan een onderzoek naar de organisatie van virtuele zorg in de Nederlandse ziekenhuizen. Hiermee bedoelen we het bieden van zorg op afstand via verschillende communicatietechnologieën, zodat zorg op elk moment en op elke plaats kan worden geleverd. Dit onderzoek wordt uitgevoerd door Jessica Balm van de Universiteit Twente, als onderdeel van haar Master Thesis voor Gezondheidswetenschappen.

Het doel van deze online vragenlijst is om een beter beeld krijgen van hoe virtuele zorg momenteel is ingericht en met welk doel. Onze focus ligt op virtuele zorg via een centrale afdeling, waarbij het ziekenhuis zelf alle taken uitvoert, zoals een Virtueel Zorgcentrum (VZC). Voor een compleet beeld van de huidige situatie in de Nederlandse ziekenhuizen, vragen wij iedereen om de vragenlijst in te vullen, ook als uw ziekenhuis geen virtuele zorg levert of deze op een andere manier aanbiedt. Het invullen van de vragenlijst duurt maximaal 20 minuten.

Er zijn geen risico's verbonden aan uw deelname. Uw deelname is geheel vrijwillig, en u kunt op elk moment stoppen. U ontvangt voor deelname aan dit onderzoek geen vergoeding. Alle antwoorden worden anoniem verwerkt en veilig opgeslagen volgens de richtlijnen van de Universiteit Twente. In de rapportage komen geen gegevens die naar personen te herleiden zijn.

Dit onderzoek is goedgekeurd door de ethische commissie (domein Humanities & Social Sciences) van de faculteit Behavioural, Management and Social Sciences van de Universiteit Twente.

Heeft u vragen? Neem dan gerust contact op met:

Naam: Jessica Balm
E-mail: j.w.h.balm@student.utwente.nl

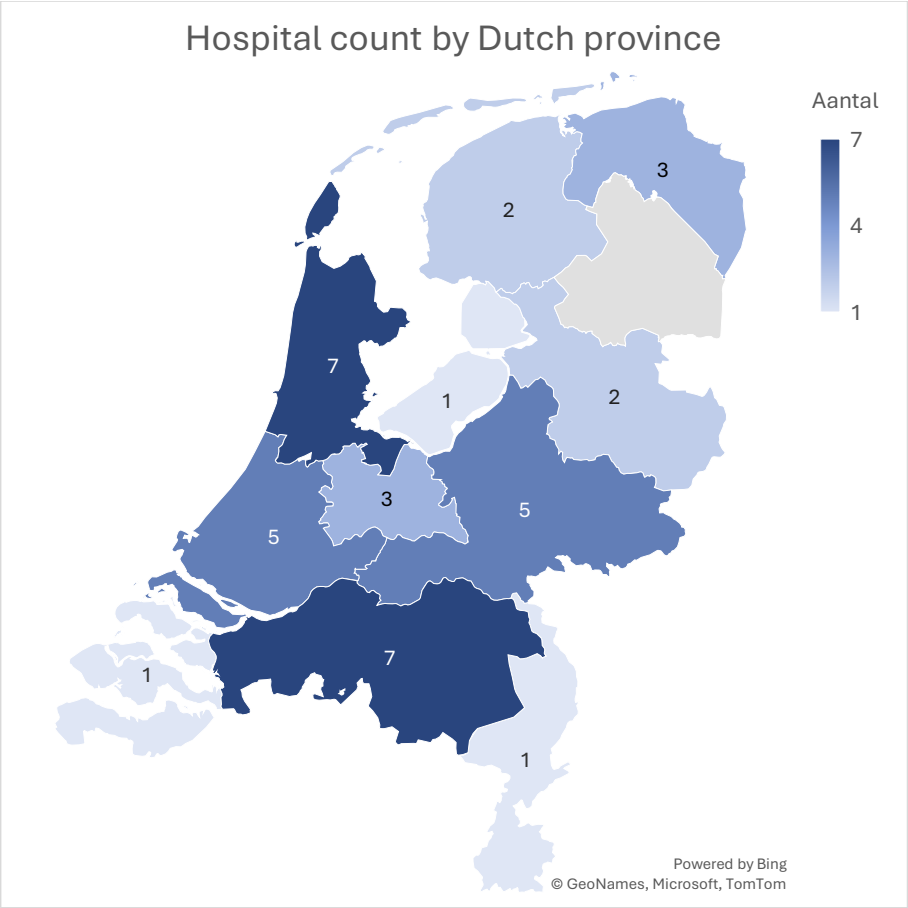
Alvast bedankt voor uw deelname!

Informed consent

Heeft u de bovenstaande informatie zorgvuldig gelezen en begrepen, en gaat u akkoord met deelname aan dit onderzoek?

Ja, ik ga akkoord
Nee, ik ga niet akkoord

# Appendix D Distribution of included hospitals by Dutch province




**Appendix Figure 1** Map of the Netherlands showing the number of unique hospitals per province included in the analysis.

# Appendix E Translations of quotes

**Appendix Table 2** Original Dutch quotes and English translations.

| Dutch quote | English translation |
|---|---|
| Verbeteren duurzaamheid (met name reizen), verbeteren toegankelijkheid zorg (met name minder reizen, meer patiënten e.d.), en verbeteren regie patiënt en naasten | Improving sustainability (especially travel), improving access to care (mainly through reduced travel and serving more patients), and enhancing the control of patients and their families. |
| Capaciteit, door snelle groei, moeten teams ook snel groeien. mensen opleiden kost tijd | Capacity, due to rapid growth, teams also need to expand quickly. Training people takes time |
| O.a. de ambitie van de regio om centraal te monitoren heeft ertoe geleid dat de monitoring nu intern centraal wordt georganiseerd. En ook om de monitoring niet meer decentraal per poli te beleggen om schaalvoordeel te kunnen bereiken. | Among other things, the region's ambition to monitor centrally has led to the monitoring now being organized internally in a centralized manner. Also, monitoring is no longer decentralized per outpatient clinic in order to achieve economies of scale. |
| Om in de toekomst dezelfde zorg te kunnen bieden zullen we in samenwerking met de regio uiteindelijk ook virtuele zorg moeten aanbieden. | To continue providing the same level of care, we will eventually need to offer virtual care in collaboration with the region. |
| De schaalgrootte van ons ziekenhuis en het beperkt aantal mensen in ondersteunende functies | The scale of our hospital and the limited number of staff in supporting roles |
| We missen een goed BI dashboard om dit weer te geven (werken we wel aan). | We lack a proper BI (Business Intelligence) dashboard to visualize this (although we are working on it) |