Workload experiences of virtual care centre nurses

Master thesis - Health Sciences

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Colophon

This document is the master thesis for the completion of the Master of Health Sciences at the University of Twente.

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Abstract

Background: Telehealth is an application provided by virtual care centre (VCC) nurses to support the online exchange of medical information to enable the delivery of remote healthcare. The VCC nurses are active in multiple care pathways and deliver care remotely using telemonitoring. This application of telehealth in hospitals is relatively new and has an innovative approach. This results in different activities compared to direct in-patient care as taught within nursing education. The effect of this on the workload of VCC nurses is unknown, just as the workload experienced in general. This research focuses on virtual care centre nurses and their experienced workload.

Study: To determine the extent workload is experienced by VCC nurses. The relative contribution of the workload variables is determined to gain insight in the workload experienced. Additionally, workload is identified in specific tasks.

Methods: An online questionnaire design that consists of the NASA-TLX in combination with the Analytical Hierarchy Process identifies the experienced workload. VCC nurses of eight hospitals are approached to participate in the questionnaire. Tasks of VCC nurses are identified through a Delphi-inspired method discussing the tasks with VCC nurses in a single-centred approach. Workload is measured by six workload variables: *mental demand, physical demand, temporal demand, effort, frustration and performance.* The variables are used to assess tasks belonging to the VCC nurses. Weights are given to the workload variables using the pairwise comparisons of the AHP and scores assess the tasks to obtain the workload of VCC nurses. The consistency of weights is determined using the Consistency Ratio. Statistical analyses are performed using the Wilcoxon-Mann-Whitney test as not all data is normally distributed.

Results: In total 21 tasks represent the profession of VCC nurses. These tasks are categorised by 1) training and education, 2) development and promotion of new care pathways, 3) contact with patients, 4) clinical decision-making, and 5) administration. In total, data of 19 respondents are used for the analysis. Of the workload variables, *mental demand* is weighted the strongest with a median of 0.227(IQR=0.161). The weakest weight is represented by *physical demand* with a median of 0.067(IQR=0.100). Additionally, 10(52.60%) have a Consistency Ratio that exceeds the 0.1 cut-off point. In scores, *effort* 31.47(IQR=36.07) and *physical demand* 6.01(IQR=7.00) are highest and lowest respectively. Workload differs between respondents and ranges from 6.35-52.75. The workload is highest for *mental demand* 6.51(IQR=10.37) and lowest for *physical demand* 0.13(IQR=0.81). Task 2.1 concerns *the development of protocols for new digital care pathways* and results in the highest workload with a median of 49.77(IQR=19.84). Task 4.4 *decision-making with protocols* has the lowest workload with a median of 6.80(IQR=27.93). No significant results are found while comparing tasks distinguished by an ad-hoc and planned approach.

Conclusion and discussion: Improving workload of VCC nurses can be achieved mostly by reducing the *mental demand*. On the contrary, *Physical demand* has the least impact on workload reductions. The workload is highest in tasks of the *development and promotion of new care pathways*, so this is a promising area of improvement. This study contributes to the scientific power of using the combined NASA-TLX and AHP. Using this approach should be considered carefully regarding possible inconsistencies when determining weights. Nevertheless, it contributes to improving limitations that are found in the original NASA-TLX.

Keywords: Workload, Virtual care, Telemonitoring, Nurses, Questionnaire, NASA-TLX, AHP

Table of content

List of abbreviations

Abbreviation	Definition
AHP	Analytical Hierarchy Process
CCC	Connected Care Centre
CI	Consistency Index
CR	Consistency Ratio
EF	Effort
FL	Frustration level
HTA	Hierarchical Task Analysis
MD	Mental demand
NASA-TLX	The National Aeronautics and Space Administration Task Load Index
PD	Physical demand
PF	Performance
TD	Temporal Demand
VCC	Virtual Care Centre

Chapter 1 | Introduction

The healthcare system in the Netherlands has experienced increasing pressures to perform with rising demands and available resources such as staff and equipment [1]. There is an ageing Dutch population and consequently, it contributes to the already rising healthcare costs [2–4]. Additionally, the Dutch healthcare labour market is expected to have a shortage of 140.000 employees in 2031 [5]. The number of job vacancies is increasing faster in the healthcare sector since the Covid-19 pandemic took place compared to prior to the pandemic [6]. This combination of employee shortage and ageing population has resulted in higher workloads for healthcare workers [7].

The occurrence of the pandemic has among others contributed to the increase of technology use in healthcare. It became evident that new healthcare approaches had to be developed since the pandemic showed a sudden high demand for patients and a decrease in employees due to sick leave [8]. Providing healthcare from a distance became more prevalent and enabled the delivery of virtual care.

Telehealth is an application within virtual care that supports the online exchange of medical information [9]. Exchange of medical information can take place between a patient and a healthcare professional, or between multiple healthcare professionals. It allows delivering patient-centred care while saving costs and taking care of more patients at the same time [10]. *Telehealth* is defined as the use of telecommunication techniques for the purpose of providing telemedicine, medical education, and health education over distance [11].

As telehealth is increasingly used in different settings of hospitals, Virtual Care Centres (VCC) are set up to provide centralised out-patient services. The title of 'VCC' may differ in hospitals and can also be described as 'Medical Direction Centre', 'Monitoring Centre' or something similar. Several hospitals in the Netherlands have recently started working with a VCC, in which the existence is still relatively new [12,13]. VCCs are responsible for multiple virtual care pathways to deliver telehealth. Within the VCCs, activities are carried out by a team of VCC nurses. These specialized nurses are active in multiple care pathways and are expected to have a broad knowledge to take care of different types of patients [14]. The VCC provides device-based monitoring, mobile telemonitoring and structured telephone support (STS) which gives patients the opportunity to be completely treated and monitored from home. *Device-based monitoring* enables patients to measure vital signs or report symptoms that could indicate health status changes using a device remotely such as from home. With *mobile telemonitoring* patients use their own mobile phone to fill in information about their vital signs or symptoms. Based on this information, healthcare providers receive automated alerts to notify changes that may ask for action. With *STS*, patients are provided with a mobile phone number that they can contact during a specific period [15]. VCC nurses assist patients from a distance and often communicate through chatting or by phone calls. This way, patients can report their health status, get advice, or have medication adjustments. In these patient-to-nurse interactions, nurses have a signalling function to the responsible doctors by informing them, for example, in case of disease progress. In support of virtual care, home care visits patients at home. VCC nurses coordinate the healthcare delivery of home care to make sure it corresponds with the patient's needs. Based on patients' healthcare data, their healthcare status is tracked and used medication can be adjusted.

The development of telehealth contributes to reducing face-to-face conversations and prevents overcrowding in hospitals [16]. Out-patient consultations are partially replaced, and hospitalisation of some patients is avoided and replaced with care from home. This reduces the number of times a patient visits the hospital. Also, particularly for outpatient clinic patients, telehealth leads to more extensive insights into the progression of patients' healthcare status as telemonitoring shows a longer course of health data compared to a single measurement. Consequently, changes can be noticed earlier to adjust treatments and medications to support favourable outcomes [17]. Hence virtual care provides a patient-centred approach and delivers multiple advantages to patients [18].

Besides the advantages for patients, telehealth also brings advantages to healthcare workers. It allows reducing the workload of nurses on nursing wards by taking over tasks. Relieving nurses is essential as research shows that they often experience a high workload [19]. Consequences of high workload can result in deterioration of the quality of healthcare due to the consequential stress [20]. Mistakes occur more often, and patient recoveries show less progress. Besides, when a high workload persists, nurses are at risk of getting burn outs [21]. For the sake of both patients and nurses, the support of programs such as telehealth can be important to maintain the quality of care and to improve the working conditions of nurses.

The workload of nurses who are active in wards can be measured, which is often done based on the characteristics of patients and their expected amount of care needed. Examples are the care severity score [22] or the Nursing activities score (NAS) [23]. However, as VCC nurses mainly monitor patients virtually, these measurements are not suitable to measure the workload of the VCC nurses. VCC nurses are occupied with multiple activities next to the monitoring and assessment of data and communication with patients. Therefore, using the number of patients or their characteristics would only measure their workload partially. An alternative approach should be used to define the workload of VCC nurses.

Virtual care is relatively new and has an innovative approach. This asks different competences and functioning of nurses compared to direct in-patient care as taught within nursing education. The effect of this on the workload of VCC nurses is unknown, just as the workload experienced in general. Therefore, the goal of this research is to determine to what extent causal variables contribute to the workload experienced by VCC nurses. Insights about specific tasks that contribute to workload being experienced should be identified.
This goal can be reached by answering the following research question:

> *To what extent is workload experienced by VCC nurses who are active in the virtual care centres in the Netherlands?*

To answer this question, first, a workload measurement instrument should be chosen. Then, tasks performed by VCC nurses must be examined to determine what causes with which extent workload is experienced.
To this end, the following sub-questions are formulated:

> *What workload measurement instrument is suitable for measuring the workload of VCC nurses?*
> *What tasks comprise the function of the VCC nurses?*
> *How do the workload variables contribute to the workload experienced by VCC nurses?*
> *To what extent do different tasks contribute to workload experienced by VCC nurses?*
> *To what extent is workload experienced differently between VCC nurses?*

Chapter 2 | Theoretical framework

This chapter discusses multiple approaches with corresponding instruments that exist to measure workload. In §2.1 approaches and instruments are compared and discussed for the methodology of this study. §2.2 discusses instruments that have a direct nurse-based approach. At last, §2.3 explains the chosen approach and corresponding instrument in more detail.

2.1 | Workload approaches

Workload[1] is a concept that has been described in multiple ways. Therefore, different measurements have been developed. Hoonakker et al. [24] distinguish quantitative workload approaches using different categories. A distinction can be made using patient-based and operator-based approaches. The patient-based approach determines workload by the characteristics and number of the patients being treated by nurses. Instruments such as the NAS [23] and Safer Nursing Care Tool (SNCT) [25] are based on this principle. These instruments say little about the well-being of nurses and often do not take indirect patient care such as administration, monitoring, and education into consideration [24]. Therefore, a patient-based approach is not appropriate to measure workload in VCC nurses.

The operator-based approach arises from the human factors discipline showing the perspective from, in this case, VCC nurses. Therefore, this study entitles it as the nurse-based approach. Here, a distinction is made between the objective and subjective approach. The objective method is based on psychophysiological features such as cardiac, respiratory, and eye movement responses and is an indirect workload measurement [26]. This measurement is indirect due to the assumptions made about the relation of workload with cognitive and autonomic activities [24]. Such assumptions are not made in subjective methods, which makes it a direct approach that is based on empirical and analytical information. The directness of subjective approaches contributes to the validity. Additionally, the subjective method is described as least intrusive as it can measure workload afterwards, meaning that the working processes of nurses do not get disturbed [24]. The objective approach is likely to be more time-consuming and disturbing for participants to perform their working activities compared with a subjective approach. Additionally, the objective approach requires physical appointments with participants to collect research data. Therefore, it constrains the target population due to the physical distance needed to reach them. A direct nurse-based approach is therefore most suitable for the goal of this study.

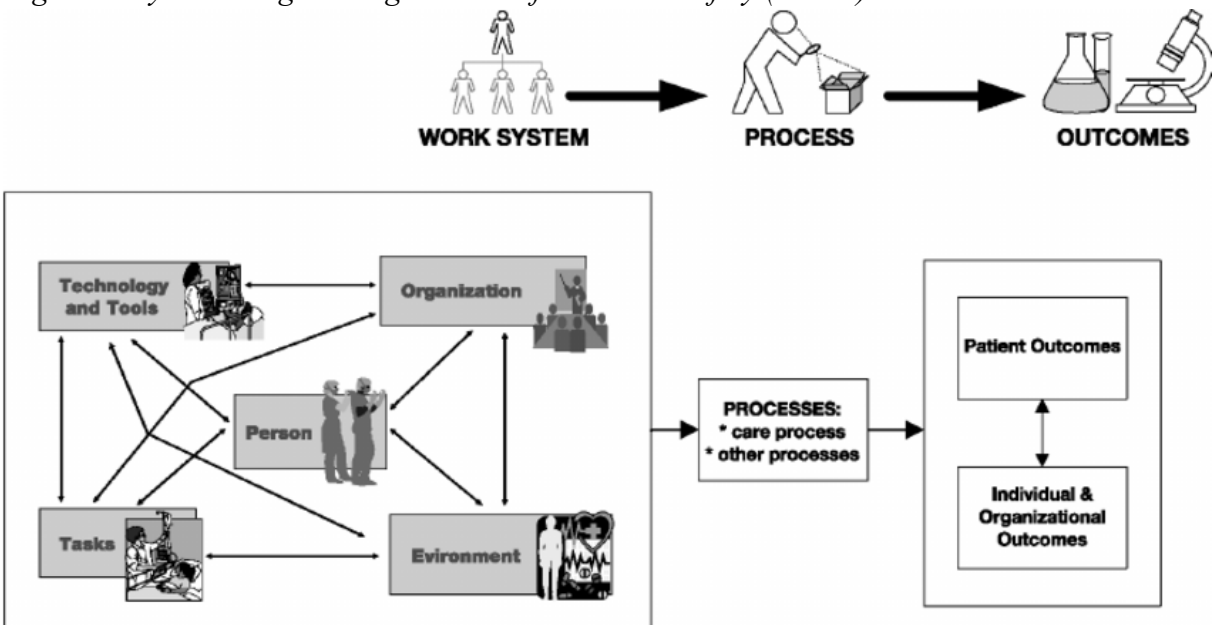
2.2 | Direct nurse-based instruments

Nurse-based approaches address workload from the Human Factors and Ergonomics (HFE) perspective. The study of Hignett defines HFE as ‘the professional discipline that focusses on systems and design to improve performance and well-being [27].’ Workload is incorporated within the field of human factors, which emphasizes the relevance of using the HFE approach for this research to improve the delivery of healthcare and working conditions [28]. Human factors within healthcare are studied by Holden et al. [29] with the Systems Engineering Initiative for Patient Safety (SEIPS) model. The SEIPS model consists of the work system, the process and outcome as shown in *Figure 1*. The work system focusses on technology and tools, organisation, person, environment, and tasks [29]. This model shows that the VCC nurse (person) performing a job is in the centre surrounded by the other necessities. Thereby, the VCC nurse has an impact on the process of the job using the necessities. If high workload is experienced by a VCC nurse, all network connections within the work system can be affected.

[1] The definition of workload for this study is explained in chapter 3.2: Methods.

Consequently, the process is performed with more stress, less thoughtful decisions, and more mistakes [20]. This is reflected in outcomes such as poor quality of care or burn-outs in VCC nurses [21]. This shows the importance to consider the conditions of VCC nurses, where this study is focused on experienced workload.

Figure 1: Systems Engineering Initiative for Patient Safety (SEIPS) model



There are multiple instruments available to measure workload with a direct nurse-based approach. *Figure 2* shows an overview of workload approaches and corresponding instruments, including those direct nurse-based. Instruments to measure workload are either general or designed specifically for the healthcare sector. The National Aeronautics and Space Administration Task Load Index (NASA-TLX) [30], Questionnaire on the Experience and Evaluation of Work (QEEW) [31], Subjective Workload Assessment Technique (SWAT) [32], and Job content questionnaire (JCQ) [33] are examples of general instruments. The Multi-level Human Factors Framework (MHFF) [34] and Expanded Nursing Stress Scale (ENSS) [35] are specifically designed to be applied within the healthcare sector.

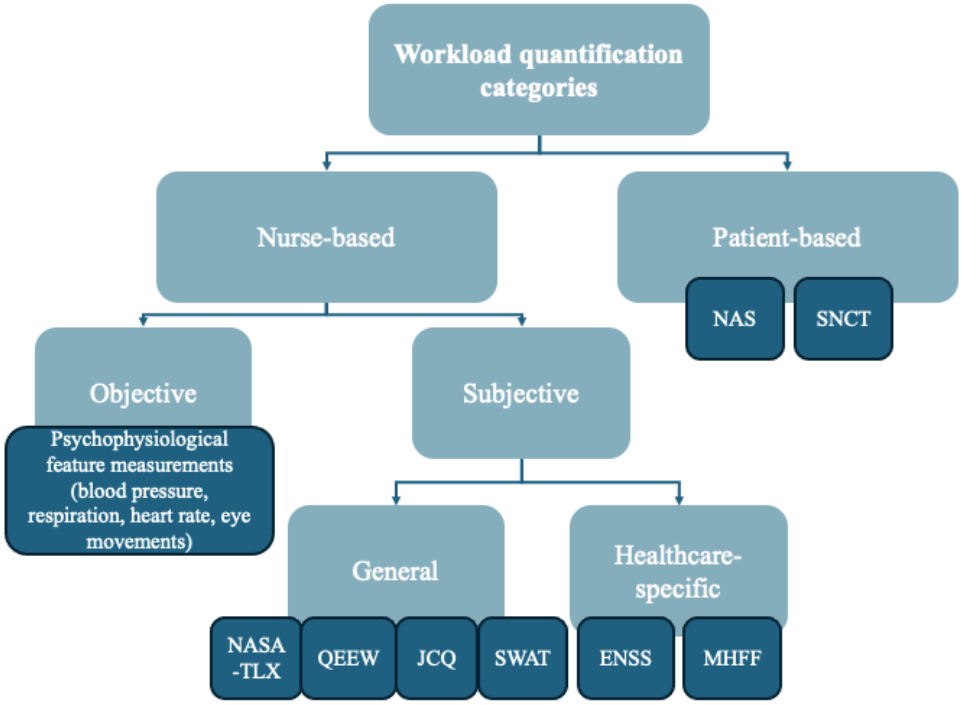
The direct nurse-based instruments are compared to clarify which one is most suitable for the goal of this study. The questions used within the QEEW, JCQ, and ENSS are based on dimensions in which workload is mentioned. These are then used to study among others stress, well-being and psychological job demands. Instead of using workload within dimensions, we want to research workload itself. An instrument focused on workload only is desired.

The MHFF is a framework that describes resources and demands on different levels. It gives good insight in different sources that could lead to workload experienced in nurses. However, the framework does not come with an instrument to measure the mentioned dimensions.

The SWAT and NASA-TLX instrument are focused on workload itself. They consist of three and six dimensions respectively. Due to the relatively little dimensions of SWAT, less distinctions are made to explain workload [36]. The dimensions mental effort load and psychological stress load are broadly oriented. Therefore, understanding the source of workload remains very general as well. A more detailed outcome would be desired which can be found

within the NASA-TLX. *Figure 2* shows an overview of the different workload approaches and corresponding instruments to clarify the selected instrument.

Figure 2: decision-tree of workload approaches with corresponding instruments



2.3 | NASA-TLX

The NASA-TLX is a direct nurse-based approach to measure workload. The NASA-TLX describes workload in a general way enabling its use within multiple sectors, although it was originally designed for the aerospace sector [30]. According to Hoonakker et al. [24] and Hart et al. [24,30] this instrument has been used within healthcare before due to its general approach. The NASA-TLX is considered as the golden standard in measuring subjective workload [37]. Workload is measured per specific task performed. With that, it is in line with the SEIPS model as they both approach workload subjectively and look at the relation between person and tasks. The NASA-TLX dimensions (variables) consist of mental demand, physical demand, temporal demand, effort, frustration level, and performance as shown in *Figure 3*. These variables combined represent the total workload of a task. The variables are weighted using pairwise comparisons to determine the relative importance. When weights are not applied, reference is made to 'Raw-TLX' [38]. The Raw-TLX presumes that workload variables are equal in size of impact. However, part of this research is about understanding the impact of variables that result in workload, and the size of impact is not yet known. Therefore, this research is performed by means of the weighted NASA-TLX. According to Hoonakker [24] the reliability of the NASA-TLX instrument was tested with a test-retest by Batisse and Bortolussi [39]. It scored a Cronbach's alpha of 0,77. It should be noted, however, that this test did not include the use of the AHP and could therefore deviate from this research.

Figure 3: Description of NASA-TLX dimensions (variables) of workload

Item	Endpoints	Description
Mental demand	1 - 10 Low / High	How much mental and perceptual activity was required (e.g., thinking, deciding, calculating, remembering, looking, searching, etc.)? Was the task easy or demanding, simple or complex, exacting or forgiving?
Physical demand	1 - 10 Low / High	How much physical activity was required (e.g.. pushing, pulling, turning, controlling, activating, etc.)? Was the task easy or demanding, slow or brisk, slack or strenuous, restful or laborious?
Temporal demand	1 - 10 Low / High	How much time pressure did you feel due to the rate or pace at which the tasks occurred? Was the pace slow and leisurely or rapid and frantic?
Performance	1 – 10 Good / Poor	How successful do you think you were in accomplishing the goals of the task set by the experimenter (or yourself)? How satisfied were you with your performance in accomplishing these goals?
Effort	1 - 10 Low / High	How hard did you have to work (mentally and physically) to accomplish your level of performance?
Frustration level	1 - 10 Low / High	How insecure, discouraged, irritated, stressed and annoyed versus secure, gratified, content, relaxed and complacent did you feel during the task?

The weighted NASA-TLX consists of two parts. First, weights are assigned to the workload variables with pairwise comparisons. Participants compare two variables at a time to indicate which variable is more important than the other. In total 15 comparisons are made to define the relative importance of variables. This is used to determine the weights of the variables.
Part two consists of task scoring. The variables weighted in part one, are used to score the tasks. For each task, the extent to which a variable contributed to workload has to be indicated. A scale from 0-100 is used with a twenty-step distribution creating steps of 5 points to score tasks on workload. A score of 0 indicates no workload and a score of 100 indicates maximum workload. In this way, the six workload variables show the total workload experienced in a specific task. A scale of 1-10 or Likert-scale of 1-7 has been applied before as well [40]. The total workload of a task is calculated by taking the sum of scores multiplied with their weight [40].

Virtanen et al. [40] examined the methodology of weight assignment within NASA-TLX. They mention that the pairwise comparison does not give the opportunity to consider dimensions as equally important. Additionally, the dimension that scores lowest, is likely to receive a total score of 0, indicating that only five of six dimensions are considered in the final workload measurement. Therefore, Virtanen et al. [40] designate the Analytical Hierarchy Process (AHP) as an alternative. The number of comparisons within AHP is based on the formula *K(K-1)/2* where k shows the number of variables [41]. As the NASA-TLX contains six dimensions, in total 6(6-1)/2= 15 comparisons should be performed by the respondents, which is also the case when using the original NASA-TLX weighting method. It enables the scoring of relative importance where all six variables are part of the final workload. Instead of using an ordinal scale as used within NASA-TLX, a cardinal scale is used running from 1-9. With that, the AHP can give more accurate weights. Giving a score on this cardinal scale indicates to what extent one variable is regarded as more important compared to the other variable where an equal importance is indicated by 1. Definitions of the AHP scale are shown in *Figure 4.* This research contributes to the literature on studies using the AHP within the NASA-TLX.

To gain insight into the consistency of the comparisons, a consistency ratio (CR) reveals to what extent respondents were consistent in assigning weights. According to Saaty [42], the developer of the AHP, results are considered insufficiently consistent when the CR of<0.1 is exceeded. Nevertheless, a CR<0.1 implies that slight inconsistencies may be present [40]. For the calculation of the CR, the Consistency Index (CI) and random consistency index (RI) are needed [43]. To calculate the CI, the maximum eigen value (λ_{max}) which is calculated using the matrix in which the pairwise comparison outcomes are stated. The RI is dependent on the number of variables measured. An RI of 1.24 belongs to the calculation of the CR when having six variables [44].

$$CR = \frac{CI}{RI} \quad \text{and} \quad CI = \frac{(\lambda_{max-N})}{N-1}$$

Figure 4: Analytical Hierarchy Process (AHP) 9-points scale definitions for pairwise comparisons [41].

Intensity of Importance	Definition	Explanation
1	Equal Importance	Judgment favors both criteria equally.
3	Moderate Importance	Judgment slightly favors one criterion
5	Strong Importance	Judgment strongly favors one criterion.
7	Very Strong Importance	One Criterion is favored strongly over the another
9	Absolute / Extreme Importance	There is evidence affirming that one criterion is favored over another
2,4.6,8	Immediate values between above scale values	Absolute Judgment cannot be given and a compromise is required
Reciprocals of the above	If element i has one of the none zero numbers assignment when compared with activity j. j has the reciprocal value when compared to i	A reasonable assumption

Chapter 3 | Methodology

3.1 | Study design

This descriptive cross-sectional case study is performed with an online questionnaire using the NASA-TLX combined with the AHP. The online questionnaire uses tasks to determine the workload of VCC nurses. A single-centre approach is used to develop a task list that represents the profession of VCC nurses. VCC nurses of Isala were approached to discuss the content of the task list using a Delphi-inspired method. Additionally, a multi-centre approach is used to reach respondents for the online questionnaire. Cases consist of nurses and medical interns who are active within virtual care centres of Medisch Spectrum Twente (MST), UMC Utrecht, or hospitals affiliated with mProve. This study aims to receive quantitative data on workload of VCC nurses. Task identification takes place to then use it within the questionnaire. The received data is then used to calculate the workload which helps to gain insight in the experiences of VCC nurses.

3.2 | Definitions

This paragraph explains the definitions of concepts that are used within the research.

3.2.1 | Workload

There is no general consensus about the definition of workload in healthcare literature. There are multiple ways in which workload can be interpreted and described. Bowling et al. [45] describe workload in a very broad way. Workload includes any variable that reflects the amount or difficulty of one's work. Besides, they show that workload includes both physical and psychological aspects and qualitative and quantitative data. A definition more specifically focusing on healthcare defines workload as 'The amount of time and care that a nurse can devote (directly and indirectly) towards patients, workplace, and professional development [46].' This definition includes a broad scope which allows taking indirect patient care and other tasks into account. Hart et al. [30] explain the workload definition in a conceptual framework where a distinction is made between imposed and experienced workload. Imposed workload is described as 'The situation encountered by an operator.' The intended demands of a task are created by its objectives, duration, and structure by human- and system resources provided. Here, the actual demand can vary depending on the environment, systems, operations, and their errors. Experienced workload is described as 'The effect on an operator of performing a task.'

Taking these definitions of workload into consideration, this study defines workload as follows: *Workload is the perceived effect on a nurse by performing a task comprised of the time, amount, and difficulty of one's work devoted to the care of patients, workplace, and professional development.*

3.2.2 | Task

In general terms, *work* is seen as the input of a process to transform inputs into outputs. In doing so, *tasks* are the units that contribute to producing the final output [47].
Work can either be continuous or differentiated into tasks. *Work* has become more complex, realising more specialisations and an increase in process size [47]. This enables the observation of tasks from different levels. Very small units of labour can be described while larger tasks or task domains that describe job functions also exist. Fernández-Macías and Bisello divide the definition of *tasks* into two dimensions; *content* and *methods and tools* [48]. *Content* is described as 'the things people do at work, transforming a specific object using a specific type of processing.' *Methods and tools* are 'used to perform tasks, reflect how an organisation is set up, and with what technology tasks.'

This study focuses on the *content* dimension to define *tasks*. Its general description makes it broadly applicable and therefore suitable to approach the activities performed by VCC nurses.

3.3 | Study population

The target population is represented by VCC nurses and medial interns in the Netherlands. Hospitals that are affiliated to the mProve program are approached to contribute to the research using the mProve network. Besides, the Medisch Spectrum Twente (MST) and UMC Utrecht were approached to participate to enlarge the number of cases. First, a single-centred approach with VCC nurses of Isala is used for the development of the task list. In recent years, Isala has gained experience by providing out-patient remote care. It can therefore be assumed that their VCC nurses can support the development of a general and concise task list that comprises the profession of a VCC nurse. Next, a multi-centred approach is used for respondents of the online questionnaire. The inclusion criteria are current activity of nurses and medical interns who are active within virtual care departments of hospitals in the Netherlands. Respondents must give informed consent to approve the terms and conditions with which data is used for the research. The informed consent letter can be found in *Appendix A*. This research aims for a sample size of 30 participants to confirm potential normality of the data [49].

3.4 | Data collection

3.4.1 | Task list

To make the examination of workload with the questionnaire possible, a list of tasks conducted by VCC nurses is compiled. A previously performed research with a forthcoming article describes the activities of VCC nurses which is used as the foundation of the task list [50]. The profession of VCC nurses is decomposed into subtasks. This decomposition is part of the Hierarchical Task Analysis (HTA) [51]. The focus of HTA within this research is to realise a list of tasks on one hierarchical level. This prevents the occurrence of overlap in activities and thus in the workload calculation. The length of the task list is considered carefully as it affects the length of the questionnaire. This may impact the interest of respondents and response fatigue during the questionnaire [52]. The task list consists of general descriptions of the job content to enable a multicentre examination of workload. In case tasks are often approached in an ad-hoc or planned manner, this distinction is implemented in the task description. This is done to understand if different approaches result in different levels of workload. The task list is verified by VCC nurses using a Delphi-inspired method until consensus was achieved. When consensus is not yet met, reasons for decisions are clarified and alternative solutions are discussed when arguments are considered insufficient. Consensus is confirmed by verifying the satisfaction of involved VCC nurses on the decisions. Additionally, the developed task list is compared with the Canadian Medical Education Directions for Specialists (CanMEDS) rolls which represent the different expected roles of nurses [53]. CanMEDS roles include 1) leader, 2) quality

promotor, 3) communicator, 4) collaboration partner, 5) reflective EBD professional and, 6) healthcare promotor as the roles which nurses are responsible for [53]. The comparison with literature helps to discover similarities and possible absences which can be used to adjust the task list.

3.4.2 | Workload instrument

This research uses a direct subjective workload instrument with a human factors approach. The questionnaire is based on the NASA-TLX instrument in combination with the AHP to determine the relative weights of the workload variables. A Dutch online questionnaire is distributed to the target group by email where Qualtrics^{XM} (2024) is used for the questionnaire design. To encourage VCC nurses and medical interns to participate, the value of participation is clarified by explaining the relevance and goals of the research. An introduction explains the content of the questionnaire including the duration and expectations. The questionnaire can be found in *Appendix B*. The questionnaire consists of the following sections: 1) demographical data collection, 2) pairwise comparisons of workload variables, and 3) assessment of tasks on experienced workload where participants first indicate which tasks they perform. As the questionnaire length affects response fatigue, which may harm the response rate and quality of answers given, the length is considered carefully with the following prevention actions [54]. Multiple sections are used to create interim targets and to keep respondents interested. This contributes to the prevention of loss of interest and drop-outs to encourage the response rate [52]. Additionally, the task assessment is formatted using a multiple-rating matrix. The six variables used to evaluate a task are merged to make the questionnaire appear shorter.

The six workload variables measure the total workload experienced. Within the NASA-TLX five of six variables are described with a positive relation with workload. Thus, an increase in the variables results in increased workload. The variable *performance,* however, has a negative relation where the increase in performance results in decreased workload. To ensure that this variable is interpreted as intended, the definition is converted from *the extent of success with which you achieved goals or tasks and the satisfaction of the extent of these deficiencies*, into *the extent of deficiencies with which you achieved goals or tasks and the dissatisfaction of the extent of these deficiencies.*

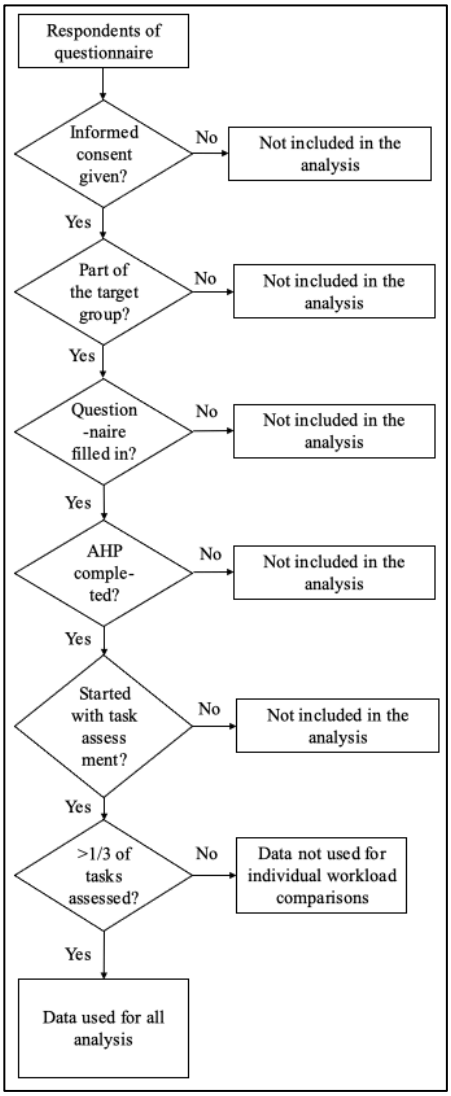
The demographical data gathered to get insight into the composition of the sample are 1) age, 2) gender, 3) job function, 4) education level, 5) affiliated hospital, 6) years active as a care provider, 7) years active as a virtual care provider and 8) hours working per week. It enables potential comparison of data based on participant characteristics. Thereafter, pairwise comparisons are performed using the AHP. Workload variables are assessed on relative importance using a cardinal scale of 1-9 where 1 indicates equal impact and 9 indicates extreme impact in comparison with the other variable contributing to workload. For example, in case *mental demand* and *physical demand* are compared where *mental demand* is indicated with a value of 7, *physical demand* receives the opposite value of 1/7. When the variables are indicated as equally important, both variables get a value of 1. Respondents must complete all comparisons to make weight assignments possible. Respondents are not informed on their level of consistency nor are they corrected in case of inconsistency. Next, tasks are assessed on workload. Respondents indicate which tasks they perform to determine which tasks should be assessed. Tasks are assessed using six variables with a scale of 0-100. The use of a Likert scale was considered, but the absence of equidistance between the numbers makes it difficult to convert data to a score between 0-100 [55]. In addition, the use of a 0-100 scale gives respondents more response options which can result in more precise data. Two reflective questions are asked at the end of the questionnaire. Respondents can indicate if there are tasks

that belong to their profession, but which were not available in the questionnaire for assessment. Finally, participants can indicate general comments on the questionnaire. These data are analysed as a secondary outcome.

3.5 | Analysis

Data obtained with the questionnaire is gathered and exported using Qualtrics^{XM} (2024). It is exported for analysis using Microsoft Excel (version 16.85) and SPSS (Version 29.0.2.0)[2]. First, a dataset clean-up is performed as according to the steps of *Figure 5*. Respondents who did not give informed consent are removed from the dataset. Next, respondents are verified on being part of the target group to be included or excluded. If respondents give informed consent but do not fill in the remaining survey they are excluded. This also accounts for respondents who do not complete the pairwise comparisons of the AHP, or respondents who do complete the pairwise comparisons but do not perform any task assessments. The remaining respondents that perform the task assessment are included in the research. However, if the task assessment is performed on less than 33,3%, of the tasks, respondents are not included in the comparison of workload in individuals as biases may occur. Outliers are maintained in the dataset as a small sample size is expected.

Figure 5: Respondent selection flowchart



[2] SPSS (Version 29.0.2.0) (IBM Corp. Released 2023. IBM SPSS Statistics for MacOs, Version 29.0.2.0 Armonk, NY: IBM Corp).

Data obtained from the pairwise comparisons are analysed using Excel for the calculation of the normalized workload variable weights. These data are processed using a matrix as displayed in *Figure 6.* Besides the workload weights, the CR of respondents is calculated to determine the consistency. Excel is also used for the calculation of workload in respondents and workload experienced in specific tasks.

After the data clean-up and calculations, the data can be analysed. First, the task list of VCC nurses is examined, reviewing the modifications of the first version with the final version of the task list. Secondly, demographical data are analysed with descriptive analysis, using the frequency and percentage, mean score, standard deviation and minimum and maximum values. Explorative analyses are performed on the data of workload and tasks. The workload of respondents is calculated by the sum of tasks in which weights are multiplied with scores. The analysis of the data is structured using multiple steps, which is supported by *Figures 7* and *8*. *Figure 7* visualises the data that is needed to calculate workload per task and per respondent, while *Figure 8* displays the data needed to perform the regarding analyses.

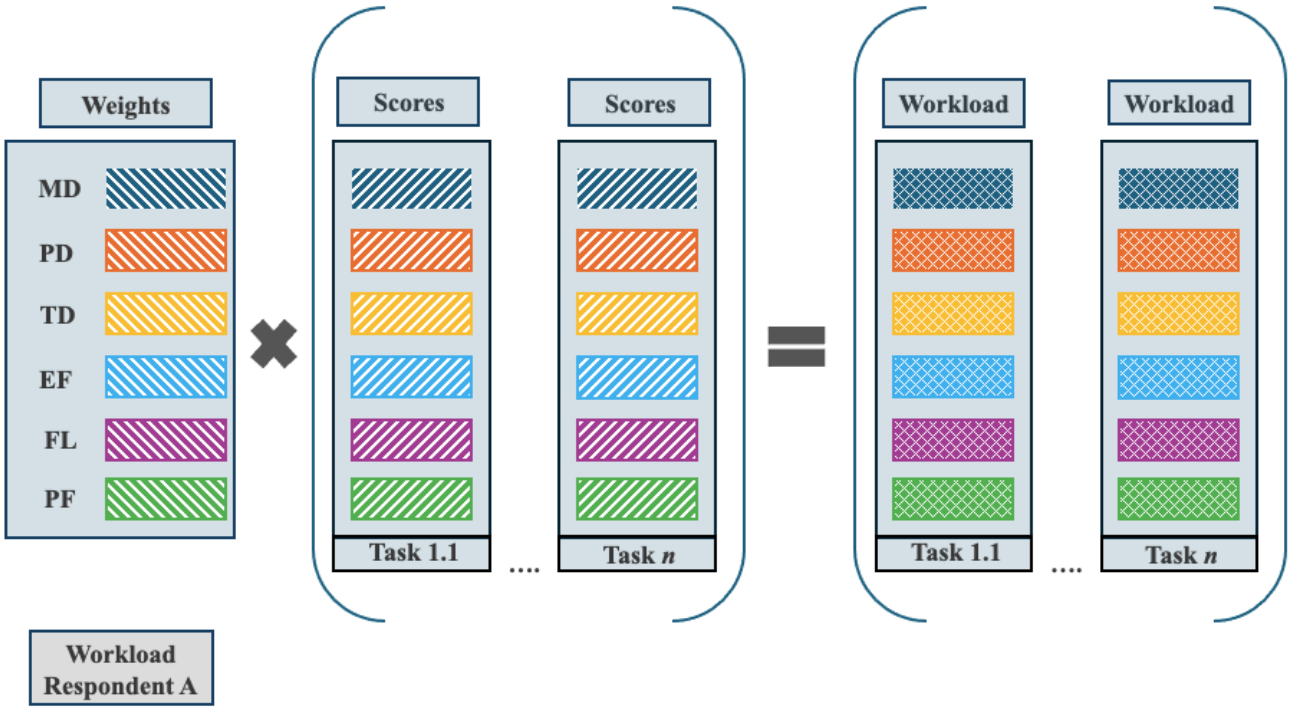
Respondent X							
Normalized workload factors	Mental demand	Physical demand	Temporal demand	Effort	Frustration	Performance	Priorities
Mental demand	1	9	7	5	3	3	
Physical demand	1/9	1	1/7	1/7	1/7	1/7	
Temporal demand	1/7	7	1	1/5	1/3	1/3	
Effort	1/5	7	5	1	1/3	1	
Frustration	1/3	7	3	3	1	1	
Performance	1/3	7	3	1	1	1	
Sum	2,121	38,000	19,143	10,343	5,810	6,476	
Workload factors	Mental demand	Physical demand	Temporal demand	Effort	Frustration	Performance	Normalized priortities
Mental demand	0,472	0,237	0,366	0,483	0,516	0,463	0,423
Physical demand	0,052	0,026	0,007	0,014	0,025	0,022	0,024
Temporal demand	0,067	0,184	0,052	0,019	0,057	0,051	0,072
Effort	0,094	0,184	0,261	0,097	0,057	0,154	0,141
Frustration	0,157	0,184	0,157	0,290	0,172	0,154	0,186
Performance	0,157	0,184	0,157	0,097	0,172	0,154	0,154
	n dimensions	random index	Matrix multiplication		Principal eigen value	Consistency index	Consistency ratio
	6	1,24	2,872	6,791	6,587	0,117	0,095
			0,150	6,153			
			0,445	6,179			
			0,972	6,879			
			1,291	6,951			
			1,009	6,569			

Figure 6: Example of AHP matrix for the calculation of workload variable weights.

1. Consistency ratio analysis: To understand the consistency in the workload weights which are provided using the pairwise comparisons, the Consistency Ratio is used. The regarding formula of the calculation can be found in chapter *3.2 NASA-TLX*. The CR helps to understand how adequate answers were given for the workload weights. The consistency is verified using a CR<0.1. In case this cut-off point is exceeded, weights of respondents remain included. However, the weights given by all respondents are compared with the consistently given weights to understand the effect of inconsistency.
2. Weight analysis: The weights of the workload variables are obtained with the pairwise comparisons. Every respondent determines the weights of the workload variables which indicates their relative importance. It is of interest to understand which workload variables are weighed highest and lowest. This gives insight into the sources with which workload is experienced.

3. Score analysis: Workload scores indicate to what extent a workload variable is present during the fulfilment of a task. This step analyses the scores without engagement of weights. This is relevant as it helps to understand the relative presence of variables in a certain task. High scores contribute more to the increase of workload than low scores. Within scores, mean values are used as the number of tasks performed in respondents may vary. Dividing the scores by the number of tasks enables the comparison of scores in respondents.
4. Workload analysis per variable: Once the weights and scores are determined the workload can be calculated. Within this step, the weights and scores are combined to analyse the workload for every variable individually. For this analysis, mean values of workload in variables are used to enable the comparison of data.
5. Task analysis: Tasks are analysed based on the six workload variables. To compare the contribution of workload in different tasks, the workload of those tasks are compared. This clarifies which tasks have a relatively high or low contribution to the workload experienced in VCC nurses.
    a. Ad-hoc and planned approaches: In addition, tasks that are distinguished by an ad-hoc or planned approach are compared. This is done to examine if different approaches result in different levels of workload.
6. Individual workload comparison: Furthermore, workload levels of individuals are analysed. This helps to understand to what extent workload is experienced differently in individuals. This calculation uses mean workload values meaning that the workload is divided by the number of tasks performed by a respondent. To prevent biased results, data of respondents are included when more than 33.3% of tasks was assessed. For the interpretation of these results, the range of 0-100 as given by the scores is categorized as according to a previous study that used the NASA-TLX [56].
7. Secondary outcomes: Finally, secondary outcomes are viewed which includes the given comments on the tasks being assessed and comments to the questionnaire in general.

Figure 7: Calculation of workload in tasks and respondents



MD: Mental demand, PD: Physical demand, TD: Temporal demand, EF: Effort, FL: Frustration, PF: Performance

Figure 8: Overview of data used within the analysis

Resp: Respondent, MD: Mental demand, PD: Physical demand, TD: Temporal demand, EF: Effort, FL: Frustration, PF: Performance

Data of step 2-5 are visualised using box-and-whisker plots, showing the Q1, median, Q3 and mean values. In addition, these data are tested on significance. In step 2, 3 and 4, this contributes to understanding the extent of deviation in workload variables. In step 5 the extent of workload deviations in tasks are analysed. First, normality of the data is tested using the normal Q-Q plots and the Shapiro-Wilk test which is suitable to determine normality in sample sizes smaller than 50 [57]. Based on the normality of the data, either a paired T-test is performed on normally distributed data, or the Wilcoxon-Mann-Whitney test is performed on non-normally distributed data. Within these tests a 2-tailed p-value of ≤ 0.05 is considered a statistically significant result [58].

3.6 | Ethical considerations

This non-Medical Research Involving Human Subjects Act (non-WMO) research was approved by the ethical commission of the Behavioural, Management and Social Sciences (BMS) faculty of the University of Twente (reference number: 240643, 17-04-2024). Approval was also given by the Medical Ethics Committee of Isala hospital (reference number: 20240419, 02-05-2024). Respondents are asked to give informed consent to continue with the questionnaire. The questionnaire is anonymous and does not result in any mental or physical harm. VCC nurses and medical interns have the right to step out of this research at any moment. In addition, informed consent was given by the respondents whose data are used for the analysis of this study.

Chapter 4 | Results

This chapter first discusses the developed task list. Next, results of descriptive analysis are displayed, followed by explorative analysis performed on the data of workload and tasks. Within explorative analysis, significant results are pointed out.

4.1 | Task list of VCC nurses

The task list that represents the function of VCC nurses is presented in *Table 1.*

Tasks are divided into five categories: 1) Education and training, 2) Development and promotion of new care pathways, 3) Contact with patients, 4) Clinical decision-making, and 5) Administration. Some tasks are distinguished by an *ad-hoc* or *planned* approach. This indicates if a specific task was scheduled to be performed or occurred spontaneously. This discrepancy is applied as the potential consequence on workload is of interest.

In *Appendix C* the first version of the task list is stated. Several adjustments were made to the task list during different rounds of discussion with VCC nurses according to a Delphi-inspired method:

- *Task 1.1 Organising education for new healthcare pathways or for induction of new colleagues.* In this task, the development of pathways is missing, although the development includes different activities than the organisation. The task is adjusted resulting in the following description:
  Organise and develop education and training for new care pathways or for the induction of new colleagues.

- Task 1.2 *Attending education and/or training* did not specify the goal of the task. This is applied to clarify the content giving the following result: *Attending education and/or training to maintain and expand knowledge.*

- *Task 2.2 Testing and evaluation of protocols (of work process and technology used)*. It was mentioned that the focus on quality was missing within tasks. To emphasize the continuous process of improvement, *optimisation* and *quality assurance* was added, giving the following result:
  Testing, evaluation, optimisation, and quality assurance of protocols (work process and technology used).

- *Task 2.3 Communication with external stakeholders to promote digital healthcare*. To include corresponding activities in a broad range, this task description was adjusted as follows:
  Ambassadorship of virtual care (Communication towards external stakeholders to promote digital care)

- Task 3.2 *Remote communication with patients for the verification of data (measurements) with the patient and/or instruction of technology/instrument use.* This description was mentioned not to be clear. To ensure that the task is interpreted as intended, the purpose of the task was added. Besides, a distinction with ad-hoc or planned execution was made giving the following description: *Ad-hoc/ planned remote communication with the patient to enable clinical decision-making (e.g., to verify data*

(e.g., measurement value) with the patient and/or give instructions on technology/instrument use).

- *Tasks 4.1* and *5.1* were described as follows respectively: *Assess information from telemonitoring via data platforms only* and *Record keeping of care performed.* To validate the interpretation, examples of data platforms are added (Luscii, Curavista, SanaNet, HiX et al.). This contributes to the recognition and clarification of the task.

- *Task 4.5 Decision-making based on consultation with a protocol owner* is extended by replacing *protocol owner* with *hospital colleague* and by giving examples. With that, the task description represents communication with all colleagues within a hospital instead of a colleague with a specific function:
  The task is now described as *Decision-making based on consultation with a hospital colleague (e.g. doctor, nursing specialist, and/or protocol owner).*

Besides adjusting existing tasks, tasks were added if missing or removed if they did not belong to the tasks of VCC nurses.

- It was mentioned that the realisation of medication@home was missing.
  Task 4.6 Coordinate and realise specialised home care (medication@home) is therefore added.

- This was also the case for Human Resource tasks, which is mentioned to be part of their tasks. *Task 5.2 Perform Human Resource Management (HRM) duties (e.g., rosters, HR administration)* is therefore added.

- *Encouraging and challenging colleagues to establish new digital care pathways* is removed from the task list as this was mentioned not to belong to the tasks of VCC nurses but to the project managers of the virtual care centre.

- *Applying generalist knowledge of multiple types of care pathways* was removed from the task list. This matter is considered not to be a task but belongs to multiple tasks as a competence.

Note that during the Delphi rounds, it was suggested to include a task designated to communication. However, this would create overlap with other tasks that also imply the need for communication. Therefore, retaining one HTA level would not be possible as the final workload measurement would experience overlap. It was concluded to omit this task and incorporate it into other tasks.

Table 1: Task list of tasks performed by virtual care centre nurses.

Task category	Task description
1. Education and training	1. Organise and develop education and training for new care pathways or for induction of new colleagues. 2. Attending education and/or training to maintain and expand knowledge.
2. Development and promotion of new care pathways	1. Develop protocols (work process and used technology) of new digital care pathways. 2. Testing, evaluation, optimisation, and quality assurance of protocols (work process and technology used). 3. Active participation in quality assurance systems to improve the quality of care (e.g., VIM committee, quality monitoring and/or improvement of protocols and/or digital platforms). 4. Ambassadorship of virtual care (Communication towards external stakeholders to promote digital care).
3. Contact with patients	1a. Planned remote patient counselling and coaching (e.g., for self-management, increased adherence, and/or psychological support.) 1b. Ad-hoc remote patient counselling and coaching (e.g., for self-management, increased adherence, and/or psychological support.) 2a. Planned remote communication with the patient to enable clinical decision-making (e.g., to verify data (e.g., measurement value) with the patient and/or give instructions on technology/instrument use). 2b. Ad-hoc remote communication with the patient to enable clinical decision-making (e.g., for verification of data (e.g., measurement value) with the patient and/or give instructions on technology/instrument use). 3. Performing nursing procedures (e.g., IV puncturing).

4. Clinical decision making	1. Assess information from telemonitoring only via data platforms (e.g., Luscii, Curavista, SanaNet, HiX). 2. Assess information only via patient contact (e.g., phone call). 3. Assessing information from data platforms as well as patient contact. 4. Decision-making based on protocols. 5. Decision-making based on consultation with a hospital colleague (e.g., doctor, nursing specialist, and/or protocol owner). 6. Coordinate and realise specialised home care (medication@home). 7a. Planned handling of notifications from the monitoring platform used. 7b. Ad-hoc handling of notifications from the monitoring platform used.
5. Administration	1. Record keeping of care performed (e.g., in Luscii, Curavista, SanaNet, HiX et al.) 2. Perform Human Resource Management (HRM) duties (e.g., rosters, HR administration)

4.2 | Respondent characteristics

In total, 33 respondents participated in the questionnaire of which 14(42.0%) are excluded of the analyses. 1(3.0%) respondent did not give informed consent. 2(6.1%) respondents did not belong to the target group. 3(9.1%) respondents started with the questionnaire but did not answer the questions. Additionally, 5(15.2%) did not perform the AHP pairwise comparisons and 3(9.1%) did not start with the task assessments. From the 19 respondents, 2(6.1%) completed less than 33.3% of the tasks while the remaining 17(51.5%) respondents completed more than 33.3%. Eventually, data from 19(57.6%) respondents is included in the analysis and 17(51.5%) respondents are included in the analysis with exception of the individual workload comparisons. The demographical data are summarised in *Appendix D.*

Eighteen (94.7%) respondents are female and 1(5.3%) is male. The mean age is 39.2 years with the youngest respondent being 23 years and oldest 56 years. 17(89.5%) Cases are a nurse, and 1(5.3%) case is a medical intern and 1 case (5.3%) indicated to have a function as ‘e-nurse’ and is therefore included within the group of nurses. The majority (n=9, 47.4%) followed higher vocational education as highest education level, followed by advanced higher vocational education (n=4, 21.1%).

4.3 | Explorative workload analysis

4.3.1 | Consistency Ratio (CR)

The CR within the AHP for the weight assignments is below the limit of 0.1 for n=7(36.8%). For n=10(52.6%) this limit is exceeded. Respondents 1,4,5, 8,10, 15, and 17 have a CR<0.1. The lowest and highest CR have a value of 0.000 and 0.636 respectively. Additionally, the median has a value of 0.164(IQR=0.146).

4.3.2 | Weight analysis

Table 2 shows that *mental demand* has the highest median weight with 0.227. *Physical demand* has the lowest weight with 0.067. *Figure 9* shows the variation in weights given by respondents to the different workload variables. The variation is largest for *mental demand* with an IQR of 0.161 and is smallest for *effort* with an IQR of 0.064. In *physical demand, temporal demand* and *frustration* a right-skewed distribution is observed.

The weights of the workload variables are not all normally distributed. Weights are therefore tested on significance using the Wilcoxon-Mann-Whitney test. Outcomes of tests on normality and the Wilcoxon-Mann-Whitney test can be found in *E and F* respectively. The weight of *mental demand* is significantly higher in comparison with *physical demand* (Z = -2.769, p = 0.006) and *effort* (Z = -2.591, p = 0.010). The *physical demand* weight is significantly lower compared with all other variables. *mental demand* (Z = -2.769, p = 0.006), *temporal demand* (Z = -2.765, p = 0.006), *effort* (Z = -2.374, p = 0.010), *frustration* (Z = -3.385, p = <0.001) and *performance* (Z=-1.982, p=0.048). Furthermore, *effort* is also significantly lower than *frustration* (Z=-2.864, p =0.004), and *frustration* is significantly higher than *performance* (Z=-2.817, p =0.005).

Table 2: Mean value of workload variable weights

Dimension N=19	**Median (IQR)**
Mental Demand (MD)	0.227 (0.161)
Physical Demand (PD)	0.067 (0.100)
Temporal Demand (TD)	0.161 (0.115)
Effort (EF)	0.125 (0.064)
Frustration level (FL)	0.193 (0.084)
Performance (PF)	0.158 (0.104)

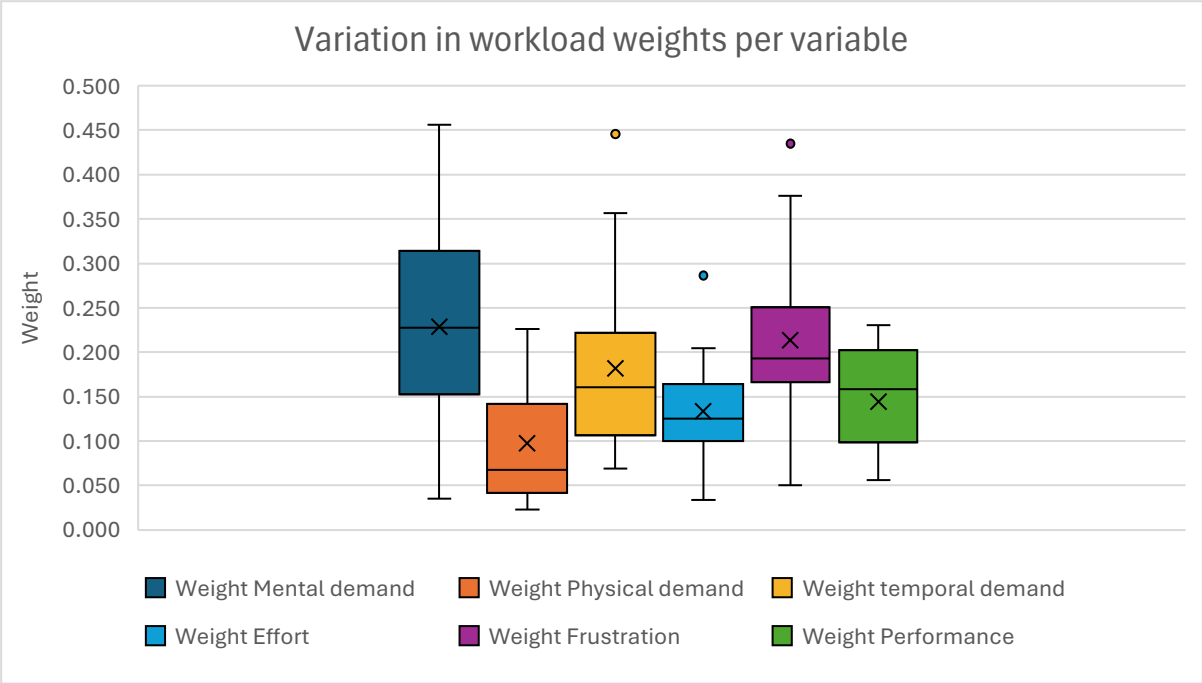


Figure 9: Variation in workload weights per workload variable

Table 3 and *Figure 10* are based on the data of the respondents with a CR<0.1. Comparing *Figure 9* with *Figure 10* reveals that the median of *effort* and *frustration* show the largest difference. Besides, wider spreads can be noticed in the upper and lower quartiles of *mental demand* and *physical demand* of *Figure 9*. The variation in temporal demand is largest within *Figure 10* with an IQR of 0.238, although the median remains almost unchanged with a 0.161 in *Figure 9* and 0.167 in *Figure 10*. The variation in *frustration* becomes denser when observing the consistent respondents only. Besides, the outliers in *effort* and *frustration* have disappeared. In both Figure 9 and 10 a right-skewed distribution is shown for *physical demand, temporal demand* and *frustration*.

The data shows a non-normal distribution according to the Shapiro-Wilk test (*p=0,021*). However, the Wilcoxon-Mann-Whitney test cannot be performed to determine the significance of results as it needs more than 16 cases to perform [59]. For that reason, no significance test was performed on the weights of respondents with a CR<0.1.

Table 3: Mean value of workload variable weights in respondents with CR<0,1

Dimension **N=7**	**Median (IQR)**
Mental Demand (MD)	0.244 (0.183)
Physical Demand (PD)	0.060 (0.114)
Temporal Demand (TD)	0.167 (0.238)
Effort (EF)	0.137 (0.066)
Frustration level (FL)	0.167 (0.031)
Performance (PF)	0.161 (0.122)

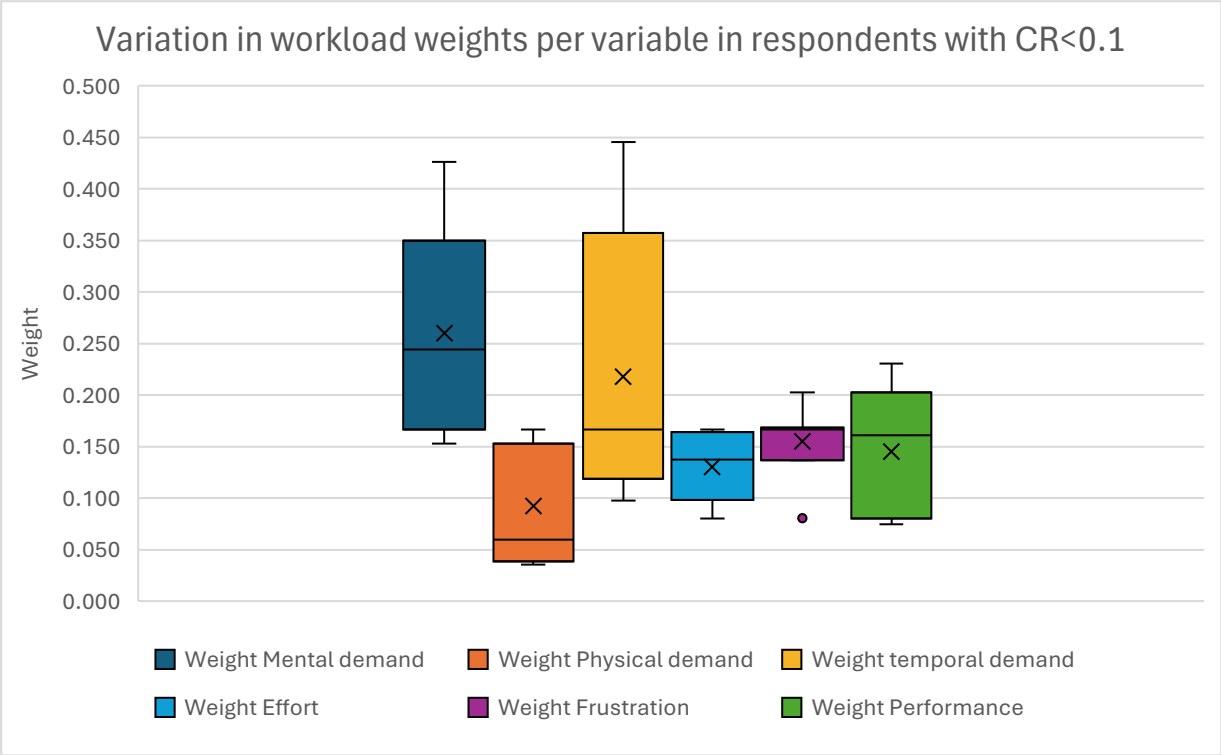


Figure 10: Variation in workload weights per workload variable

4.3.3 | Score analysis

Table 4 presents the scores given by the respondents in tasks. The scores given in individual tasks are summed up per workload variable and summarized using mean scores. The median value of *effort* has the highest score with 31.5. Physical demand represents the mean lowest score with 6.0 as shown in *Figure 11*. The variance of scores is highest and lowest in mental demand (IQR=48.11) and physical demand (IQR=7.00) respectively. All variables have a right-skewed distribution with an exception for *effort*.

The workload scores are not all normally distributed. Weights are therefore tested on significance using the Wilcoxon-Mann-Whitney test. According to the Wilcoxon-Mann-Whitney test, the mean physical demand scores are significantly lower compared with the other workload variables (*MD: Z=-3.724, p= <0.001), (TD: Z=-3.783, p=<0.001), (EF: Z=-3.823, p=<0.001), (FL: Z=-3.549, p=<0.001), (PF: Z=-3.621, p=<0.001).* The mean mental demand scores are significantly higher compared with the other workload variables *(PD: Z=-3.724, p= <0.001), (TD: Z=-2.817, p=0.005), (EF: Z=-2.093, p=0.036), (FL: Z=-3.462, p=<0.001), (PF: Z=-3.381, p=<0.001)*

Table 4: Median of mean workload variable scores

Dimension N=19	Median (IQR)
Mental Demand (MD)	29.00 (48.11)
Physical Demand (PD)	6.01 (7.00)
Temporal Demand (TD)	19.29 (43.15)
Effort (EF)	31.47 (36.07)
Frustration level (FL)	10.52 (28.50)
Performance (PF)	13.57 (26.96)

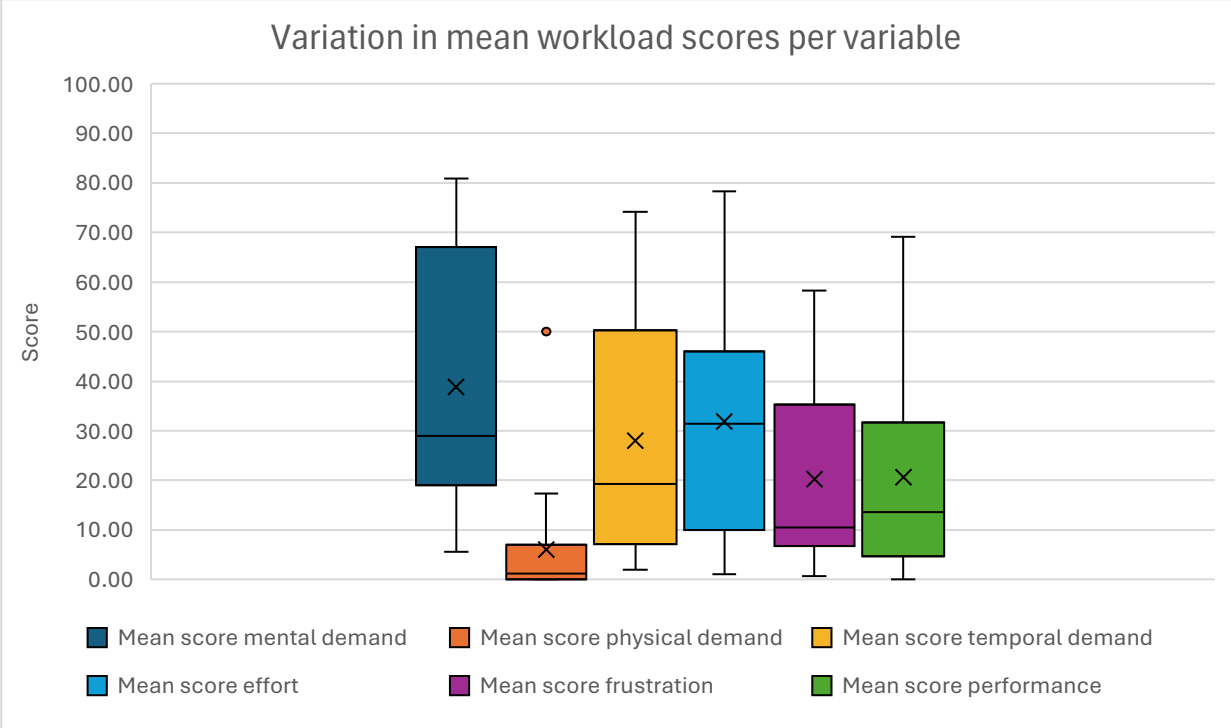


Figure 11: Variation in mean workload scores per workload variable

4.3.4 | Workload analysis per variable

Table 5 summarises with which extent workload is caused by the different workload variables. Here, the combination of weights and scores are applied displaying the six mean *variable workload* values of respondents. The mean *variable workload* of *Mental demand* has the highest median with a value of 6.51. The mean *variable workload* of *Physical demand* has the lowest median with a value of 0.13 as displayed in *Figure 12*. All variables have a right-skewed distribution.

The variation of the mean *variable workload* is highest in mental demand (IQR= 10.37) and lowest in physical demand (IQR= 0.81). The variation of the six *variable workload* values are tested on significant differences using the Wilcoxon-Mann-Whitney test as the data are not all normally distributed. The mean *variable workload* caused by *physical demand* is significantly lower than all other *variable workload* values (*MD: Z=-3.724, p=<0.001), (TD: Z=-3.702, p=<0.001), (EF: Z=-3.823, p=<0.001), (FL: Z=-3.680, p=<0.001), (PF: Z=-3.479, p=<0.001).* The mean workload caused by *mental demand* is significantly higher than *physical demand (Z=-3.724, p=<0,001*), *effort (Z=-2.736, p=0.006), frustration (Z=-2.373, p=0.018)* and *performance (Z=-2.656, p=0.008).* Additionally, frustration is significantly higher than *performance (Z=-2.133, p=0.033).*

Table 5: Median of mean workload per variable

Dimension N=19	Median (IQR)
Mental Demand (MD)	6.51 (10.37)
Physical Demand (PD)	0.13 (0.81)
Temporal Demand (TD)	2.58 (7.98)
Effort (EF)	3.25 (5.48)
Frustration level (FL)	2.63 (6.87)
Performance (PF)	1.89 (3.34)

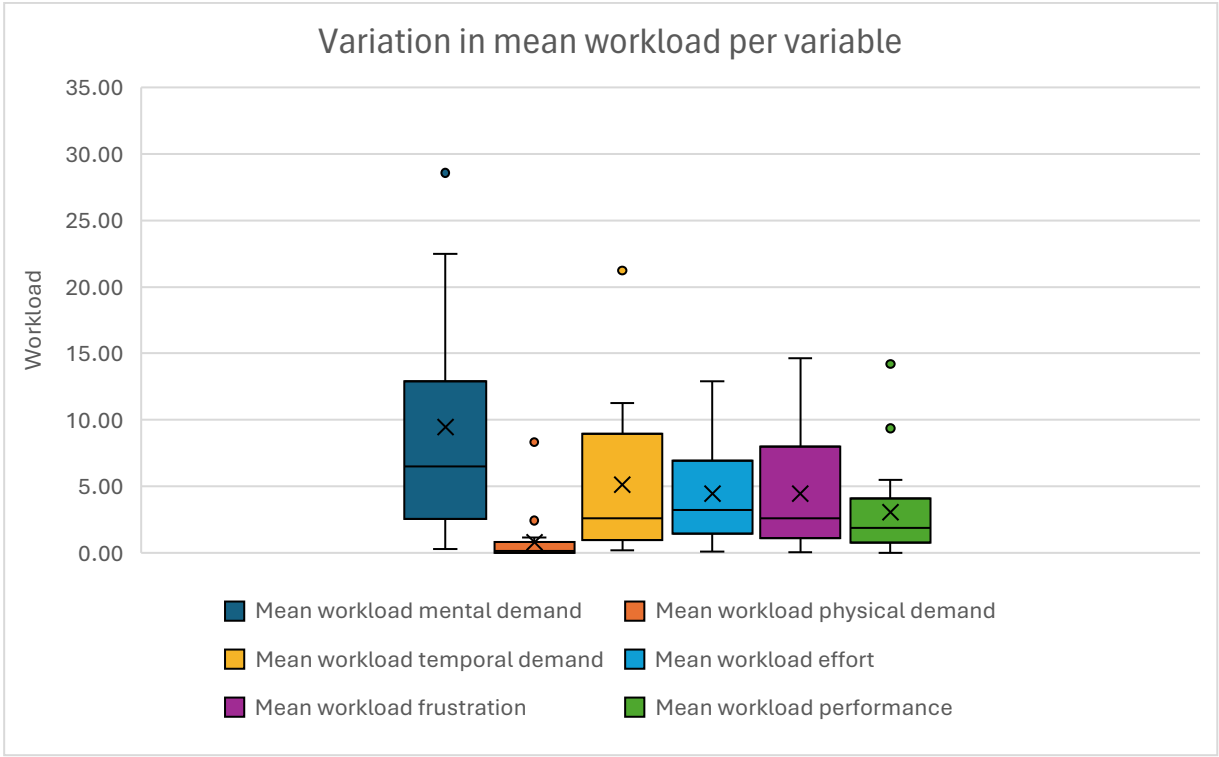


Figure 12: Variation in mean total workload per workload variable

4.3.5 | Task analysis

Table 6 summarises how often tasks are indicated as performed by the respondents. *Task 3.3 Performing nursing procedures (e.g., IV puncturing) and Task 5.2 Perform Human Resource Management (HRM) duties (e.g., rosters, HR administration)* are most often not implemented (n=8 (42.1%)). *Tasks 4.1, 4.4,* and *5.1* are performed by all respondents.

Table 7 also mentions the median of the mean *task workload*. This *task workload* is different from the previously mentioned *variable workload* in §4.3.4. The *task workload* represents the workload from a specific task which consists of the six workload variables. *Figure 13* displays the *task workload* of the 21 tasks. *Task 2.1 develop protocols (work process and used technology) of new digital care pathways* has the highest median with a value of 49.77 (IQR=19.84). Meanwhile, *task 4.4 decision-making based on protocols* has the lowest median with a value of 6.80 (IQR=27.93). The significance of the results is tested using the Wilcoxon-Mann-Whitney test as not all data is normally distributed. *Task 2.1* has a significantly higher *task workload* than all other tasks. Task 4.4 has a significantly lower *task workload* compared with task 1.1(*p=0.015*), 2.1*(p=0.001*), 2.2(*p=0.030*), and 2.4(*p=0.007)*.

Table 6: Overview of the quantity and median of tasks carried out by respondents

Task performed by respondents N= 19	**Yes (%)**	**Median (IQR)**
Education and training		
1.1 Organising and development	18 (94.7)	30.06 (43.18)
1.2 Attending	18 (94.7)	21.96 (39.76)
Development and promotion of new care pathways		
2.1 Develop protocols	17 (89.5)	49.77 (19.84)
2.2 Evaluating protocols	18 (94.7)	34.39 (37.19)
2.3 Quality assurance systems	16 (84.2)	21.15 (36.74)
2.4 Ambassadorship	12 (63.2)	18.52 (36.52)
Contact with patients		
3.1a Planned patient counselling	17 (89.5)	21.05 (33.32)
3.1b Ad-hoc patient counselling	18 (94.7)	11.68 (36.68)
3.2a Planned verification with patient	18 (94.7)	8.81 (34.54)
3.2b Ad-hoc verification with patient	18 (94.7)	16.14 (37.50)
3.3 Nursing procedures	8 (42.1)	17.91 (41.97)
Clinical decision making		
4.1 Assessment with data platforms	19 (100.0)	12.66 (37.99)
4.2 Assessment with patient contact	16 (84.2)	8.11 (21.98)
4.3 Assessment with data platforms and patient contact	18 (94.7)	11.01 (19.04)
4.4 Decision making with protocols	19 (100.0)	6.80 (27.93)
4.5 Decision making with hospital colleague	18 (94.7)	17.90 (30.99)
4.6 Medication at home	10 (52.6)	12.27 (31.39)
4.7a Planned notification handling	18 (94.7)	8.73 (38.16)
4.7b Ad-hoc notification handling	17 (89.5)	10.35 (31.94)
Administration		
5.1 Record keeping	19 (100.0)	8.92 (18.97)
5.2 Human resource management	8 (42.1)	10.21 (22.23)

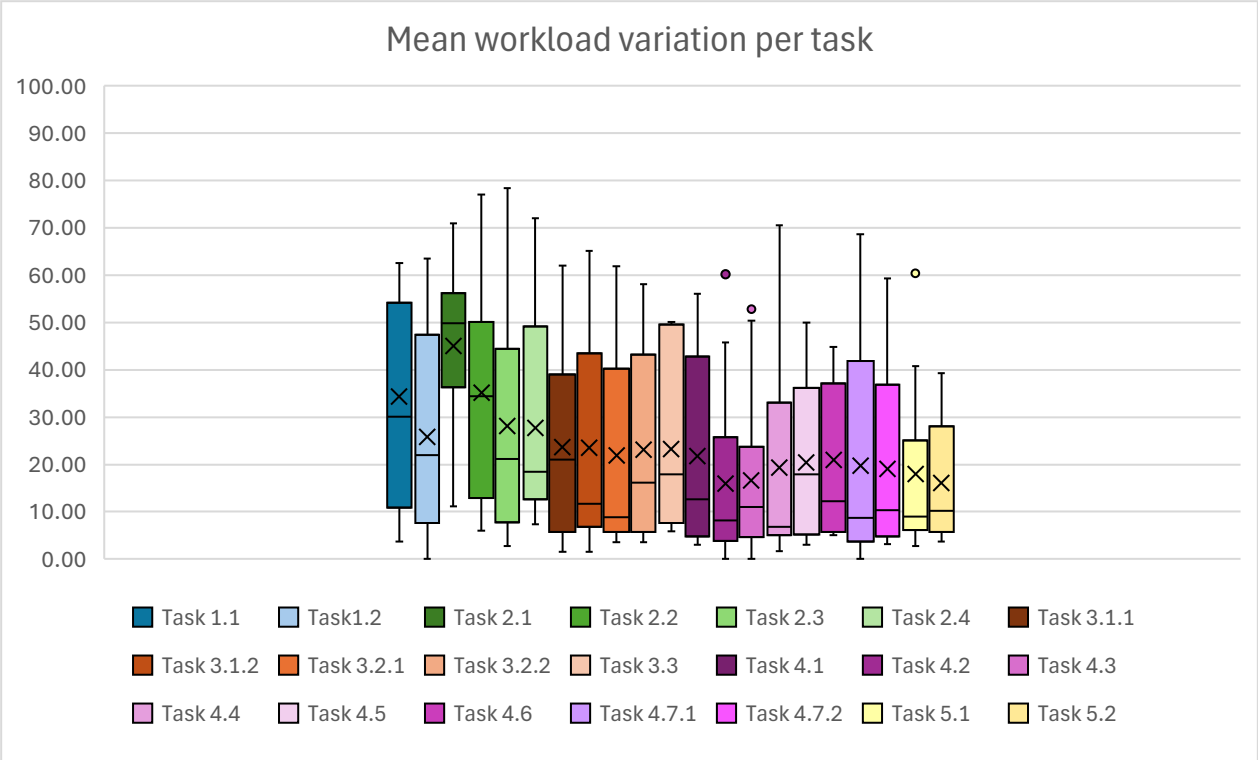


Figure 13: Variation in mean total workload per task

Ad-hoc vs planned tasks

Table 7 summarises the median values of tasks that are distinguished by an ad-hoc or planned approach. In *tasks 3.2* and *4.7,* the ad-hoc approach has a higher mean value in comparison with the planned approach. For *task 3.1* the opposite is the case, where the planned approach results in a higher median workload compared with the ad-hoc approach. No significant results are found within the comparison of the ad-hoc and planned tasks as stated in *Appendix E, Table E4*.

Table 7: Mean values of tasks distinguished by ad-hoc and planned approach

Task	Median (IQR)
3.1a (planned)	21.05 (33.32)
3.1b (ad-hoc)	11.68 (36.68)
3.2a (planned)	8.81 (34.54)
3.2b (ad-hoc)	16.14 (37.50)
4.7a (planned)	8.73 (38.16)
4.7b (ad-hoc)	10.35 (31.94)

4.3.6 | Individual workload comparison

Figure 14 shows the mean *individual workload* of the respondents. Respondent 4 has the lowest mean *individual workload* with a score of 6.35, which is highest in respondent 10 with a mean *individual workload* of 52.75. Regarding the categories as shown in *Table 8,* 5(29.41%) respondents have a very low workload, 8(47.06%) have a low workload, 2(11.8%) have a medium workload, and 2(11.8%) have a high workload. No respondents are categorized into having a very high workload. Respondents 1 and 14 are excluded from the mean weighted workload comparison due to the lack of assessed tasks.

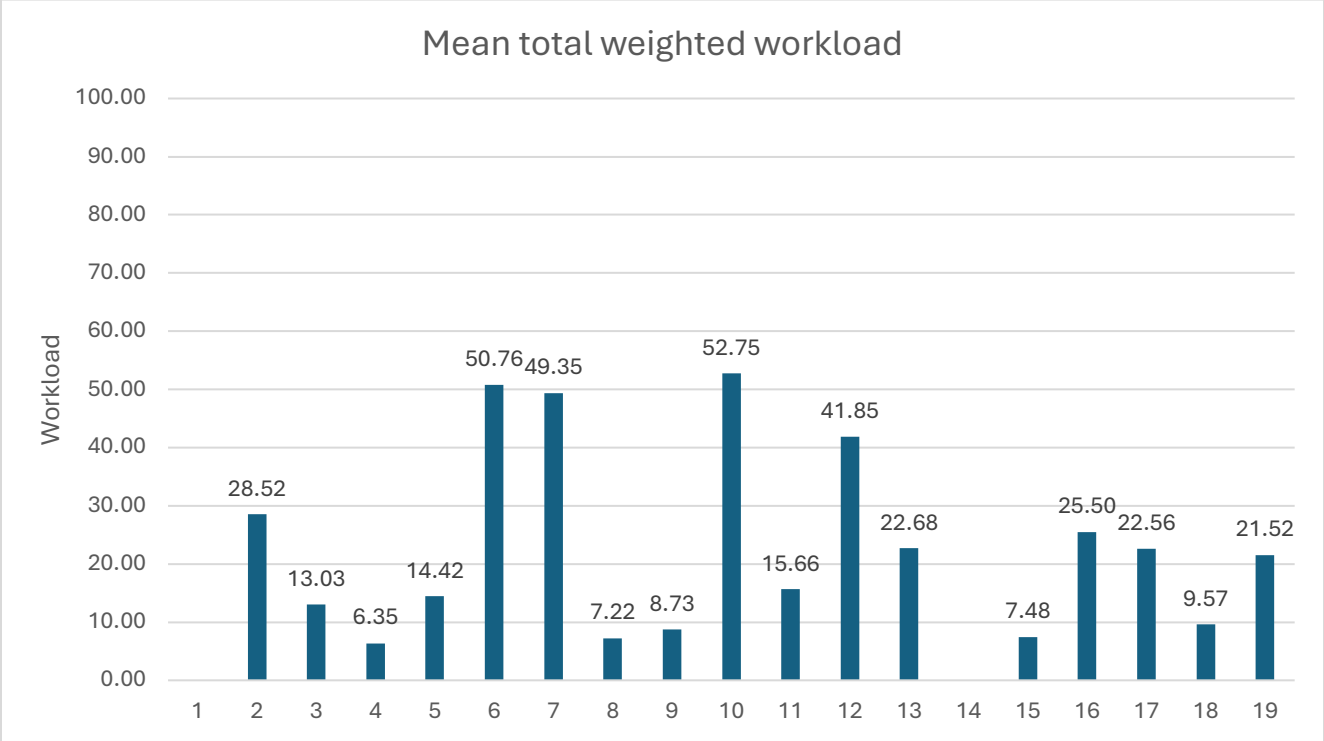


Figure 14: *Mean total workload of respondents N=17*

Table 8: Categorization of the mean workload in individuals [56]

Workload category	**Mean workload**
Very low workload	0-9
Low workload	10-29
Medium workload	30-49
High workload	50-79
Very high workload	80-100

4.3.7 | Secondary outcomes

At the end of the questionnaire, respondents indicate if there are tasks missing within the assessment that do belong to their function. 14(73.68%) respondents mentioned not to perform additional tasks next to the one's assessed. 3(15.79%) respondents mentioned an additional task, namely *participation in project meetings for the development of new care pathways* and *coordination of the virtual care team during the day,* and *process optimalisation*. All comments were given once. From 2(10.53%) respondents an answer to the question was missing.

Comments were also given on the questionnaire in general. 5(26.32%) respondents had a comment or addition to the questionnaire. Comments given on the questionnaire were '*difficult to rate activities on this scale'*, '*Weighting questions were difficult'*, and '*pretty long-winded.'* Two general comments given on the function of VCC nurses are *'a startup takes a lot of energy and thinking and is a lot at once'* and '*If others have high expectations of the work being done, sometimes workload can be experienced from this*.'12(63.16%) respondents did not have any comment, and from 2(10.53%) respondents an answer on the question was missing.

Chapter 5 | Conclusion and discussion

5.1 | Principal findings

This research explored the subjective workload experiences of VCC nurses using a direct nurse-based approach with the combined NASA-TLX and AHP. Based on tasks that decompose the function of VCC nurses, workload is assessed. The 21 tasks identified represent five categories: 1) education and training, 2) development and promotion of new care pathways, 3) patient contact, 4) clinical decision-making, and 5) administration.

These tasks are assessed to determine the experienced workload of VCC nurses using the six workload variables. The workload consists of the weights and scores, where the pairwise comparisons of weights are assessed on consistency. Most respondents exceeded the cut-off point of CR<0.1 indicating that most weights are given inconsistently. The effect of weights given by all respondents are compared with respondents who had consistent weights. More variation is found in the inconsistently given weights where the minimum and maximum values are located further apart but tests on significance were absent due to the sample size.

The weights of workload variables given by respondents have resulted in the weight of *mental demand* being the highest and *physical demand* being the lowest. *Mental demand* is significantly higher than *physical demand* and *effort,* while *physical demand* is significantly lower in all workload variables. When workload scores are observed, *effort* and *physical demand* are the highest and lowest variable respectively. The workload in all variables show that *Mental demand* is significantly higher and *physical demand* is significantly lower for all other workload variables. In *mental demand* weights, the median and mean value are about the same, which is also the case for the score of *effort*. Meanwhile, *physical demand* data are right skewed in both weights and scores. This shows that lower values are indicated more often than higher values.

When workload is observed in the tasks, the workload is highest in task 2.1 *Develop protocols (work process and used technology) of new digital care pathways.* The workload experienced in this task is significantly higher compared with all other tasks. Besides, tasks belonging to the *development and promotion of new care pathways* category show higher median task workload values compared with tasks from the category's *patient contact* and *clinical decision-making.* Only task 2.4 on *ambassadorship* is an exception on this. On the other hand, task 4.4 *Decision making based on protocols* scores lowest on workload. Meanwhile, no significant differences were found in tasks which are distinguished by an ad-hoc and planned approach. However, in two of three compared tasks, planned fulfilment results in less mean workload than in ad-hoc. Comparing the mean workload in individuals, learns that it is widely distributed. Outcomes range from 6.35 to 52.75 where 2 respondents have a high workload. Secondary outcomes of the study show that the instrument is difficult for some respondents to use, and that the questionnaire is lengthy.

5.2 | Meaning of the study

The tasks of VCC nurses result in a profession full of variety where one part focuses on patient care and the other part focuses on policy and development. The task list is an accurate reflection of the function of VCC nurses as only a few suggestions were given on missing tasks in the task assessment. To make sure that the tasks are properly carried out, VCC nurses must manage the competences that are required. Rodrigues et al. [60] describe competences as 'a combination of skills knowledge and attitudes that are needed to perform a task' which shows the importance of competence management. Due to the variety of tasks, it is important to inform VCC nurses about competence management to enable optimal use of combined skills and knowledge.

While weights indicate the importance of the variables, scores give insight into the extent of presence of variables in tasks. The weight and scores of *physical demand* are low while these are high in *mental demand*. This indicates that the tasks generally ask for a high consumption of mental capacity which at the same time has a relatively high contribution to the experienced workload. Meanwhile, Nasirizad Moghadam et al. [61] shows that ICU nurses with direct patient contact on hospital wards show high outcomes in both *mental demand* and *physical demand*. This shows that a great difference is found for *physical demand* outcomes when ICU and VCC nurses are compared. As *mental demand* represents the highest mean weight and highest mean variable workload in this study, this is the most influential variable for the workload experienced in VCC nurses. Therefore, to improve on workload, most is to be gained from *mental demand.*

In terms of tasks, workload is highest in tasks from the category *development and promotion of new care pathways.* VCC nurses were all active in healthcare before providing remote care. This could have helped to gain experience and become familiar with tasks on *patient contact* and *clinical decision-making.* Tasks from the category *development of digital care pathways*, however, do not belong to the tasks of nurses working on wards, which is why presumably no previous experience is gained within this field. This could explain why these tasks result in more workload. Improving workload using tasks can be gained most by improving the competences related to the development and promotion of new care pathways. Besides, it is recommended not to perform tasks with high workloads simultaneously or consecutively as this may result in the accumulation of workload.

This study defined workload as *the perceived effect on a nurse by performing a task comprised of the time, amount, and difficulty of one's work devoted to the care of patients, workplace, and professional development.* Considering this definition, workload can be dealt with based on time, quantity and difficulty. It can therefore be recommended to reduce workload by increasing the used time for a task, reduce the quantity of a task in a specific amount of time, or enhance skills and knowledge using training or education. Additionally, it may also help to examine organizational aspects.

Knowledge on workload in VCC nurses is increased by making relative comparisons. From the VCC nurses, 2 out of 17 are classified as having high workload. Comparing this outcome with the workload of Intensive Care Unit (ICU) nurses and emergency unit nurses, shows that VCC nurses experience less workload. Nur et al.[56] shows that the workload in ICU and emergency unit nurses on average had a value of 80 and 83 respectively. This shows that on average a very high workload is experienced in these nurses. From this it can also be concluded that the workload in VCC nurses is relatively lower. However, as a high workload can result in stress, less thoughtful decisions and mistakes, it is important to focus on VCC nurses with high experienced workload [20].

5.3 | Strengths and limitations in relation to other studies

The developed task list is based on the forthcoming article of Leenen et al. [50]. Tasks are described generally, but specifically represent the tasks of VCC nurses. Houwelingen et al. [62] based their research on Nursing Telehealth Entrustable Professional Activities (NT-EPAs) and represents the tasks involved with telehealth. Comparing the task list of Houwelingen et al. with this study, it stands out that the NT-EPAs do not describe tasks on *training and education* and *development and promotion of new care pathways.* On the other hand, tasks *on independent double-checking of high-risk medication* and *guidance and peer consultation* are not mentioned in this research while found in NT-EPAs. While Houwelingen et al. focussed on a list that represents the competences needed in general for telehealth, this study focussed specifically on telehealth related activities in VCCs. Both this study and that of Houwelingen et al. used a Delphi method for the development of the tasklist. However, Houwelingen et al used a panel that consisted of individuals with multiple professions, while this study only used VCC nurses. Nevertheless, lots of similarities in tasks are found in these two studies.

Based on the outcomes of this study, several recommendations are given to improve the workload of VCC nurses. Whereas Wegman [14] investigated the barriers and facilitators of telemonitoring and the experiences of VCC nurses, this study elaborates on the experiences by determining the corresponding workload. The experiences of VCC nurses are compared with the outcomes on workload and contribute to the explanation of certain outcomes. As mentioned earlier, task 2.1 *Develop protocols (work process and used technology) of new digital care pathways* contributes to a relatively high workload. Wegman shows that the rectification of existing protocols is seen as a barrier. The use of protocols is valued, but new insights into the relatively new care pathways ask for continuous adjustments. Consequently, these adjustments result in frustration. This explanation about the view on protocols may explain the experienced workload in task 2.1. Besides, Wegman gives insight into the experiences of VCC nurses with clinical lessons. Clinical lessons with professionals are indicated as beneficial for gaining knowledge on different care pathways [14]. One of the respondents in the research of Wegman mentions that convincing skills help to optimise efficacy [14]. As the outcome of Wegman correspond with the outcomes of this study, certain outcomes are substantiated.

It is important to mention that this study combined two instruments. Combining the NASA-TLX with the AHP had been suggested by Virtanen et al. [40]. They mention that applying the AHP is recommended as its approach is similar but more extensive than the original NASA-TLX [40]. The used combined approach in this study strengthens the recommendation of Virtanen et al. as the limitations of the original approach are dealt with.

5.4 | Strengths and limitations

This study conducted research on the workload of 19 VCC nurses. The relatively high drop-out of respondents can indicate that the questionnaire was too lengthy. The number of tasks assessed in the questionnaire should therefore be considered carefully as this affects the length of the questionnaire. Yet, the questionnaire gives extensive data on the workload of VCC nurses and helps to identify its sources. The power of this study can be enhanced by increasing the sample size. Especially as workload in this study must be interpreted relatively by comparing the workload of other individuals, an increase of respondents can help with the accuracy of the study. This is, among others, relevant to get a better understanding of tasks that are distinguished by an ad-hoc or planned approach. Ivziku et al. [63] mention that unscheduled activities are a significant predictor for workload, whereas no significant evidence was found on this topic in this study.

The activities of VCC nurses are determined using a single-centred approach. As the organisation of VCCs in different hospitals may deviate, this single-centred approach could be a limitation. No VCC nurses other than the ones of Isala had been spoken to. Nevertheless, during the multi-centred approach of the questionnaire, respondents had the opportunity to indicate if tasks were missing. Most respondents indicated no tasks to be missing. Therefore, it can be assumed that the tasks of VCC nurses are equivalent in different hospitals and are properly represented by the task list. It can be noted that the use of a single-centred approach for the task list determination was suitable for this study. In doing so, the general description of tasks strengthens the study as generalisability in VCCs is enabled.

While workload is determined in tasks, this is done for individual tasks only. In practice, however, certain tasks may be performed simultaneously. A limitation of this study is that the effect of simultaneous practices is not examined. The combined NASA-TLX and AHP is suitable to determine workload in individual tasks but does not provide insight in combined tasks. Nevertheless, this limitation also applies to the original NASA-TLX. Presumably, the workload of two combined tasks is not represented by the sum of the individual workloads. To better understand the workload in combined tasks, additional research is needed.

Comparing the original NASA-TLX with the combined NASA-TLX and AHP instrument, contributes to scientific research on which instrument to use. The combined NASA-TLX with AHP shows multiple advances towards the limitations of the NASA-TLX as also mentioned by Virtanen [40]. Weights are indicated more precisely as a cardinal scale is used, the option to assess variables as equally important is available and all six variables are included in the workload. Variables were scored as equally important multiple times, which shows the necessity of this option, and all variables are included even for the variable that scores lowest. However, while cardinal scales results in more precise outcomes, it does not solve the inconsistency that occurs in the pairwise comparisons. Using the AHP, often coincides with the Consistency Ratio (CR) which can help to create more awareness on inconsistency. As this study did not correct respondents on inconsistency, it has been identified repeatedly. While the possibility of correcting inconsistencies is available, adjustments may damage the validity or relevance of workload variables. A trade-off between the consistency of responses and the interest in respondents' perspective regarding workload variables should therefore be made [40]. Additionally, the combined NASA-TLX with AHP should be considered carefully, where suitability of the tool for the target group should be considered regarding its difficulty.

It has been debated if workload is better to be approached from a subjective or objective way [64]. Zamudio et al. [65] mention that the sensitivity of retrospective task assessment is a limitation of the NASA-TLX. The timeframe till assessment of tasks should be considered whereas it mainly affects the answers given in temporal demand [65]. Therefore, it is important to control the time that elapses between the assessment of tasks and the moment they are carried out. Objective measurements use psychophysiological features such as heart rate, respiration, blood pressure or eye movement tracking are used [26]. However, the instruments for objective measurements use an indirect approach and have been reported to cope with sensitivity and validity limitations [66]. Additionally, these objective measurements disrupt the course of action, as it must take place during the execution of tasks. Considering this, the subjective approach of the NASA-TLX is less intrusive, besides which it is also seen as the golden standard in subjective approaches [37]. Additionally, Bowling and Kirkendall [67] mention that perceived workload has a stronger influence on adverse outcomes than objective workload. It has stronger effects on job performances, results in counterproductive work behaviours and leads to more dropouts [67]. This shows the suitability of the subjective approach in this study.

5.5 | Future research

Based on the findings of this research, additional research can help to extent the knowledge around the workload of VCC nurses.

This cross-sectional research was performed where all respondents give information at one point in time. To understand more about the progression of workload, additional longitudinal research is recommended. It helps to understand if workload in respondents fluctuate or remain stable over time. Besides, this approach can be used to examine the effect of implementations that are used to reduce the workload in VCC nurses. For example, modifications in the distribution and sequence of tasks can be analysed. Separate research on these different distributions and sequences can help to understand the workload patterns as well.

Moreover, as this research has examined the workload of VCC nurses in individual tasks, it is still unknown what the effect of workload will be when more tasks are performed simultaneously. By examining the tasks that often occur simultaneously, the assessment of workload in certain task combinations is enabled. This contributes to understanding the workload experiences on a deeper level.

As the extent of workload in VCC nurses is examined, the consequences of this workload on the occurrence of errors would be favourable to discover. Mazur et al. [68] concluded that workload around 50-55 resulted in increased errors and poorer achievements in physicians on radiation therapy planning. Although the target group differs, a similar trend may apply for VCC nurses as well. Gaining insight into the causes, frequency, and severity of errors in relation to workload can help to understand what specific causes should be tackled. If it appears that more errors occur in nurses from a specific amount of workload, actions can be taken regarding the workload experienced.

Although this research approached workload with 6 variables of the NASA-TLX, there may be other variables that can be used to identify workload as well. In doing so, workload is approached from different perspectives. Minvielle [69] shows that the culture and climate within ICUs affect the workload of healthcare professionals. Examining the culture and climate in VCCs can help to identify additional workload causes that contribute to subsequent improvements. Besides, one of the respondents mentioned that the expectations of colleagues affect the workload experienced. To understand if this is experienced among VCC nurses in general, this variable should be investigated as well.

Lastly, future research where VCC nurses are compared with nurses working in nursing wards is of interest. This also accounts for nurses who deliver remote healthcare in a decentralised way. As this research focussed on the workload of VCC nurses, no comparison was made with other types of nurses. One of the reasons for this is that the used instrument is not suitable to compare the workload of different professions. By identifying the other type of nurses, more knowledge is gained on the sources of workload, and it also helps to specify in what way their activities differ. This information is beneficial as it helps to understand what types of tasks lead to different levels of workload which can then be optimised. What is important, is that future research helps to provide new insights. New insights lead to more knowledge which subsequently contributes to improvements and a decrease of workload. Not only will this benefit the VCC nurses, but it may help to improve patient care and healthcare outcomes as well.

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Appendix

Appendix A – Informed consent letter

Beste zorgmedewerker van zorg op afstand,

Ik ben Cindy Vollenbroek en ben master student Health Sciences aan de Universiteit Twente. Voor mijn afstudeeropdracht doe ik bij het Connected Care Center van het Isala ziekenhuis onderzoek naar de werkdruk bij zorgmedewerkers op afstand (verpleegkundigen, co-assistenten).

Er zijn al veel onderzoeken gedaan naar werkdruk bij verpleegkundigen op een verpleegafdeling, maar over werkdruk bij verpleegkundigen voor zorg op afstand, is er nog veel onbekend.
Het is van belang om inzicht te krijgen in de werkdruk aangezien een te hoge werkdruk kan leiden tot negatieve gevolgen zoals stress of zelfs een burn-out.

Met behulp van deze vragenlijst wil ik meer inzicht krijgen in de ervaren werkdruk, wat de oorzaken zijn van deze werkdruk en hoe erg werkdruk bij verschillende taken wordt ervaren. Om de werkdruk bij verpleegkundigen voor zorg op afstand te onderzoeken wil ik u graag vragen om deel te nemen aan dit onderzoek.

De vragenlijst bestaat uit drie onderdelen en duurt in totaal ongeveer 15-20 minuten. Het doel is om inzicht te krijgen in uw persoonlijke ervaringen met betrekking tot werkdruk. Denk hierbij terug aan de afgelopen periode van 4 weken waarin alle zorgpaden worden betrokken waarin u werkzaam bent. Er zijn geen foute antwoorden mogelijk, het gaat om uw ervaringen.

Bij deelname aan dit onderzoek gaat u ermee akkoord dat de gegevens die verzameld worden met de vragenlijst anoniem worden gebruikt voor onderzoek. De exacte voorwaarden zijn hieronder te lezen bij *Geïnformeerde toestemming vragenlijst*.

Als u vragen of opmerkingen heeft, kunt u contact opnemen met Cindy Vollenbroek via c.l.t.vollenbroek@student.utwente.nl

Gebruik van informatie bij het onderzoek
De gegevens zullen worden verwerkt door master studente Cindy Vollenbroek van de studie Health Sciences aan de Universiteit Twente.
De gegevens die verzameld worden middels deze vragenlijst worden uitsluitend gebruikt voor onderzoek.
Verzamelde gegevens blijven anoniem en kunnen niet worden teruggeleid naar een persoon.
De verzamelde gegevens worden bewaard voor een periode van 10 jaar. Na deze periode zal de data worden verwijderd.

De verzamelde onderzoek data worden opgeslagen en gedeeld met het Isala ziekenhuis in Zwolle met enkel voor het doel van dit onderzoek.
Het onderzoek is door de ethische commissie van de universiteit Twente en Lokale haalbaarheid commissie van Isala ziekenhuis goedgekeurd.

Potentiële risico's en ongemakken bij deelname aan het onderzoek
Uw deelname aan dit onderzoek staat niet in verband met risico's of ongemakken. U bent niet verplicht tot het geven van antwoorden en kunt op elk moment stoppen met uw deelname zonder bijkomstige consequenties.

Compensatie
Bij deelname aan dit onderzoek ontvangt u geen compensatie.

Vrijwilligheid
Het deelnemen aan dit onderzoek door het voltooien van de vragenlijst is volledig op vrijwillige basis.
Op elk moment is het mogelijk om uw deelname te stoppen of om toestemming tot het gebruiken van uw gegevens in te trekken zonder dat u hiervoor een reden voor hoeft te geven.

Toestemming

- ☐ Ik ben voldoende geïnformeerd over het onderzoek. Ik heb deze informatie gelezen en de mogelijkheid gehad om vragen te stellen. De vragen die ik had zijn duidelijk beantwoord. Daarmee geef ik vrijwillig toestemming om deel te nemen aan dit onderzoek en begrijp ik dat ik kan weigeren om vragen te beantwoorden en dat ik me op elk moment kan terugtrekken uit het onderzoek, zonder dat ik daarvoor een reden hoef op te geven.

Appendix B – Questionnaire

Beste zorgmedewerker van zorg op afstand,

Deze vragenlijst is onderdeel van een onderzoek naar de werkdruk bij zorgmedewerkers die zorg op afstand bieden. Er wordt veel onderzoek gedaan naar werkdruk bij verpleegkundigen op een verpleegafdeling. Maar over de werkdruk van zorgmedewerkers die zorg op afstand bieden is er nog weinig bekend. Aangezien een te hoge werkdruk kan leiden tot onder andere stress of zelfs een burn-out, is het belangrijk om hier inzicht in te krijgen.

Ik ben Cindy Vollenbroek en ben master student Health Sciences aan de Universiteit Twente. Voor mijn afstudeeropdracht doe ik bij het *Connected Care Center* van het *Isala ziekenhuis* onderzoek naar de werkdruk bij zorgmedewerkers op afstand (verpleegkundigen, co-assistenten).

Deze vragenlijst helpt om meer inzicht te krijgen in de ervaren werkdruk.
Wat zijn de oorzaken van werkdruk? Hoe hoog is de werkdruk? En bij welke activiteiten wordt er werkdruk ervaren? Een antwoord op deze vragen draagt in de toekomst bij aan het verbeteren van werkomstandigheden en kwaliteit van zorg. Graag wil ik u vragen om deel te nemen aan deze vragenlijst om de werkdruk bij zorgmedewerkers op afstand te onderzoeken.

De vragenlijst bestaat uit drie onderdelen en duurt ongeveer 15-*20 minuten*. Het doel is om inzicht te krijgen in uw persoonlijke ervaringen met betrekking tot werkdruk. Denk hierbij terug aan de afgelopen periode van *4 weken* waarin u werkzaam bent geweest. Betrek hierbij alle zorgpaden waarin u werkzaam bent. Er zijn *geen foute antwoorden mogelijk*, het gaat om uw ervaringen. Wanneer u tussentijds wilt stoppen worden gegevens opgeslagen zodat u later de vragenlijst kunt hervatten.

Bij deelname aan de vragenlijst wordt de door u aangeleverde informatie gebruikt voor onderzoek. Gegevens blijven anoniem en u kunt op elk moment uw deelname intrekken zonder daar een reden voor te geven. De volledige voorwaarden zijn te lezen in het bijgevoegde document van de vragenlijst uitnodiging.

Als u vragen of opmerkingen heeft, kunt u contact opnemen met Cindy Vollenbroek via c.l.t.vollenbroek@student.utwente.nl

Geïnformeerde toestemming

- ○ Ik ben voldoende geïnformeerd over het onderzoek. Ik heb bovenstaande informatie gelezen en heb de mogelijkheid gehad om vragen te stellen. Ik geef vrijwillig toestemming om deel te nemen en begrijp dat ik kan weigeren om vragen te beantwoorden. Ik kan me op elk moment terugtrekken uit het onderzoek, zonder dat ik daarvoor een reden hoef op te geven.

Dit is deel 1 van de vragenlijst. In dit deel worden er vragen gesteld over persoonlijke gegevens. Kies per vraag een antwoord dat het best bij u past.

Q1 Wat is uw Functie?

- ○ Verpleegkundige
- ○ Co-assistent
- ○ Anders, namelijk _____

Q2 Wat is uw leeftijd? (jaren)

_____

Q3 Wat is uw geslacht?

- ○ Man
- ○ Vrouw
- ○ Anders

Q4 Wat is het hoogste onderwijsniveau dat u heeft gevolgd?

- ○ Middelbaar beroepsonderwijs (Mbo
- ○ In-service opgeleid
- ○ Hoger beroepsonderwijs (Hbo)
- ○ Hoger beroepsonderwijs (Hbo) vervolgopleiding
- ○ Wetenschappelijk onderwijs (Wo) Bachelor
- ○ Wetenschappelijk onderwijs (Wo) Master
- ○ PhD
- ○ Anders, namelijk _____

Q5 Ziekenhuis In welk ziekenhuis bent u momenteel werkzaam?

_____

Q6 Werkzaam zorg Hoeveel jaren bent u al werkzaam in de zorg (inclusief zorg op afstand jaren)? Antwoord mag per half jaar worden gegeven (bijv. 3,5 jaar werkzaam)

_____

Q7 Werkzaam ZOA Hoeveel jaren bent u al werkzaam binnen 'zorg op afstand'? Antwoord mag per half jaar worden gegeven (bijv. 0,5 jaar werkzaam)

_____

Q8 Uren per week Hoeveel uren per week werkt u gemiddeld?

_____

Deel 2

U bent aangekomen bij deel 2. Dit deel bestaat uit 15 vragen.

'Werkdruk' bestaat uit de volgende 6 factoren: 1) mentale belasting, 2) fysieke belasting, 3) tijdsdruk, 4) inspanning, 5) frustratie en 6) uitvoering. Deze 6 factoren moeten met elkaar worden vergeleken.

Geef per vergelijking tussen twee factoren aan welke factor meer impact heeft op werkdruk ten opzichte van de ander. De definities van de factoren staan bij de vragen omschreven.

Elke vergelijking stelt een weegschaal voor met aan elke kant een factor. De omschrijving boven de bolletjes geeft aan in welke mate een factor belangrijker is dan de ander. Kies het bolletje dat voor u het beste omschrijft hoeveel impact een factor heeft op werkdruk ten opzichte van de andere factor.

Q1-5 AHP Mentaal Hoeveel impact heeft 'Mentale belasting' op het ervaren van werkdruk in vergelijking met de vijf andere factoren? Kies per vergelijking één antwoord.

Mentale belasting: Mentale en waarnemende activiteiten. (bijv. nadenken, beslissen, berekenen, onthouden, kijken en/of zoeken)
Fysieke belasting: Fysieke en lichamelijke activiteiten. (duwen, trekken, draaien, gecontroleerd en/of actief)
Tijdsdruk: Tijdsdruk met betrekking tot snelheid en tempo waarmee iets moet worden uitgevoerd.
Inspanning: Moeite en inspanning die geleverd wordt om een beoogd prestatieniveau te halen/behouden.
Frustratie: Mate van onzekerheid, ontmoediging, irritatie en/of stress.
Uitvoering: Mate van tekortkomingen waarmee je doelen of taken hebt bereikt en ontevredenheid over de mate van deze tekortkomingen.

	Extreem veel impact	Heel veel impact	Veel impact	Matige impact	Gelijk matige impact	Matige impact	Veel impact	Heel veel impact	Extreem veel impact	
Mentale belasting	○	○	○	○	○	○	○	○	○	Fysieke belastin
Mentale belasting	○	○	○	○	○	○	○	○	○	Tijdsdruk
Mentale belasting	○	○	○	○	○	○	○	○	○	Inspanning
Mentale belasting	○	○	○	○	○	○	○	○	○	Frustratie
Mentale belasting	○	○	○	○	○	○	○	○	○	Uitvoering

Q6-9 AHP Fysiek Hoeveel impact heeft 'Fysieke belasting' op het ervaren van werkdruk in vergelijking met de andere factoren? Kies per vergelijking één antwoord.

Fysieke belasting: Fysieke en lichamelijke activiteiten. (duwen, trekken, draaien, gecontroleerd en/of actief)
Tijdsdruk: Tijdsdruk met betrekking tot snelheid en tempo waarmee iets moet worden uitgevoerd.
Inspanning: Moeite en inspanning die geleverd wordt om een beoogd prestatieniveau te halen/behouden.
Frustratie: Mate van onzekerheid, ontmoediging, irritatie en/of stress.
Uitvoering: Mate van tekortkomingen waarmee je doelen of taken hebt bereikt en ontevredenheid over de mate van deze tekortkomingen.

	Extreem veel impact	Heel veel impact	Veel impact	Matige impact	Gelijk matige impact	Matige impact	Veel impact	Heel veel impact	Extreem veel impact	
Fysieke belasting	○	○	○	○	○	○	○	○	○	Tijdsdruk
Fysieke belasting	○	○	○	○	○	○	○	○	○	Inspanning
Fysieke belasting	○	○	○	○	○	○	○	○	○	Frustratie
Fysieke belasting	○	○	○	○	○	○	○	○	○	Uitvoering

Q10-12 AHP Tijdsdruk Hoeveel impact heeft 'Tijdsdruk' op het ervaren van werkdruk in vergelijking met de andere factoren? Kies per vergelijking één antwoord.

Tijdsdruk: Tijdsdruk met betrekking tot snelheid en tempo waarmee iets moet worden uitgevoerd.
Inspanning: Moeite en inspanning die geleverd wordt om een beoogd prestatieniveau te halen/behouden.
Frustratie: Mate van onzekerheid, ontmoediging, irritatie en/of stress.
Uitvoering: Mate van tekortkomingen waarmee je doelen of taken hebt bereikt en ontevredenheid over de mate van deze tekortkomingen.

	Extreem veel impact	Heel veel impact	Veel impact	Matige impact	Gelijk matige impact	Matige impact	Veel impact	Heel veel impact	Extreem veel impact	
Tijdsdruk	○	○	○	○	○	○	○	○	○	Inspanning
Tijdsdruk	○	○	○	○	○	○	○	○	○	Frustratie
Tijdsdruk	○	○	○	○	○	○	○	○	○	Uitvoering

Q13-14 AHP Inspanning Hoeveel impact heeft 'Inspanning' op het ervaren van werkdruk in vergelijking met de andere factoren? Kies per vergelijking één antwoord.

Inspanning: Moeite en inspanning die geleverd wordt om een beoogd prestatieniveau te halen/behouden.
Frustratie: Mate van onzekerheid, ontmoediging, irritatie en/of stress.
Uitvoering: Mate van tekortkomingen waarmee je doelen of taken hebt bereikt en ontevredenheid over de mate van deze tekortkomingen.

	Extreem veel impact	Heel veel impact	Veel impact	Matige impact	Gelijk matige impact	Matige impact	Veel impact	Heel veel impact	Extreem veel impact	
Inspanning	○	○	○	○	○	○	○	○	○	Frustratie
Inspanning	○	○	○	○	○	○	○	○	○	Uitvoering

Q15 AHP Frustratie Hoeveel impact heeft 'Frustratie' op het ervaren van werkdruk in vergelijking met 'Uitvoering'?

Frustratie: Mate van onzekerheid, ontmoediging, irritatie en/of stress.
Uitvoering: Mate van tekortkomingen waarmee je doelen of taken hebt bereikt en ontevredenheid over de mate van deze tekortkomingen.

	Extreem veel impact	Heel veel impact	Veel impact	Matige impact	Gelijk matige impact	Matige impact	Veel impact	Heel veel impact	Extreem veel impact	
Frustatie	○	○	○	○	○	○	○	○	○	Uitvoering

Deel 3

U bent aangekomen bij het derde en laatste deel van de vragenlijst.
In totaal komen er 5 onderwerpen aan bod verdeeld over verschillende vragen.

Allereerst geeft u aan welke taken u als zorgmedewerker op afstand uitvoert. Vervolgens beoordeelt u de taken die u uitvoert aan de hand van de werkdruk factoren.

Q1 Scholing Voert u de onderstaande taken uit tijdens uw werk?

	Ja	Nee
Het organiseren en ontwikkelen van scholing voor nieuwe zorgpaden of inwerken van nieuwe collega's.	○	○
Het volgen van een scholing en/of training voor het onderhouden en uitbreiden van persoonlijke en professionele kennis en ontwikkeling.	○	○

Q2 Zorgpaden Voert u de onderstaande taken uit tijdens uw werk?

	Ja	Nee
Ontwikkelen van protocollen (werkproces en gebruikte technologie) van nieuwe digitale zorgpaden.	○	○
Testen en evalueren van protocollen (werkproces en gebruikte technologie).	○	○
Actieve participatie in kwaliteitszorgsystemen voor het verbeteren van de zorgkwaliteit (bijv. VIM commissie en/of kwaliteits- bewaking en verbetering van protocollen en/of digitale platforms).	○	○
Ambassadeurschap van virtuele zorg (communicatie richting externe stakeholders ter promotie van digitale zorg).	○	○

Q3 Contact patiënten Voert u de onderstaande taken uit tijdens uw werk?

	Ja	Nee
Gepland* begeleiden en coachen van de patiënt op afstand (bijv. voor zelfmanagement, therapietrouwheid en/of psychologische ondersteuning). *Gepland*: Van tevoren vastgesteld om uit te voeren.*	○	○
Ongepland* begeleiden en coachen van de patiënt op afstand (bijv. voor zelfmanagement, therapietrouwheid en/of psychologische ondersteuning). *Ongepland*: Onverwacht, niet van te voren vastgesteld.*	○	○
Gepland* communiceren met de patiënt op afstand om klinische besluitvorming mogelijk te maken (bijv. voor het verifiëren van de data (bijv. meetwaarde) bij de patiënt en/of instructie over technologie/instrumenten gebruik). *Gepland*: Van tevoren vastgesteld om uit te voeren.*	○	○
Ongepland* communiceren met de patiënt op afstand om klinische besluitvorming mogelijk te maken (bijv. voor het verifiëren van de data (bijv. meetwaarde) bij de patiënt en/of instructie over technologie/instrumenten gebruik). *Ongepland*: Onverwacht, niet van te voren vastgesteld.*	○	○
Het uitvoeren van verpleegtechnische handelingen (bijv. infuus prikken).	○	○

Q4 Klinisch Voert u de onderstaande taken uit tijdens uw werk?

	Ja	Nee
Beoordelen van informatie vanuit enkel telemonitoring via digitale platforms (bijv. Luscii, Curavista, SanaNet, HiX (EPD)).	○	○
Beoordelen van informatie vanuit enkel patiëntencontact (bijv. telefoongesprek).	○	○
Beoordelen van informatie vanuit digitale platforms én patiëntcontact.	○	○
Besluitvorming op basis van protocollen.	○	○
Besluitvorming op basis van overleg met een collega uit het ziekenhuis (arts, verpleegkundig specialist en/of protocoleigenaar).	○	○
Coördineren en bewerkstelligen van specialistische thuiszorg (medicatie@home).	○	○
Gepland* afhandelen van notificaties vanuit het gebruikte monitorings-platform. *Gepland*: Van tevoren vastgesteld om uit te voeren.*	○	○
Ongepland* afhandelen van notificaties vanuit het gebruikte monitorings-platform. *Ongepland*: Onverwacht, niet van te voren vastgesteld.*	○	○

Q5 Administratie Voert u de onderstaande taken uit tijdens uw werk?

	Ja	Nee
Dossiervoering van de uitgevoerde zorg (in bijv. Luscii, Curavista, SanaNet, HiX (EPD)).	○	○
Uitvoeren van Human Resource Management (HRM) werkzaamheden (bijv. roosters, HR-administratie).	○	○

U heeft aangegeven welke taken u tijdens uw werk uitvoert.
Beoordeel aan de hand van de 6 werkdruk factoren hoeveel werkdruk u per taak ervaart.

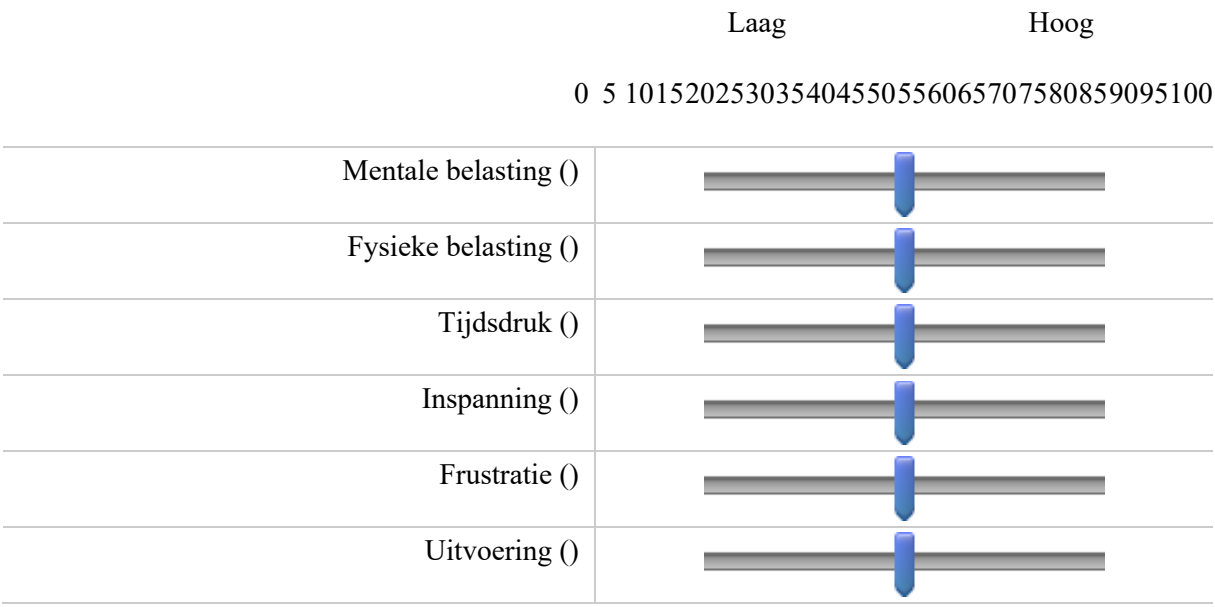
Gebruik de getallen 0 tot 100 om aan te geven hoe sterk een factor bijdraagt aan het ervaren van werkdruk. Geef een score van 0 als een factor niet bijdraagt aan werkdruk.
Geef een score van 100 als een factor maximaal bijdraagt aan werkdruk.

Display of Questions: Following questions are displayed If Voert u de onderstaande taken uit tijdens uw werk? = [Ja] on the corresponding task.

Every question displayed the definitions of the workload variables as follows:

Mentale belasting: Mentale en waarnemende activiteiten. (bijv. nadenken, beslissen, berekenen, onthouden, kijken en/of zoeken)
Fysieke belasting: Fysieke en lichamelijke activiteiten. (duwen, trekken, draaien, gecontroleerd en/of actief)
Tijdsdruk: Tijdsdruk met betrekking tot snelheid en tempo waarmee iets moet worden uitgevoerd.
Inspanning: Moeite en inspanning die geleverd wordt om een beoogd prestatieniveau te halen/behouden.
Frustratie: Mate van onzekerheid, ontmoediging, irritatie en/of stress.
Uitvoering: Mate van tekortkomingen waarmee je doelen of taken hebt bereikt en ontevredenheid over de mate van deze tekortkomingen.

The following questions are answered using the sliders of the figure below. For every question the six sliders are displayed to assess the tasks.



Taak 1.1 **Onderwerp 1: Scholing en training**
Het organiseren en ontwikkelen van scholing voor nieuwe zorgpaden of inwerken van nieuwe collega's. In welke mate ervaart u de volgende 6 factoren tijdens deze taak?

Taak 1.2 Het volgen van een scholing en/of training voor het onderhouden en uitbreiden van persoonlijke en professionele kennis en ontwikkeling.
In welke mate ervaart u de volgende 6 factoren tijdens deze taak?

De volgende vragen gaan over: **Ontwikkelen en promotie van nieuwe zorgpaden**

Taak 2.1 Het ontwikkelen van protocollen (werkproces en gebruikte technologie) van nieuwe digitale zorgpaden.
In welke mate ervaart u de volgende 6 factoren tijdens deze taak?

Taak 2.2 Het testen en evalueren van protocollen (werkproces en gebruikte technologie).
In welke mate ervaart u de volgende 6 factoren tijdens deze taak?

Taak 2.3 Actieve participatie in kwaliteitszorgsystemen voor het verbeteren van de zorgkwaliteit (bijv. VIM commissie en/of kwaliteits- bewaking en verbetering van protocollen en/of digitale platforms).
In welke mate ervaart u de volgende 6 factoren tijdens deze taak?

Taak 2.4 Ambassadeurschap van virtuele zorg (communicatie richting externe stakeholders ter promotie van digitale zorg).
In welke mate ervaart u de volgende 6 factoren tijdens deze taak?

De volgende vragen gaan over: **Contact met patiënten**

Taak 3.1A **Gepland*** begeleiden en coachen van de patiënt op afstand (bijv. voor zelfmanagement, therapietrouwheid en/of psychologische ondersteuning).
Gepland*: Van tevoren vastgesteld om uit te voeren.
In welke mate ervaart u de volgende 6 factoren tijdens deze taak?

Taak 3.1B **Ongepland*** begeleiden en coachen van de patiënt op afstand (bijv. voor zelfmanagement, therapietrouwheid en/of psychologische ondersteuning).
Ongepland*: Onverwacht, niet van tevoren vastgesteld.
In welke mate ervaart u de volgende 6 factoren tijdens deze taak?

Taak 3.2A **Gepland*** communiceren met de patiënt op afstand om klinische besluitvorming mogelijk te maken (bijv. voor het verifiëren van de data (bijv. meetwaarde) bij de patiënt en/of instructie over technologie/instrumenten gebruik).
Gepland*: Van tevoren vastgesteld om uit te voeren.
In welke mate ervaart u de volgende 6 factoren tijdens deze taak?

Taak 3.2B **Ongepland*** communiceren met de patiënt op afstand om klinische besluitvorming mogelijk te maken (bijv. voor het verifiëren van de data (bijv. meetwaarde) bij de patiënt en/of instructie over technologie/instrumenten gebruik).

Ongepland*: Onverwacht, niet van tevoren vastgesteld.
In welke mate ervaart u de volgende 6 factoren tijdens deze taak?

Taak 3.3 Het uitvoeren van verpleegtechnische handelingen (bijv. infuus prikken).
In welke mate ervaart u de volgende 6 factoren tijdens deze taak?

De volgende vragen gaan over: **Nemen van klinische beslissingen**

Taak 4.1 Het beoordelen van informatie vanuit enkel telemonitoring via digitale platforms (bijv. Luscii, Curavista, SanaNet, HiX(EPD)).
In welke mate ervaart u de volgende 6 factoren tijdens deze taak?

Taak 4.2 Het beoordelen van informatie vanuit enkel patiëntencontact (bijv. telefoongesprek).
In welke mate ervaart u de volgende 6 factoren tijdens deze taak?

Taak 4.3 Het beoordelen van informatie vanuit digitale platforms én patiëntencontact.
In welke mate ervaart u de volgende 6 factoren tijdens deze taak?

Taak 4.4 Besluitvorming op basis van protocollen.
In welke mate ervaart u de volgende 6 factoren tijdens deze taak?

Taak 4.5 Besluitvorming op basis van overleg met een collega uit het ziekenhuis (bijv. arts, verpleegkundig specialist en/of protocol eigenaar).
In welke mate ervaart u de volgende 6 factoren tijdens deze taak?

Taak 4.6 Het coördineren en bewerkstelligen van specialistische thuiszorg (medicatie@home).
In welke mate ervaart u de volgende 6 factoren tijdens deze taak?

Taak 4.7A **Gepland*** afhandelen van notificaties vanuit het gebruikte monitorings-platform.
Gepland*: Van tevoren vastgesteld om uit te voeren.

Taak 4.7B **Ongepland*** afhandelen van notificaties vanuit het gebruikte monitorings-platform.
Ongepland*: Onverwacht, niet van tevoren vastgesteld.
In welke mate ervaart u de volgende 6 factoren tijdens deze taak?

De volgende vragen gaan over: **Administratie**

Taak 5.1 De dossiervoering van de uitgevoerde zorg (in bijv. Luscii, Curavista, SanaNet, HiX (EPD)).
In welke mate ervaart u de volgende 6 factoren tijdens deze taak?

Taak 5.2 Het uitvoeren van Human Resource Management (HRM) werkzaamheden (bijv. roosters, HR-administratie).
In welke mate ervaart u de volgende 6 factoren tijdens deze taak?

Evaluatie vragenlijst

Zijn er taken die u als zorgmedewerker op afstand uitvoert maar die niet zijn langsgekomen bij de beoordeling van werkdruk?

- ○ Ja, namelijk_____
- ○ Nee

Opmerking algemeen Heeft u andere toevoegingen of opmerkingen met betrekking tot de vragenlijst in het algemeen?

- ○ Ja, namelijk: _____
- ○ Nee

Appendix C – First version of task list

Scholing en training

1. Het organiseren van scholing voor nieuwe zorgpaden of inwerken van nieuwe collega's
2. Het volgen van een scholing en/of training

Ontwikkelen en promotie van nieuwe zorgpaden

1. Ontwikkelen van protocollen (werkproces en gebruikte technologie) van nieuwe digitale zorgpaden
2. Testen, evalueren en optimaliseren van het nieuwe protocol (werkproces en gebruikte technologie)
3. Stimuleren en uitdagen van collega's om nieuwe digitale zorgpaden op te zetten
4. Communicatie richting externe stakeholders ter promotie van digitale zorg

Contact met patiënten

1. Begeleiden en coachen van de patiënt op afstand voor zelfmanagement en therapietrouwheid vergroten
    a. Ad-hoc
    b. Gepland
2. Communicatie met de patiënt op afstand voor het verifiëren van de data (bijv. meetwaarde) bij de patiënt en/of instructie over technologie/instrumenten gebruik
    a. Ad-hoc
    b. Gepland

Nemen van klinische beslissingen

1. Beoordelen van informatie vanuit enkel telemonitoring of andere applicatie
2. Beoordelen van informatie vanuit enkel een telefoongesprek met de patiënt
3. Beoordelen van informatie vanuit meerdere applicaties én patiëntcontact
4. Besluitvorming op basis van het protocol
5. Besluitvorming op basis van overleg met een collega uit het ziekenhuis (protocoleigenaar)
6. Afhandelen van notificaties vanuit het gebruikte platform
    a. Ad-hoc
    b. Gepland
7. Het toepassen van generalistische kennis van meerdere type zorgpaden

Registratie

1. Dossiervoering van de uitgevoerde zorg (in HiX, Luscii, e.a.)

Appendix D – Demographical data of respondents

Confidential

Appendix E – Tests on normality

Table E1: Normality test on workload weights

Dimension N=19	Minimum weight	Maximum weight	Mean weight (SD)	Shapiro-Wilk test
Mental Demand (MD)	0.035	0.456	0.229 (0.124)	0.570
Physical Demand (PD)	0.023	0.226	0.098 (0.063)	0.040*
Temporal Demand (TD)	0.069	0.445	0.182 (0.102)	0.014*
Effort (EF)	0.034	0.286	0.134 (0.054)	0.134
Frustration level (FL)	0.050	0.435	0.213 (0,091)	0.189
Performance (PF)	0.056	0.231	0.145 (0,056)	0.134

** Significance level p≤0.05*

Table E2: Normality test on mean workload scores

Dimension N=19	Minimum score	Maximum score	Mean score (SD)	Shapiro-Wilk test
Mental Demand (MD)	5.59	80.83	38.90 (25.21)	0.113
Physical Demand (PD)	0.00	50.00	6.01(11.70)	<0.001*
Temporal Demand (TD)	1.90	74.17	28.02 (24.63)	0.021*
Effort (EF)	1.11	78.33	31.92 (21.00)	0.470
Frustration level (FL)	0.71	58.33	20.20 (19.16)	0.004*
Performance (PF)	0.00	69.17	20.63 (20.78)	0.011*

** Significance level p≤0.05*

Table E3: Normality test on mean workload

Dimension N=19	Minimum mean workload	Maximum mean workload	Mean workload (SD)	Shapiro-Wilk test
Mental Demand (MD)	0.31	28.75	9.46 (8.85)	0.008*
Physical Demand (PD)	0.00	8.33	0.82 (1.92)	<0.001*
Temporal Demand (TD)	0.19	21.23	5.15(5.45)	0.002*
Effort (EF)	0.09	12.89	4.48 (3.80)	0.019*
Frustration level (FL)	0.07	14.63	4.46 (4.29)	0.014*
Performance (PF)	0.00	14.21	3.04 (3.57)	<0.001*

** Significance level p≤0.05*

Table E4: Normality tests on tasks

Dimension	Minimum workload	Maximum workload	Mean workload (SD)	Shapiro-Wilk test
Education and training				
1.1	3.75	62.50	34.36 (21.62)	0.044*
1.2	0.00	63.46	25.77 (21.18)	0.094
Development and promotion of new care pathways				
2.1	11.21	70.94	45.06 (17.12)	0.291
2.2	5.96	76.98	35.11 (22.39)	0.164
2.3	2.78	78.34	28.11 (22.58)	0.174
2.4	7.36	72.03	27.71 (20.85)	0.043*
Contact with patients				
3.1a	1.53	62.00	23.72 (19.70)	0.052
3.1b	1.53	65.09	23.56 (21.25)	0.011*
3.2a	3.63	61.81	21.93 (20.07)	0.006*
3.2b	3.63	58.05	23.12 (20.07)	0.006*
3.3	5.80	50.15	23.18 (19.17)	0.053
Clinical decision making				
4.1	2.98	56.09	21.73 (19.68)	0,005*
4.2	0.00	60.17	15.89 (19.51)	<0.001*
4.3	0.00	52.83	16.59 (17.61)	0.001*
4.4	1.64	70.56	19.27 (20.88)	0,001*
4.5	3.00	49.95	20.40 (16.68)	0,030*
4.6	5.00	44.85	20.90 (16.74)	0,032*
4.7a	0.00	68.67	19.78 (22.79)	0.001*
4.7b	3.15	59.23	19.00 (19.24)	0,002*
Administration				
5.1	2.78	60.34	17.93 (16.04)	0.004*
5.2	3.75	39.29	16.12 (13.12)	0.124

** Significance level $p \leq 0.05$*

Appendix F – Significance test

Table F1: Wilcoxon-Mann-Whitney test on workload weights

	MD	**PD**	**TD**	**EF**	**FL**	**PF**
MD		Z=-2.769 0.006*	Z=-1.241 0.215	Z=-2.591 0.010*	Z=-0.370 0.711	Z=-1.938 0.053
PD			Z=-2.765 0.006*	Z=-2.374 0.018*	Z=-3.385 <0.001*	Z=-1.982 0.048*
TD				Z=-1.302 0.193	Z=-1.111 0.267	Z=-0.734 0.463
EF					Z=-2.864 0.004*	Z=-0.827 0.408
FL						Z=-2.817 0.005*
PF						

***MD**: Mental Demand, **PD**: Physical Demand, **TD**: Temporal Demand, **EF**: Effort, **FL**: Frustration Level, **PF**: Performance*
***Red** = negative rank **green**= positive rank *Significance level p≤0.05*

Table F2: Wilcoxon-Mann-Whitney test on mean workload scores

	MD	**PD**	**TD**	**EF**	**FL**	**PF**
MD		Z= -3.724 <0.001*	Z=-2.817 0.005*	Z=-2.093 0.036*	Z=-3.462 <0.001*	Z=-3.381 <0.001*
PD			Z=-3.783 <0.001*	Z=-3.823 <0.001*	Z=-3.549 <0.001*	Z=-3.621 <0.001*
TD				Z=-1.415 0.157	Z=-2.817 0.005*	Z=-2.744 0.006*
EF					Z=-3.419 <0.001*	Z=-3.201 0.001*
FL						Z=-0.423 0.673
PF						

***MD**: Mental Demand, **PD**: Physical Demand, **TD**: Temporal Demand, **EF**: Effort, **FL**: Frustration Level, **PF**: Performance*
***Red** = negative rank **green**= positive rank *Significance level p≤0.05*

Table F3: Wilcoxon-Mann-Whitney test on mean workload

	MD	**PD**	**TD**	**EF**	**FL**	**PF**
MD		Z=-3.724 <0.001*	Z=-1.690 0.091	Z=-2.736 0.006*	Z=-2.373 0.018*	Z=-2.656 0.008*
PD			Z=-3.702 <0.001*	Z=-3.823 <0.001*	Z=-3.680 <0.001*	Z=-3.479 <0.001*
TD				Z=-0.240 0.811	Z=-0.080 0.936	Z=-1.546 0.122
EF					Z=-0.563 0.573	Z=-1.720 0.085
FL						Z=-2.133 0.033*
PF						

***MD**: Mental Demand, **PD**: Physical Demand, **TD**: Temporal Demand, **EF**: Effort, **FL**: Frustration Level, **PF**: Performance*
***Red** = negative rank **green**= positive rank *Significance level p≤0.05*

Table F4: Wilcoxon-Mann-Whitney test on workload

Pair	**Z statistic**	**2-tailed significance**
Task 3.1a – 3.1b	-1.223	0.221
Task 3.2a – 3.2b	-1.784	0.074
Task 4.7a – 4.7b	-1.503	0.133

** Significance level p ≤0.05*

Table F5: Wilcoxon-Mann-Whitney test on tasks

3.2.2	3.3	4.1	4.2	4.3	4.4	4.5	4.6	4.7.1	4.7.2	5.1	5.2
0.496	0.398	0.056	0.008*	0.022*	0.015*	0.002***	0.401	0.088	0.075	0.010*	0.028*
0.691	0.917	0.918	0.048*	0.125	0.098	0.379	0.401	0.363	0.245	0.088	0.093
0.002*	0.028*	<0.001*	0.00w*	<0.001**	0.001**	<0.001**	0.012*	0.002*	<0.001**	0.001*	0.018*
0.363	0.237	0.196	0.016*	0.053	0.030*	0.044*	0.208	0.156	0.084	0.013*	0.208
0.397	0.735	0.730	0.182	0.249	0.109	0.397	0.327	0.158	0.507	0.075	0.866
0.508	0.249	0.037*	0.017*	0.005*	0.007*	0.386	0.043*	0.008*	0.008*	0.059	0.043*
0.701	0.091	0.972	0.155	0.209	0.173	0.363	0.735	0.233	0.101	0.196	0.463
0.333	0.612	0.594	0.060	0.028*	0.078	0.427	0.327	0.140	0.013*	0.034*	0.091
0.074	0.176	0.925	0.131	0.221	0.650	0.397	0.374	0.363	0.198	0.301	0.398
	0.499	0.221	0.075	0.011*	0.100	0.198	0.767	0.064	0.047	0.088	0.249
		0.735	0.225	0.612	0.091	0.176	0.310	0.028	0.091	0.499	0.593
			0.117	0.019*	0.334	0.427	0.484	0.691	0.496	0.234	0.345
				0.169	0.374	0.116	0.500	0.422	0.695	0.600	0.753
					0.701	0.470	0.208	0.955	0.807	0.776	0.715
						0.507	0.161	0.501	0.925	0.796	0.500
							0.674	0.955	0.683	0.438	0.237
								0.214	0.110	0.398	0.593
									0.133	0.796	0.889
										0.826	0.753
											0.866

	1.1	1.2	2.1	2.2	2.3	2.4	3.1.1	3.1.2	3.2.1
1.1		0.022*	0.028*	0.744	0.427	0.859	0.078	0.134	0.125
1.2			<0.001**	0.062	0.363	0.169	0.496	0.501	0.334
2.1				0.049*	0.002*	0.041*	0.001*	0.002*	0.001*
2.2					0.036*	0.374	0.256	0.408	0.427
2.3						0.721	0.778	0.778	0.778
2.4							0.086	0.005*	0.015*
3.1.1								0.221	0.861
3.1.2									0.182
3.2.1									
3.2.2									
3.3									
4.1									
4.2									
4.3									
4.4									
4.5									
4.6									
4.7.1									
4.7.2									
5.1									
5.2									

** Significance level p≤0.05* *** Significance level p≤0.01*
***Red** = negative rank* ***Green**= positive rank*