

Designing for the wellbeing of healthcare professionals

Using AI to reduce the administrative load of healthcare professionals & improve their job satisfaction

Name: Gabi Verstappen
Student number: 4661079

Study program: Strategic Product design
Specialisation: Medisign





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Designing for the wellbeing of healthcare professionals: Using AI to reduce the administrative load of healthcare professionals & improve their job satisfaction

Written & designed by
Gabi Verstappen

TU Delft supervision by
Prof. Dr. Ir. Richard Goossens | Chair
Dr. Ir. Jiwon Jung | Mentor

In collaboration with
Erasmus MC

Company mentor
Dr. Denise Hilling



Preface

As I present this thesis titled *Designing for the Wellbeing of Healthcare Professionals: Using AI to Reduce the Administrative Load of Healthcare Professionals & Improve Their Job Satisfaction*, I reflect on the journey that has led me to this point. This work is the culmination of my graduation project for my Master in *Strategic Product Design*, with a specialization in *Medisign*, at the Faculty of Industrial Design Engineering at TU Delft. The background of this thesis lies in the critical need to enhance the wellbeing of healthcare professionals, who are often burdened by administrative tasks that detract from their primary role of providing care. By exploring the potential of artificial intelligence, this project aims to alleviate some of these burdens and, in turn, improve job satisfaction within the healthcare sector.

Throughout this process, I have honed skills that place healthcare professionals at the heart of the solution. Learning about the implementation of AI in healthcare settings has been both challenging and enlightening, providing me with invaluable insights into the intersection of technology and user-centered design.

I am deeply grateful to my supervisors for their guidance and support. I would like to extend my heartfelt thanks to the chair, Richard Goossens, for his positive attitude and the inspiration he provided throughout my research. My mentor, Jiwon Jung, deserves special mention for her hands-on approach and the critical and valuable feedback that greatly shaped this work. I also wish to thank Denise Hilling, my company mentor, for her assistance in understanding the context of healthcare professionals and for facilitating access to participants for this study.

My appreciation also goes out to the healthcare professionals who participated in the interviews and co-creation sessions. Their openness, honesty, and enthusiasm throughout the process were instrumental in the success of this project. I am also thankful to the IT department of the EMC and Chipsoft for sharing insights into their processes, which enriched my understanding of the current landscape.

On a personal note, I would like to thank my family, friends, and boyfriend for their unwavering mental support throughout this journey. Their encouragement and belief in my work have been a source of strength and motivation.

In closing, it is my hope that this project makes a valuable contribution to the healthcare sector by identifying ways to improve the industry from within. I aspire to inspire designers, policymakers, and healthcare professionals to sometimes also put the healthcare professionals at the center of the solution, recognizing their essential role in the delivery of care.

Gabi Verstappen
Delft, March 2024



Management summary

This thesis, titled "Designing for the Wellbeing of Healthcare Professionals: Using AI to Reduce the Administrative Load of Healthcare Professionals & Improve Their Job Satisfaction," explores the critical issue of healthcare professional wellbeing. It delves into the factors affecting their job satisfaction and the potential of artificial intelligence (AI) to alleviate administrative burdens. This research is part of a Master's graduation project in Strategic Product Design, specializing in Medesign, at the Faculty of Industrial Design Engineering, TU Delft.

Key Findings

The study identifies three major domains impacting the wellbeing of healthcare professionals: efficiency of practice, culture of wellness, and personal resilience. Efficiency of practice is influenced by workplace systems and processes, such as electronic medical records. Culture of wellness encompasses the values, attitudes, and behaviors within an organization that promote self-care and growth. Personal resilience refers to the skills, behaviors, and attitudes contributing to an individual's physical, emotional, and social wellbeing.

The research employs a desk research methodology, followed by semi-structured interviews with healthcare professionals, to explore these domains further. The findings highlight the importance of job demands and resources, including social support, skill utilization, autonomy, and job security, in influencing healthcare professionals' wellbeing.

Conclusions

Wellbeing in healthcare professionals is a complex interplay of job demands and resources, with significant implications for patient care quality and healthcare system vitality. The study underscores the need for a supportive work environment that fosters professional fulfillment and engagement. It also points to the potential of AI in reducing administrative burdens, thereby improving job satisfaction among healthcare professionals.

Recommendations

The thesis recommends focusing on enhancing the efficiency of practice, fostering a culture of wellness, and supporting personal resilience among healthcare professionals. It suggests that strategic product design, particularly through the implementation of AI, can play a crucial role in achieving these objectives.

Impact & future work

This thesis aims to make a valuable contribution to the healthcare sector by identifying ways to improve the industry from within. It hopes to inspire designers, policymakers, and healthcare professionals to prioritize the wellbeing of healthcare workers, recognizing their essential role in delivering high-quality patient care.

TABLE OF CONTENTS

	Introduction	6
	Project brief	7
01	Wellbeing of healthcare professionals	10
02	The administrative burden	25
03	Themes to improve healthcare professional wellbeing	31
04	The journey of gastro-intestinal oncology surgery	48
05	AI in healthcare	56
06	Co-creating the solution	76
07	Roadmapping the solution	83
08	Stakeholders in technology	92
09	Empowering the healthcare professionals	97
	Limitations & recommendations	102
	Conclusion & discussion	103

Introduction

The healthcare industry is at a pivotal moment, where the wellbeing of its professionals is under intense scrutiny. The administrative load they carry is immense, often overshadowing the critical care they provide. This thesis, "Designing for the Wellbeing of Healthcare Professionals: Using AI to Reduce the Administrative Load of Healthcare Professionals & Improve Their Job Satisfaction," seeks to address this imbalance by exploring the potential of artificial intelligence (AI) to streamline administrative tasks and enhance job satisfaction.

In pursuit of this goal, a semi-structured interview format was adopted, allowing for a flexible yet focused dialogue with healthcare professionals, including surgeons, a nurse practitioner, and a senior nurse with varying years of experience. The interview guide, detailed in appendix 1, facilitated a comprehensive exploration of the challenges faced in the healthcare environment. A treatment journey, inspired by the works of Sun, Y. (2023) and Peters, T. (2021), served as a tool to help participants articulate the problem areas throughout the treatment process, as depicted in figures 8, 9, and 10.

The insights from these interviews revealed prevalent themes such as administrative tasks and communication, which are central to the efficiency of practice, culture of well-being, and personal resilience. These themes resonate with the key job resources identified by Leiter (1990), De Jonge & Schaufeli (1998), and Rijk et al. (1998), which include social support, skill utilization, autonomy, job security, and personal resources. The interplay between job demands and resources was evident, with high job resources potentially lowering the perception of job demands and vice versa.

Commitment emerged as a significant factor associated with wellbeing, manifesting in various forms such as organizational commitment, job involvement, and occupational commitment, each with distinct impacts on wellbeing. The consequences of wellbeing, both job-related and personal, were also examined, highlighting the importance of understanding these outcomes to underscore the significance of healthcare professionals' wellbeing.

This thesis aims to contribute to the healthcare sector by offering insights into the treatment journey from the healthcare professional's perspective and proposing AI-driven solutions to optimize this journey. The SmartEHR Optimizer and DocuMentor AI are two concepts that leverage AI to enhance the documentation process, reduce manual data entry, and improve the overall efficiency and satisfaction of healthcare professionals[1]. Through this work, we hope to inspire continued innovation and dedication to the wellbeing of those at the heart of healthcare.

Project brief

The problem, as described in the sustainable health programs proposal for the Health & technology convergence, is as follows:

"The healthcare system is facing a crisis due to rising workloads in nurses and doctors, leading to higher burnout rates, reduced job satisfaction, and high job turnover rates, resulting in shortage of medical staff (nurses in particular), compromising patient care quality and accessibility. This situation requires strategic solutions to prevent an implosion of the healthcare system. Our proposal focuses on integrating Artificial Intelligence (AI) into workflows of nurses and doctors to reduce these workloads. We aim to identify the AI technologies that can significantly reduce the administrative strain on medical staff. Implementing such AI solutions can lessen administrative burdens and enhance job satisfaction, addressing the urgent shortage in the sector."

The ambition they set in this is:

"With this project we aim to harness the power of AI technology to decrease the administrative burden of nurses and doctors. We anticipate that by streamlining these responsibilities, job satisfaction levels will increase. This rise in morale could consequently reduce job turnover rates and increase efficiency within the hospital setting. Moreover, since research has shown a correlation between decreased work satisfaction and patient access to healthcare, this initiative not only indirectly benefits patients but also, in the long run, results in a higher quality of care for society."

With this problem in mind, I come to the following problem description:

We see a dramatic increase of workload in the healthcare sector over the past 20 years. These high workloads lead to burnout, job dissatisfaction, high departure rates and a critical (nursing) staff shortage. This is not only harmful for professionals, but also for the quality and access of patients to healthcare (Gesner et al., 2022).

Most nurses and doctors pursue their career to help people, but we see an increase in other tasks they have to perform in their day to day life. By streamlining these responsibilities, we can bring up morale of the healthcare staff, and thus the job satisfaction. Research has shown a correlation between decreased work satisfaction and patient access to healthcare, which means solving this issue will benefit patients, but also will result in a higher quality of care for society in the long run (Woolhandler & Himmelstein, 2014). De Visser et al. (2021) states the 3 dimensions of sustainability of care as: financial sustainability, staff sustainability and social-cultural sustainability. These 3 have to be balanced to the overall sustainability of care, and currently staff shortages are the reason why we don't have sustainability of staff. By restructuring the healthcare to be more efficient, less people and resources are needed.

In this project, I am going to research the problems the healthcare professionals face daily that keep them from their core tasks of helping people. For these tasks, I am going to create some possible solutions to help them lowering the time it takes to finalise these tasks successfully.

My aim to deliver is a strategy, backed with a product/service to help healthcare professionals towards this strategy. Right now, talking to some healthcare professionals, they feel like the main thing that they face is too high a administrative load. In the first phase, I want to look a bit broader to see whether this is actually the reason, or if there are other reasons. After finding out the main reasons that keep them from their main task, I will propose a strategy to bring them back to their main tasks and some ideas to work towards this strategy.

The complete project brief can be found in appendix 1.

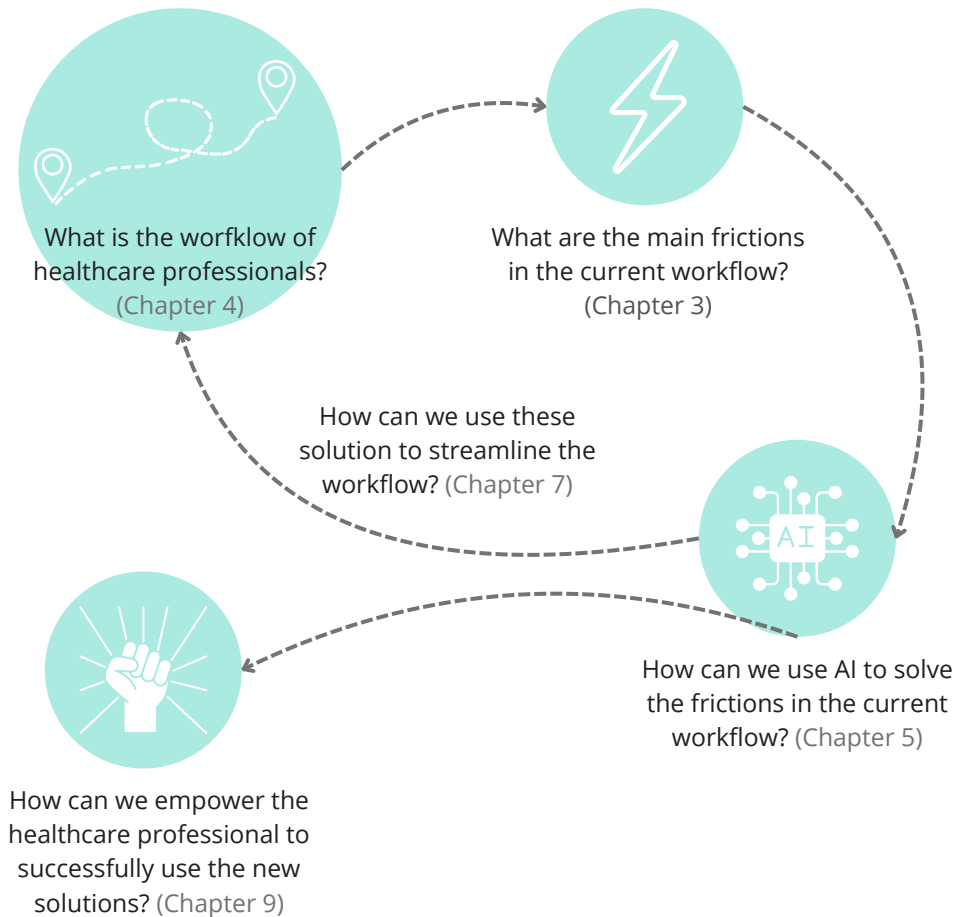
Project aim & scope

Project aim

Designing an AI application that better the workflow of healthcare professionals to improve their wellbeing

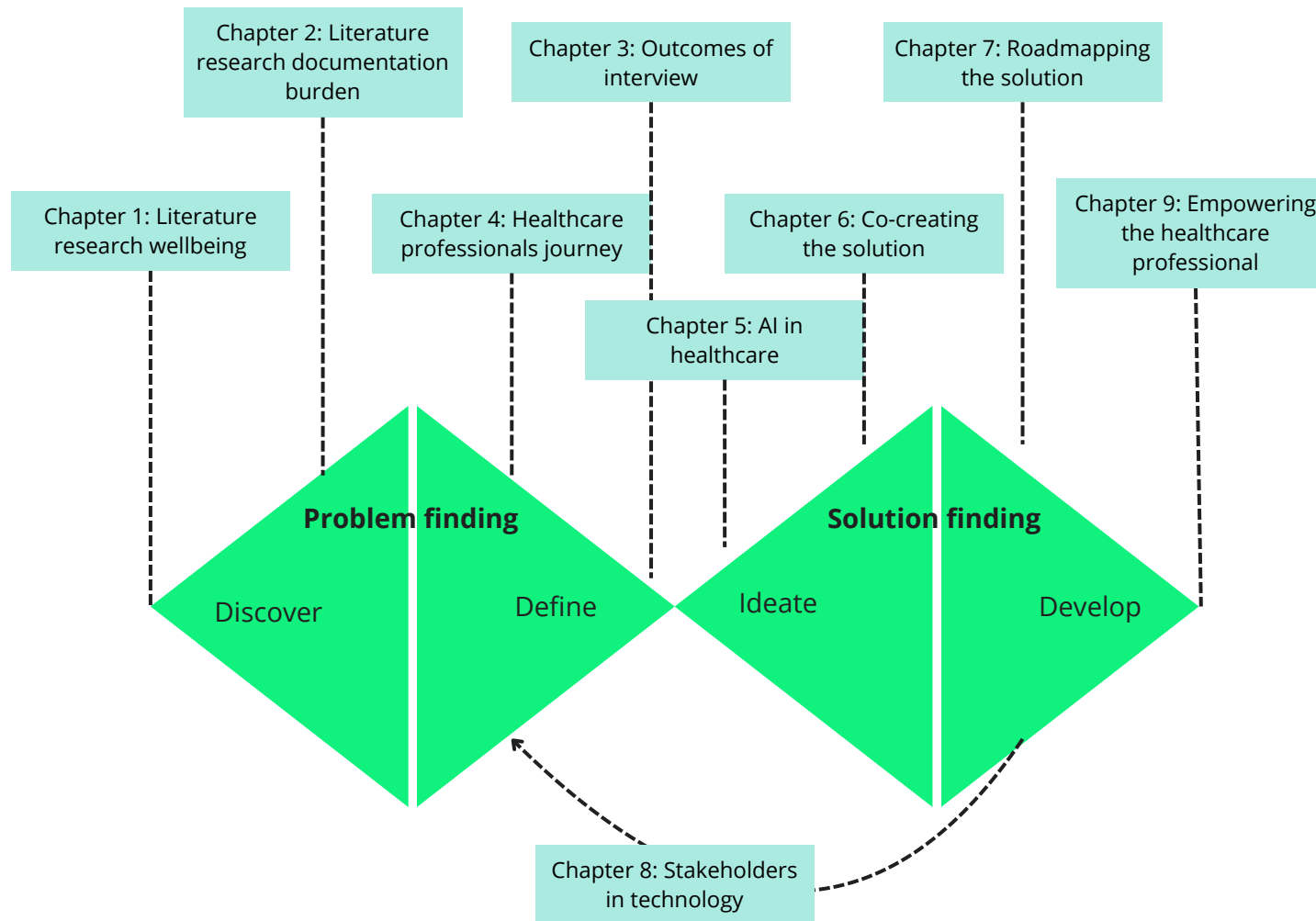
Research questions:

- What are the main challenges in the workflow of healthcare professionals that lower their feeling of wellbeing?
- How can we improve the occupational wellbeing of healthcare professionals?
- How can we use AI to achieve this goal?
- How can we implement this successfully?



Project approach

For this project, the double diamond was used



1. Wellbeing of healthcare professionals

- 1.1 Method
- 1.2 What is wellbeing
- 1.3 Job demands & resources
- 1.4 Commitment
- 1.5 Consequences of wellbeing
- 1.6 General remarks about research done on wellbeing



Source Image: Erasmus MC. (n.d.). Wat vindt u van onze dienstverlening? - Erasmus MC. <https://www.erasmusmc.nl/nl-nl/patientenzorg/klachtenopvang-en-klachtenbemiddeling>

Introduction

The wellbeing of physicians can heavily impact the quality and safety of patient care and the vitality of our healthcare system as a whole (Bohman et al., 2017). What is important to note about this is that wellbeing is not just the absence of burnout but rather the optimal state of physical, mental, and social health (Health and Well-Being, n.d.).

The other extreme of burnout, on the scale of wellbeing, is professional fulfillment. We see that professionally fulfilled physicians, who find happiness, self-worth, self-efficacy, and satisfaction in their work, not only deliver better clinical care but also are more likely to lead efforts to improve the healthcare system. Thus, not only benefiting their patients better but also the system as a whole. Unfortunately, we are currently witnessing a troubling trend of diminishing professional fulfillment alongside a rise in burnout rates.

Three major domains are found that impact the wellbeing of healthcare professionals:



Efficiency of practice

Defined by on one hand the *value of clinical work tasks accomplished* divided by on the other hand *the time and energy spent*. This is influenced by workplace systems, processes, and practices. An example of this is the electronic medical records. This domain is influenced most by the whole healthcare system with some influences of the organization.



Culture of wellness

The values, attitudes, and behaviors that promote *self-care and growth*. It is about the culture within an organization where *appreciation, support, and compassion* can be found, together with a sense of community. An example of this is peer support programs. This domain is mostly defined by an organization or even a department within an organization.



Personal resilience

The skills, behaviors, and attitudes that contribute to *personal physical, emotional, and social wellbeing*. Especially in a healthcare environment, it is very important that physicians pursue these healthy personal behaviors. This domain is mainly focused on the individual healthcare professional.

1.1 Method

In order to explore the wellbeing of healthcare professionals, a desk research methodology was employed. Data was collected and analysed from books, papers, reports, and other sources. The goal of this was to do a first deep dive into the subject, learn about the importance of healthcare professional wellbeing, learn about the main struggles found today and use it as a base to set up the interview guide used in the later stage.

A systematic search of electronic databases and (online) libraries was conducted using (among others) the following keywords:

"healthcare professionals wellbeing,"
"electronic health record (EHR) impact,"
"clinician burnout,"
"administrative burden in healthcare,"
"job satisfaction in healthcare,"
and "patient care quality."

1.2 What is wellbeing

Wellbeing can be seen as a scale with burnout on one end, and professional fulfillment on the other. So to understand wellbeing, it is important to understand both of the extremes of the scales.



Burnout

On the negative pole of the spectrum, we see burnout. This is typically seen in professions involving a lot of human interactions. Burnout can be characterized by three elements.



Emotional exhaustion

A feeling of being overextended and exhausted by the emotional demands of one's work (Demerouti et al., 2001).

Emotional exhaustion is often related to workload, role-problems and other job stressors (Schaufeli & Enzmann, 1998).

The complaints that can be the result of this are fatigue, (job-related) depression, psychosomatic complaints, and anxiety (Buunk et al., 1998).

The results of emotional exhaustion are higher turnover intentions & absenteeism (Lee & Ashforth, 1996)



Depersonalization

A detached and cynical response to the recipients of one's service/care. Depersonalization is also often used as a coping mechanism, used to decrease the intensity of unpleasant experiences, ranging from mild stress to chronically high anxiety (Demerouti et al., 2001).

The complaints that can be the result of this are withdrawal or mental distancing from recipients (Cherniss, 1980).

The results of depersonalization are alienations, disengagement and cynicism about the job and work role (Demerouti et al., 2001).



Reduced personal accomplishments

A self evaluation that one is no longer effective in fulfilling their job responsibilities and working with recipients (Demerouti et al., 2001).

Reduced personal accomplishments are often related to self-efficacy, which is the belief in one's own abilities (Bandura, 1986).

The complaints that can be the result of this are a decreased productivity, substance abuse, and suicidal thoughts.

The results of depersonalization are reduced physician productivity, less patient access and increased physician turnover (Demerouti et al., 2001).

This first way of describing Burnout comes from the Maslach Burnout Inventory (MBI), which is considered the gold standard for measuring burnout and is the most used one. The main critique on this one however, is that the scales are very one sided, since it doesn't include both the positive & negative aspects. The other critique is that it does not include a threshold or level on the scales that indicate that the burnout is in a stage of which the effects are detrimental or have negative consequences. For these reasons, it is interesting to also look at the Oldenburg Burnout Inventory (OLBI). The OLBI closely resembles the MBI, but does include 2 core dimensions which include both positive and negative framed items (Demerouti et al., 2001).



Exhaustion

The feeling of physical, emotional, and cognitive fatigue, often due to prolonged exposure to demands. This is the stress component of burnout.



Disengagement

The distancing from one's work, including a negative attitude towards the job and the content of the job. This is the motivational component of burnout.

As already mentioned, these two inventories have similarities. These similarities can be seen in the exhaustion from the OLBI and the emotional exhaustion from the MBI, also in the disengagement from the OLBI and the depersonalization from the MBI. Which means that the reduced personal

accomplishments or something similar, is not included in the OLBI (Williamson et al., 2018).

With these considerations in mind, the MBI will be the main inventory used to look at burnout in my research. This is since I will not be measuring whether healthcare professionals are burned out, but rather look at which factors come into play when looking into wellbeing & the negative pole of burnout.

Professional fulfillment

On the other side of the spectrum of wellbeing, we can see professional fulfillment. It can be seen as the intrinsic rewards someone get from doing their job and can contribute to a higher level of job satisfaction. This is a state of finding satisfaction, engagement, happiness, and meaningfulness in one's work. It can be viewed as the beneficial outcomes stemming from one's professional life. This explanation makes it clear that fulfillment is not just the absence of negative feelings of burnout, but the presence of positive experiences and feelings from one's job. This illustrates why it is important to look at both of the poles from the wellbeing spectrum, rather than just focussing on the absence of burnout. Even if a healthcare professional isn't burned out, they may still not feel professionally fulfilled. We see that professionally fulfilled healthcare professionals deliver better care and are better able to cope with stress, thus benefiting themselves, the patient and the hospital as a whole (Trockel et al., 2017).

Engagement

The professional fulfillment, the positive side of the wellbeing scale, consists mainly of intrinsic rewards and feelings someone gets from their work. One of the components of professional fulfillment, engagement, is one that I want to explain a bit further. This is because engagement is further defined by the Utrecht Work Engagement Scale (UWES) in three dimensions that can be seen as the opposite of the three dimensions of MBI (Mills et al., 2011):



Vigor

High levels of energy and mental resilience while working, willingness to invest efforts in one's work, persistence even in the face of difficulties (Schaufeli et al., 2002).

It can be defined by physical strength, emotional energy and cognitive alertness (Shirom, 2011).

The result of vigor are a better work performance, increased adaptability, increased ability to learn new skills (Cortés-Denia et al., 2022), and a sustainable employability (Kodden, 2020).



Dedication

Strong involvement in one's work, experiencing a sense of significance, enthusiasm, inspiration, pride and challenge.

It can be defined by the degree of involvement in one's work and the extent to which someone sees their

work as meaningful and rewarding (Schaufeli et al., 2002).

The results of dedication are improved job satisfaction & performance, positive workplace culture and enhanced employee retention (Mills et al., 2011).



Absorption

Fully concentrated and engrossed in one's work, time passes quickly.

It can be defined as a state of flow where someone is completely involved in their work and enjoys the work activities (Schaufeli et al., 2002).

The results of absorption are increased productivity and creativity and personal development (Mills et al., 2011).

So looking at all of these findings, there are multiple ways to define wellbeing. In this project, the MBI and the UWES will be the main scales used to define wellbeing. Taking these two together, we get a definition outlined in figure 1.

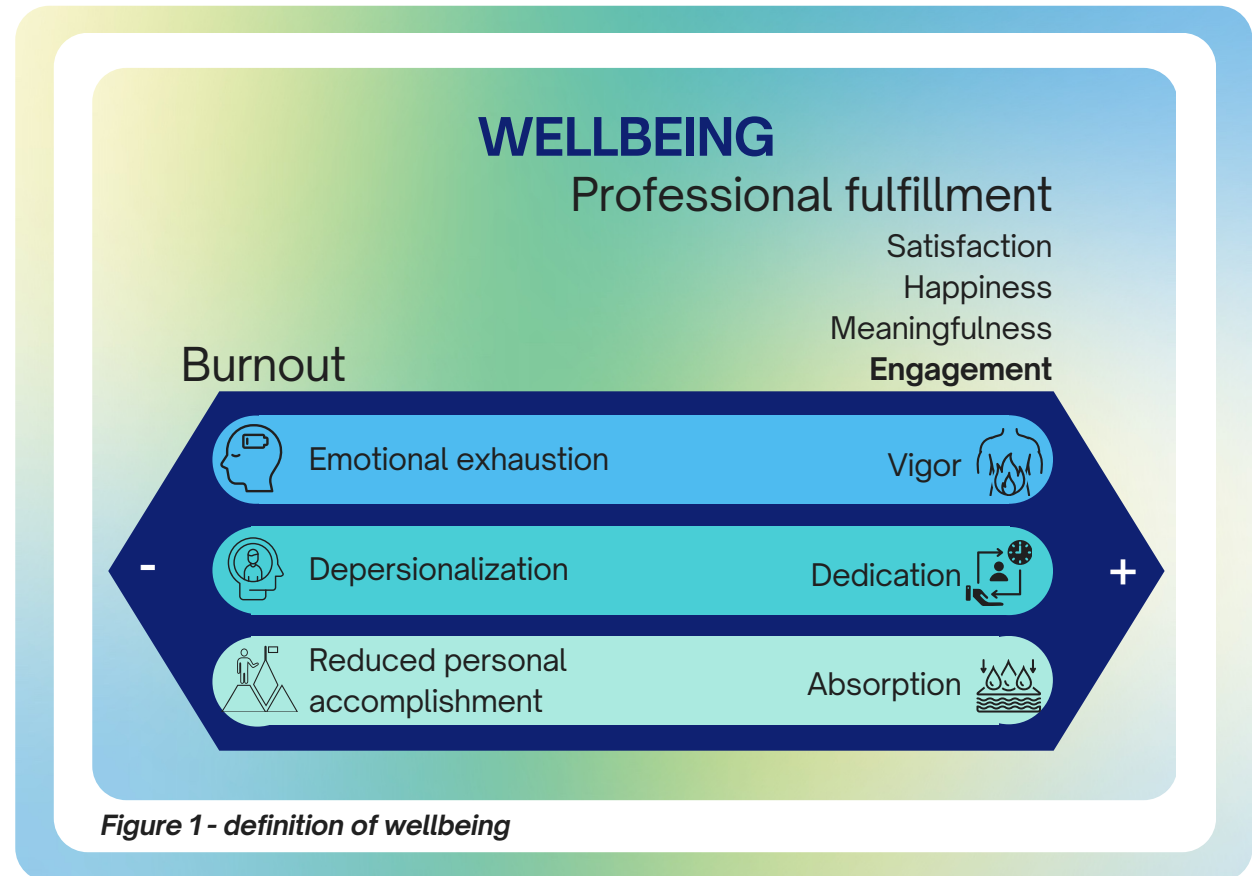


Figure 1 - definition of wellbeing

1.3 Job demands & resources

With wellbeing being defined, it is important to look at what factors come into play that affect someone's wellbeing. Understanding where an individual falls on the wellbeing spectrum is complex, however, we can look at the factors that play a role in defining where someone is on the scale. The most commonly used framework is the job demands & resources model, which describes what a job is asking from a professional (job demands) and what tools are in place to help the professional (job resources) (Demerouti et al., 2001).

Job demands

These are the aspects that require physical and/or psychological effort from the healthcare professional. They are associated with certain physiological and psychological costs and can lead to burnout, particularly the emotional exhaustion component of it. The key job demands are (Cordes & Dougherty, 1993; Lee & Ashforth, 1996; Friedman, 1991):



High workload

This includes training demands, research requirements, off-work study, and work-home conflicts (Verweij et al. 2017). High workload can lead to low job autonomy, which impacts the engagement and increases the risk of burnout (Ogundipe et al., 2014).



Time pressure

This stems from having too many tasks and too little time to do it. It can be seen in many jobs, but more often in fast paced or high stakes environments such as healthcare. It leads to a sense of urgency, which can cause a feeling of rush, stress and overwhelmed (Lee & Ashforth, 1996).



Patient contact

The interactions with patients are the centre of this aspect. It is both the load of patients, as well as the nature of the interaction. The way they have to act and communicate around patients calls for surface acting, which calls for a way of behaviour around the patient that is often contrary to how they actually want to behave. This is especially prevalent in younger doctors. It can in a feeling of inauthenticity and personal conflict (Castelo-Branco et al. 2007).



Work environment

The hierarchical and competitive culture in the medical field can lead to limited space for expressing feelings and vulnerability. It can also increase the workload for residents (AIOs in dutch), as they feel the need to prove themselves (Verdonk et al. 2014).



Shift work

Long shifts, being on call, the overtime, and the irregular schedule that comes with the healthcare profession can affect the mental health (Elmore et al. 2016; Ringrose et al. 2009). This is because shift work is proven to disrupt the body's circadian rhythm, which leads to fatigue. Another factor that contributes here is that the irregular hours and shift work make it more challenging to maintain a healthy work life balance, since the non standard hours interfere with social and family life (Gu et al., 2023).



Work outcomes

There is a high uncertainty about task outcomes in the healthcare sector, with a potential for negative results, and even patient death as a worst case. This leads to feelings of uncertainty and can impact decision making and stress levels (Simpkin et al., 2018).



Personal demands

Personal factors that come into play, such as stress from life events, mental health issues, maladaptive coping behaviors, etc. can also heighten the feeling of the demands experienced at work. These factors are however more challenging to address at an organizational level (Jackson et al., 2017; Kroska et al., 2017).

Job resources

These are the aspects that help a professional meet work demands, achieve work goals and promote personal growth. These can help to lead to professional fulfillment and engagement. The key job resources are (Leiter, 1990; De Jonge & Schaufeli, 1998; Rijk et al., 1998):



Social support

Emotional & instrumental support, together with adequate feedback about performance can help reduce stress, increase job satisfaction and in turn lower turnover intentions. The quality of supervision also plays a role in this, as this affects the perception of job demands and enhance job performance (Richter et al., 2014; Myers et al., 2018).



Skill utilization & development opportunities

These can impact the employees' work experience and outcomes. They allow employees to use their existing skills in an effective way, while they can also

acquire new skills, leading to positive outcomes. This leads to improved performance and increased engagement (Verweij et al., 2017).



Autonomy & participation

Having control over one's work and being involved in decision making can reduce stress and enhance work engagement (Chung, 2017; Muecke et al., 2020).



Job security & feedback

These contribute to stability and growth, which reduce stress and improve performance (Asfaw & Chang, 2019).



Personal resources

Personal traits like resilience and empathy can act as resources, but also gender, family dynamics, personal health, can be seen as resources, even though they are more challenging to address at an organizational level (Lee et al. 2017).

What is also good to note about the demand resource model, is that the job demands and resources also interact with each other. If the job resources are experienced as very good, people tend to experience the demands as lower. The other side can also be true, if someone experiences high job demands, they may not see the job resources as high (Demerouti et al., 2001). An overview of how this interact with each other and with the wellbeing scale can be found in figure 2.

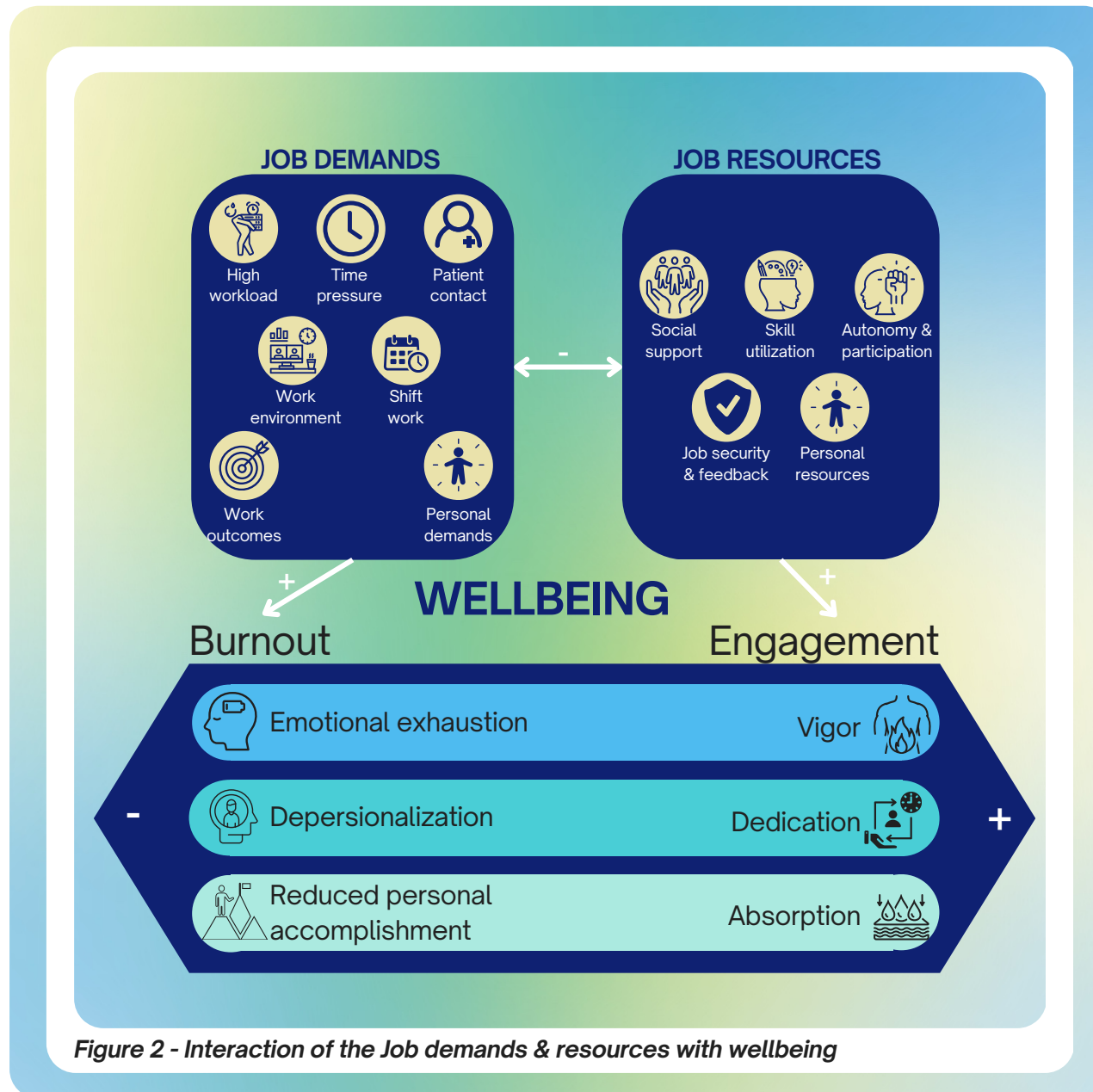


Figure 2 - Interaction of the Job demands & resources with wellbeing

Categorizing the job demands & resources

Looking at all these job demands and resources, we can see that they all play at different levels: healthcare system level, organizational level and personal level. With a healthcare system level, we can see things that are happening across the whole sector and simply “come with the job”. On an organizational level, we see the things, that are organized by the institution a healthcare professional works for, in this research, the institution will be the Erasmus MC, and more specifically

the department of gastro-intestinal oncology surgery. Differences that you can see in this level between healthcare professionals are the differences between institutions or departments. Lastly, the personal level is aimed at the healthcare professional itself and the demands and resources that we see that fit this level, are very personal and can differ greatly between healthcare professionals. How the different job demands and resources fit these different levels can be seen in figure 3. When fitting the job demands & resources to these levels, we can also

see 3 domains that we can form that affect wellbeing are:

- **Efficiency of practice:** Workplace systems, processes & practices
- **Culture of wellness:** Culture of appreciation, support & compassion in an organization
- **Personal resilience:** Skills, behaviors and attitudes of an individual that contribute to different forms of wellbeing

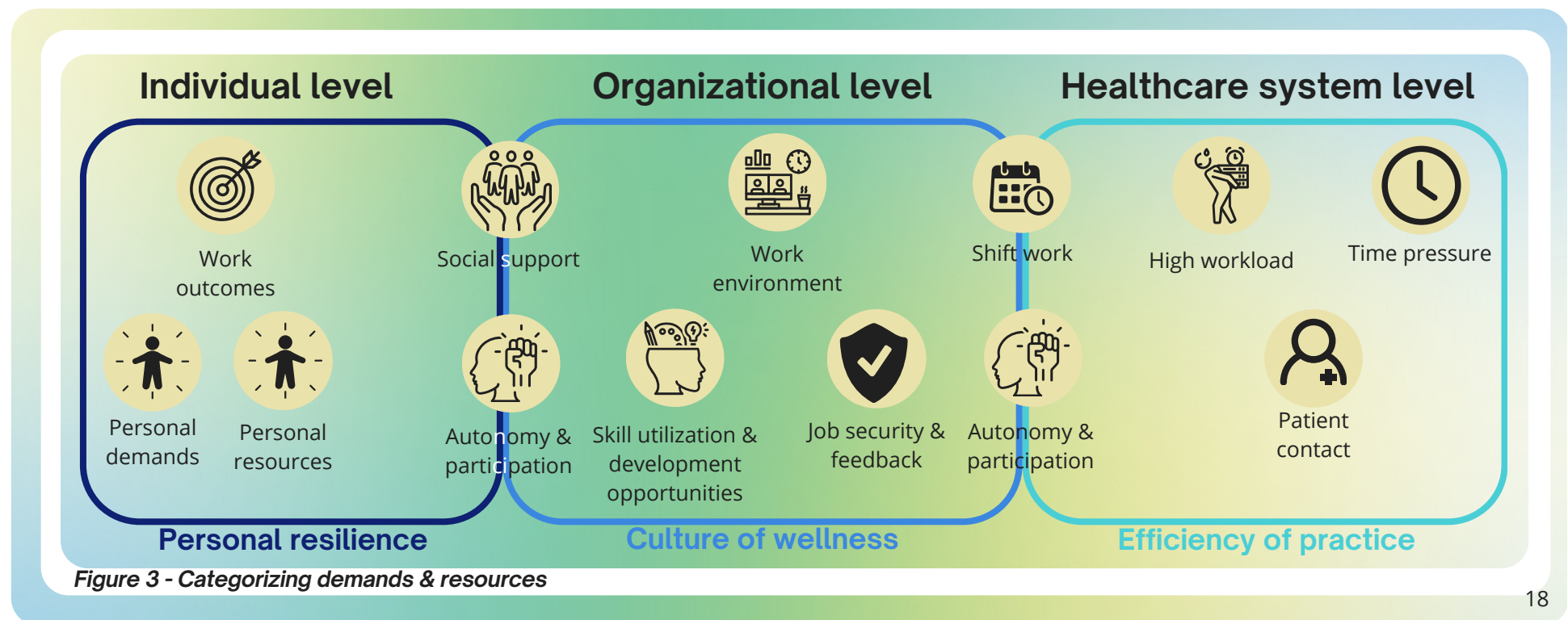


Figure 3 - Categorizing demands & resources

1.4 Commitment

One of the factors that have not been highlighted in these models yet is commitment. It is however a significant factor that is associated with wellbeing. It can be defined as the level of commitment an individual feels towards their profession. It is influenced by the position of an individual on the well-being scale. Work commitment can serve as a buffer against burnout and a facilitator of engagement. There are different forms of work commitment and all of them have a different work outcome.

- Organizational commitment
- Occupational commitment
- Job involvement
- Work involvement
- Protestant work ethic

How commitment interacts with wellbeing, can be seen in figure 4.

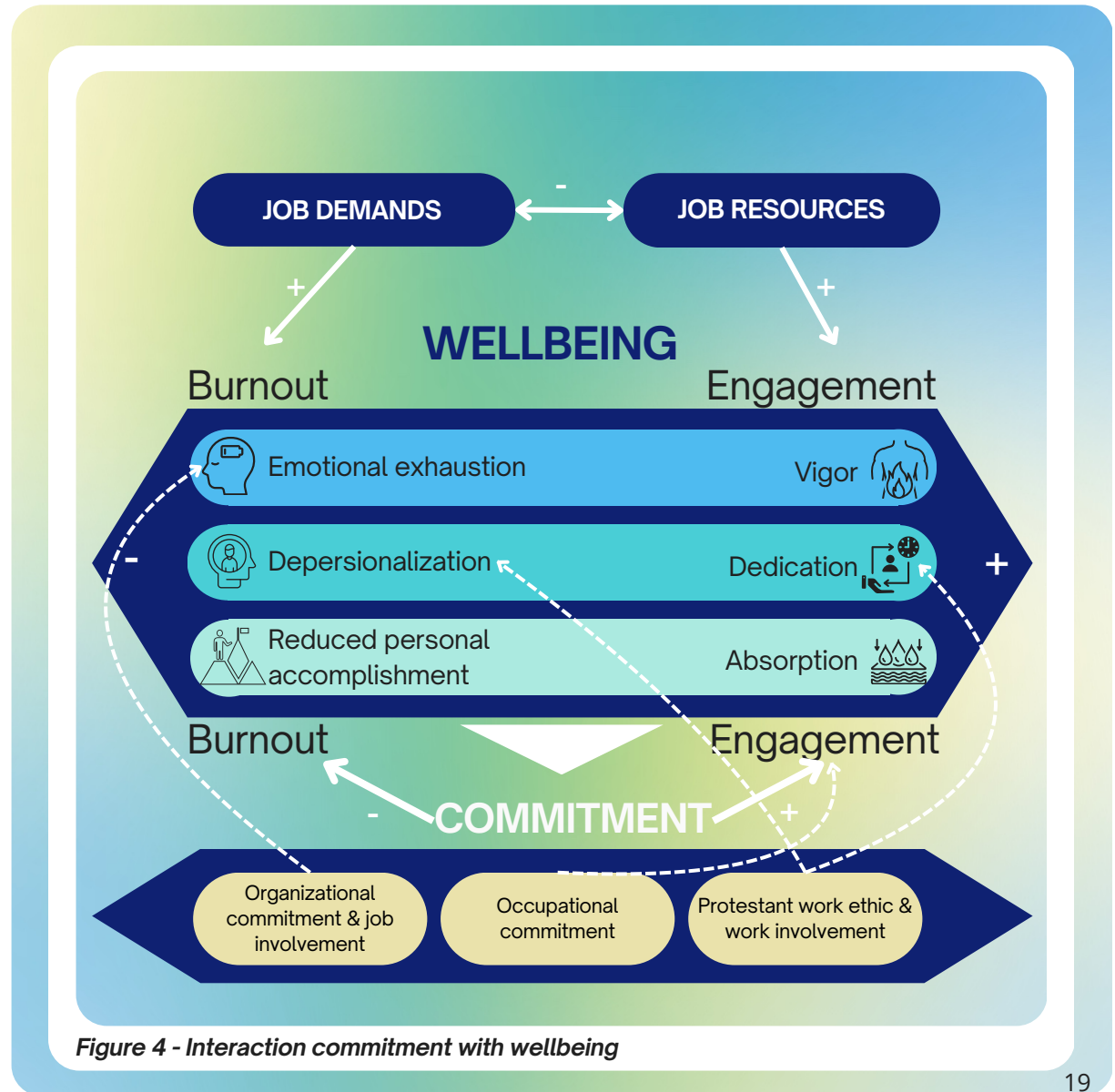


Figure 4 - Interaction commitment with wellbeing



Organizational commitment can be seen as the level of attachment a healthcare professional feels towards the organization they work for. It influences the professionals intent to stay at the organization (Fantahun et al., 2023).

Job involvement is the degree to which a healthcare professional identifies with their work, participates in it, and derives self-worth from it (Cohen, 1998).

Both of these have a direct impact on wellbeing. By fostering a work environment that promotes these aspects, they can enhance employee wellbeing and productivity, leading to better patient outcomes.

Organizational commitment & job involvement have a big impact on emotional exhaustion and, if present in high levels, can mitigate it (Fantahun et al., 2023).



Occupational commitment refers to the degree of dedication & attachment someone feels towards their profession. This is a crucial kind of commitment, especially in professions with a high degree of vocational dedication, personal identification & professional values, like in healthcare. The reason why this commitment is so crucial is because it is a key determinant of turnover (Luna et al., 2023).

This type of commitment has a more intermediate effect on wellbeing. This is mainly because of its mediating role between work-related factors, it can for example act as a buffer against negative work-related outcomes.

Occupational commitment has the highest effect on the engagement side of wellbeing, by enhancing vigor, dedication & absorption (Jain et al., 2009).



Protestant work ethic is associated with the belief that hard work and individual effort leads to success in someone's goals. It stems from the values of protestantism & there is often a belief of being destined for a certain purpose/job.

Work involvement is the degree to which an individual is engaged in their work and are driven by their beliefs & morals. Whenever someone is involved in their job, they often go beyond the minimum requirements of their role.

Both of these types of commitment have a long term effect on wellbeing, mainly because of their foundational influence on an individual's approach to work and life.

Protestant work ethic & work involvement have the highest effect on dedication & on depersonalization (Furnham, 2021).

1.5 Consequences of wellbeing

Now that we have a better understanding of wellbeing and which factors can influence the wellbeing, it is also important to look at what the consequences of wellbeing can be. The consequences can be categorized into job-related and personal related consequences and the impact it has on stakeholders. Understanding the consequences is a crucial part of demonstrating the importance of the wellbeing of healthcare professionals. How all of these consequences relate to wellbeing can be seen in figure 5.

Job related outcomes



Withdrawal & turnover intentions

Withdrawal is a consequence of burnout can disrupt the continuity and quality of care. It can start with absenteeism and lead to quitting. Whenever a feeling of engagement is experienced, employees are less likely to consider quitting their job.



Job attitude & behavior

The feeling reduced personal accomplishments and self efficacy can

lead to a disengaged and unmotivated staff. But when Vigor & dedication is experienced, proactive behavior can be seen, which leads to innovation & problem solving.



Healthcare system

The wellbeing of healthcare professionals can determine physician productivity, turnover, and overall costs, thereby affecting the system as a whole.



Performance

Errors and malpractice can compromise patient safety & care quality, and can be seen especially when wellbeing is reduced. On the other side, when engagement is high, work performance is often higher.



Healthcare professionals

Professionals with a reduced wellbeing are more prone to substance abuse, depression, poor self care, motor vehicle accidents or suicidal ideation.

(Hariharan & Griffin, 2019; Loerbroks et al., 2017)

Personal related outcomes



Social

A decrease in empathy, which is vital in a healthcare setting, is a consequence of burnout.



Health

With burnout comes a decrease in psychological & physical health, leading to depression, anxiety and being more susceptible to illness. On the other hand, with high engagement comes a better psychological and physical health.

Effect on stakeholders



Patients

The quality of care is influenced by the wellbeing of the healthcare provider, influencing the chance of errors, recovery time, and patient satisfaction.

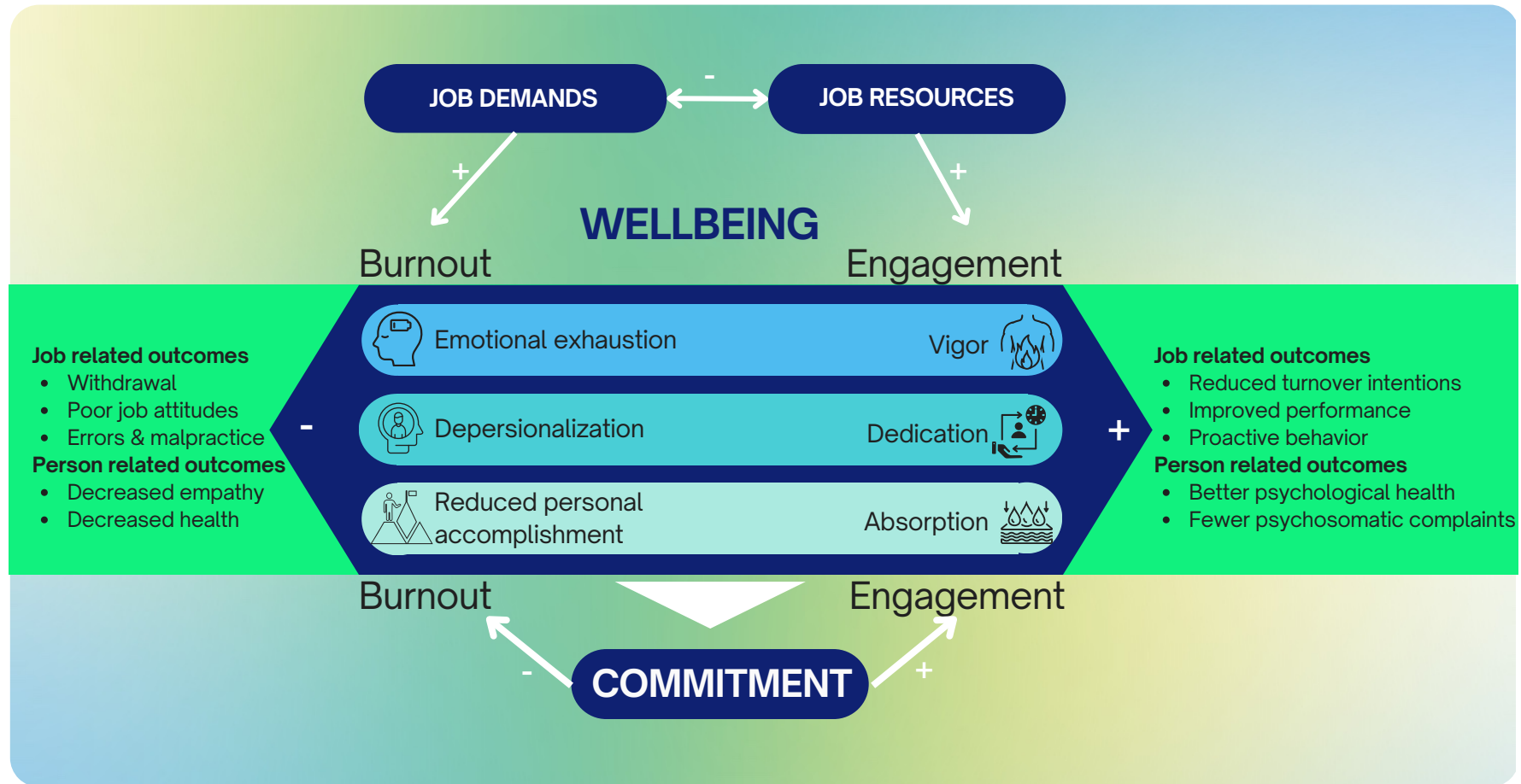


Figure 5 - Consequences of wellbeing

1.6 General remarks about research done on wellbeing

In examining the literature on the wellbeing of healthcare professionals, two primary themes emerge:

- The bulk of this research is quantitative, providing a broad understanding of factors affecting wellbeing but lacking specific, real-world examples.
- There is a significant emphasis on quantifying burnout and wellbeing, offering a general view of the challenges within the healthcare sector but falling short in detailing the interactions between different factors or providing actionable insights for intervention.

From a strategic design viewpoint, while these research foundations are valuable, a fresh perspective is necessary to develop effective interventions for healthcare professionals. This necessitates a closer examination of the significance of these themes.

Quantitative Research

Quantitative studies dominate this field, offering insights into the various elements influencing wellbeing. However, this approach often results in an abstract overview, lacking tangible examples. For strategic design to effectively address the needs of healthcare professionals, it is crucial to have concrete examples of their current challenges.

Measuring Wellbeing

Research focusing on measuring wellbeing and burnout rates provides a clear picture of the existing problems in healthcare. Yet, it does not fully explore how these factors interact or their implications, making it difficult to devise targeted interventions.

To enhance the existing body of research, my project aims to compile a comprehensive overview of wellbeing aspects and explore a model for their interrelation. This has been initiated in the first chapter, with subsequent chapters two and three focusing on identifying specific intervention opportunities. This involves examining the literature on documentation burdens and conducting qualitative interviews with healthcare professionals in the gastro-intestinal oncology surgery department at Erasmus MC. These steps are designed to gain a deeper understanding of the challenges faced and identify the most critical issues for intervention.

Conclusion

The wellbeing of healthcare professionals is a multifaceted concept that spans a spectrum from burnout to professional fulfillment and engagement. Burnout is characterized by emotional exhaustion, depersonalization, and reduced personal accomplishment, while engagement is marked by vigor, dedication, and absorption. The position of healthcare professionals on this wellbeing scale is influenced by job demands and resources, which can be categorized into three domains: personal resilience, culture of wellness, and efficiency of practice.

Job demands such as high workload, time pressure, and patient contact can lead to burnout, particularly if not balanced by adequate job resources like social support, skill utilization, and autonomy. These resources not only help professionals meet work demands but also promote personal growth and fulfillment. Additionally, occupational commitment plays a critical role in healthcare, acting as a key determinant of whether professionals consider leaving their job.

Despite the predominance of quantitative research in this field, which focuses on measuring wellbeing, there is a need for a more nuanced understanding of how these factors interact and influence each other. This understanding is crucial for developing targeted interventions that can enhance the wellbeing of healthcare professionals, ultimately benefiting the individuals, their patients, and the healthcare system as a whole.

Key take-aways

- 1.1 Wellbeing is a scale that ranges from burnout to professional fulfillment/engagement
- 1.2 Burnout is characterized by emotional exhaustion, depersonalization and reduced personal accomplishments
- 1.3 Engagement is characterized by vigor, dedication and absorption
- 1.4 The job demands and resources are the factors that influences where a healthcare professional is on the wellbeing scale
- 1.5 The job demands and resources can be categorized in the domains of personal resilience, culture of wellness and efficiency of practice
- 1.6 Occupational commitment is crucial in jobs like healthcare and is the key determinant on whether someone is considering leaving the profession
- 1.7 Mainly quantitative research is done on the subject and is mostly on how we can measure wellbeing, lacking concrete examples of where improvement is needed

2. The administrative burden

- 2.1 Documentation burden
- 2.2 The HITECH act
- 2.3 System Usability Scale



Source Image: Stip op de horizon voor patiëntgerichte zorg. (2022, October 17). Amazing Erasmus MC. <https://amazingerasmusmc.nl/kno/stip-op-de-horizon-voor-patientgerichte-zorg/>

Introduction

The administrative burden in healthcare has increasingly become a focal point of concern, particularly with the advent and widespread adoption of Electronic Health Records (EHRs). While the primary intention behind the introduction of EHRs was to streamline patient data management and enhance the efficiency of healthcare delivery, the reality has unfolded differently for many healthcare professionals. The shift towards digital documentation has significantly altered work dynamics and workflows, often leading to a reduction in direct patient interaction and an increase in administrative tasks. This shift has profound implications for healthcare professional wellbeing, as the increased documentation burden can contribute to burnout and reduce job satisfaction. Understanding the nuances of this burden, its origins, and its impacts is crucial for developing strategies to mitigate its negative effects on healthcare professionals and, by extension, on patient care quality.

2.1 Documentation burden

What is documentation burden?

The transition from paper-based records to Electronic Health Records (EHRs) marked a significant shift in healthcare documentation practices. Initially, this shift was promised as a move towards greater efficiency and improved patient care management. However, it also resulted in an increase in the volume and complexity of documentation required from healthcare professionals (Budd, 2023). This increase is attributable to the capabilities of EHR systems to capture a wide array of data points and the growing demands from various stakeholders, including healthcare organizations, insurance providers, and regulatory bodies, for detailed and structured documentation (figure 6). As a result, a significant portion of healthcare professionals' time is now diverted from direct patient care to administrative tasks, impacting their workflow, job satisfaction, and ultimately, their wellbeing (Tai-Seale et al. 2017).

*Documentation burden is a prominent example of a job demand that falls within the domain of efficiency of practice**, as defined in the broader context of healthcare professional wellbeing. It not only increases the workload on healthcare

professionals but also affects their autonomy. The autonomy of healthcare professionals is compromised as they are required to navigate complex EHR systems, ensure accuracy, and comply with regulatory requirements, all of which limit their discretion and control over their work processes. *This burden is one of the few concrete examples of job demands that has been extensively researched and associated with reduced healthcare professional wellbeing**.* The documentation burden, therefore, represents a critical area of concern that needs to be addressed to improve the overall wellbeing of healthcare professionals.

This increase not only adds to the workload of healthcare professionals but also constrains their autonomy, forcing them to spend considerable time and cognitive effort on documentation at the expense of patient interaction. The

documentation burden has been identified as a key job demand associated with reduced wellbeing among healthcare professionals, highlighting the need for interventions to mitigate its impact and enhance the quality of healthcare delivery (Gesner et al., 2022).

***Key take away 1.5 The job demands and resources can be categorized in the domains of personal resilience, culture of wellness and efficiency of practice**

****Key take away 1.7 Mainly quantitative research is done on the subject and is mostly on how we can measure wellbeing, lacking concrete examples of where improvement is needed**

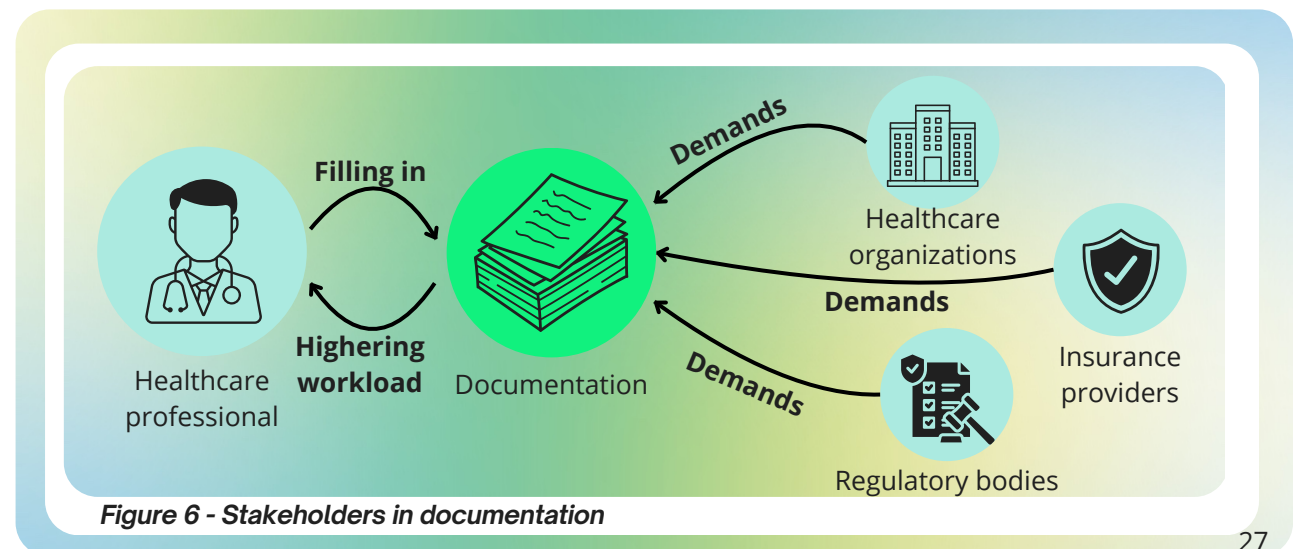


Figure 6 - Stakeholders in documentation

The effect of documentation on Healthcare professional wellbeing

The impact of the documentation burden on healthcare professional wellbeing is multifaceted and profound. At its core, the *increased time and mental energy devoted to documentation tasks can lead to emotional exhaustion**, one of the key components of burnout. This exhaustion is compounded by the *depersonalization that can occur when healthcare professionals spend more time interacting with computer screens than with patients**, leading to a sense of disconnection from the very essence of their work. Furthermore, the *pressure to maintain high levels of accuracy and detail in documentation can contribute to a sense of reduced personal accomplishment**, as professionals may feel that their skills and efforts are not being directed towards meaningful patient care (figure 7). The cumulative effect of these factors can shift healthcare professionals away from the engagement end of the wellbeing spectrum, characterized by vigor, dedication, and absorption in their work, towards burnout. This shift not only affects individual healthcare professionals but also has broader implications for patient care quality and healthcare system efficiency.

**Key take away 1.2 Burnout is characterized by emotional exhaustion, depersonalization and reduced personal accomplishments*

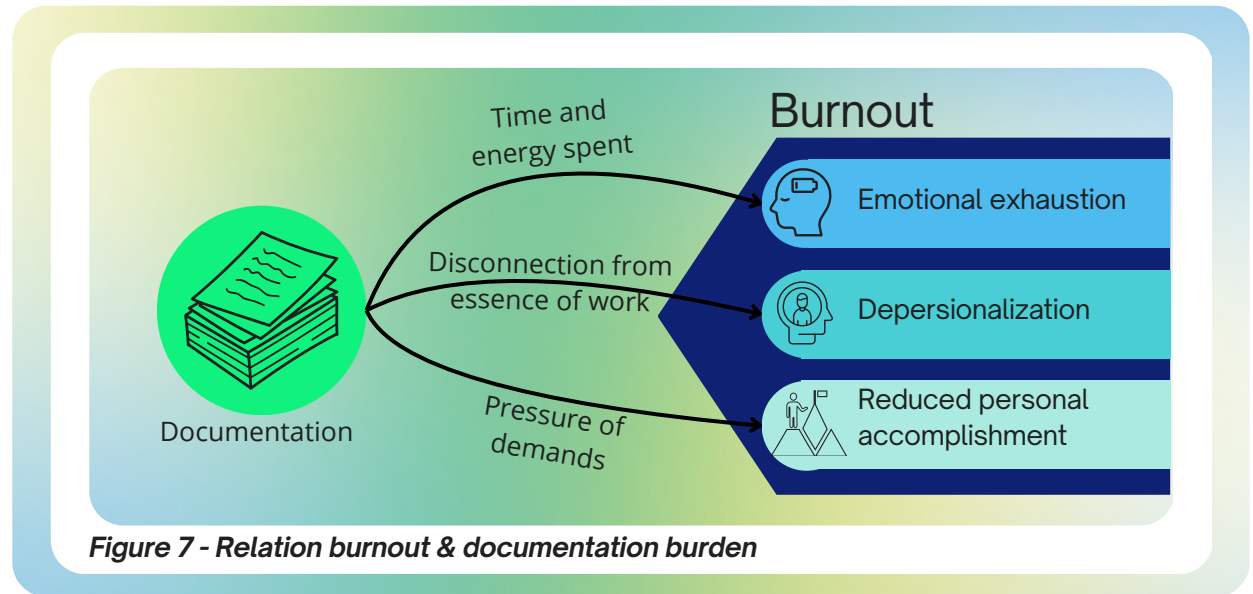


Figure 7 - Relation burnout & documentation burden

2.2 The HITECH act

The Health Information Technology for Economic and Clinical Health (HITECH) Act, enacted in 2009, played a pivotal role in accelerating the adoption of EHRs across the U.S. healthcare system. By providing financial incentives for the meaningful use of certified EHR technology, the HITECH Act aimed to improve the quality, safety, and efficiency of patient care. While the act has been successful in increasing EHR adoption rates, it has also contributed to the documentation burden faced by healthcare professionals. The requirements for demonstrating meaningful use include detailed and structured data entry, which has led to an increase in the volume of documentation required. Additionally, the act's emphasis on the use of EHRs for billing, quality reporting, and compliance purposes has further compounded the administrative tasks associated with patient care. While the HITECH Act has undoubtedly brought about significant advancements in healthcare delivery through technology, its unintended consequences on documentation burden warrant attention and action (Mennemeyer et al., 2015).

The Electronic Health Record (EHR/EPD)

Electronic Health Records (EHRs) have transformed the landscape of healthcare documentation, offering the potential for improved care coordination, enhanced patient safety, and more efficient healthcare delivery. However, the current implementation and use of EHRs have also introduced significant challenges for healthcare professionals. The complexity of EHR systems, combined with the extensive documentation requirements, has led to increased administrative tasks, reducing the time available for direct patient care. This situation is exacerbated by the often suboptimal usability of EHR systems, which can make documentation tasks more time-consuming and frustrating for healthcare professionals. Despite these challenges, EHRs remain a crucial component of modern healthcare infrastructure. Addressing the usability issues and streamlining documentation requirements within EHR systems are essential steps towards reducing the administrative burden on healthcare professionals and unlocking the full potential of EHRs to enhance patient care (Tai-Seale et al. 2017).

2.3 System Usability Scale

The System Usability Scale (SUS) is a tool used to evaluate the usability of various systems, including EHRs. The low scores that EHR systems have received on the SUS highlight the significant usability challenges that healthcare professionals face when interacting with these systems. With EHRs scoring (45.9) in the bottom percentile (9%) and receiving a usability grade of "F," it is clear that the current user experience is far from optimal. This poor usability not only contributes to the documentation burden but also exacerbates the stress and frustration experienced by healthcare professionals. Improving the usability of EHR systems is therefore a critical step towards alleviating the administrative burden and enhancing healthcare professional wellbeing. By focusing on user-centered design principles and involving healthcare professionals in the development and refinement of EHR systems, it is possible to create more intuitive and efficient documentation tools that support rather than hinder patient care (West et al., 2018).

Conclusion

The administrative burden in healthcare, particularly the documentation burden associated with EHRs, poses significant challenges to healthcare professional wellbeing and the overall efficiency of patient care. The HITECH Act, while instrumental in advancing the adoption of EHRs, has also contributed to the increase in documentation requirements. The current state of EHR usability, as reflected in low SUS scores, further exacerbates the burden on healthcare professionals. Addressing these issues requires a multifaceted approach that includes revising documentation requirements, improving EHR usability, and ensuring that healthcare professionals are supported in their administrative tasks. By taking these steps, it is possible to reduce the administrative burden on healthcare professionals, thereby enhancing their wellbeing, improving patient care, and ultimately contributing to a more effective and efficient healthcare system.

Key take-aways

- 2.1 The switch from paper to EHRs has increased documentation complexity and volume, shifting healthcare professionals' focus from patient care to administrative tasks
- 2.2 Documentation burden, a significant job demand, affects healthcare professionals' autonomy and workload, impacting their efficiency of practice
- 2.3 The HITECH Act's push for EHR adoption has inadvertently intensified the documentation burden by requiring detailed data entry for meaningful use
- 2.4 Poor EHR usability, reflected in low System Usability Scale scores, exacerbates the burden, indicating a need for user-centered design improvements

3. Themes to improve healthcare professional wellbeing

- 3.1 Method
- 3.2 Themes & analysis
- 3.3 Findings
- 3.4 Discussion



Source Image: Erasmus MC. (n.d.). Samen zorg - Erasmus MC. <https://www.erasmusmc.nl/nl-nl/sophia/patientenzorg/samenzorg>

Introduction

The healthcare sector is increasingly recognizing the importance of (occupational) well-being among its professionals. The engagement and satisfaction of healthcare workers are crucial not only for their personal health but also for the quality of patient care and the efficiency of healthcare delivery. The interviews conducted in this study aimed to explore examples of the job demands and resources contributing to the occupational well-being of healthcare professionals, with a focus on identifying bureaucratic demands that may lead to feelings of low task significance and exploring the underlying purposes behind their commitment to occupational well-being. By targeting gastro-intestinal oncology surgeons and nurse practitioners at the Erasmus MC, the research sought to gain insights from those directly involved in the treatment process of patients with gastro-intestinal cancer.

3.1 Method

Research purpose

The goal of the interviews was to investigate ways to enhance the engagement of healthcare professionals by understanding *examples of the job demands & resources that contribute to their occupational well-being**. Specifically, the study aimed to identify bureaucratic demands that may lead to feelings of low task significance and to *explore the underlying purposes behind their commitment to occupational well-being***. By examining these aspects, the research sought to uncover insights that could inform strategies to improve the work experience and satisfaction of healthcare professionals, ultimately leading to better patient care and more efficient healthcare delivery.

**Key take away 1.7 Mainly quantitative research is done on the subject and is mostly on how we can measure wellbeing, lacking concrete examples of where improvement is needed*

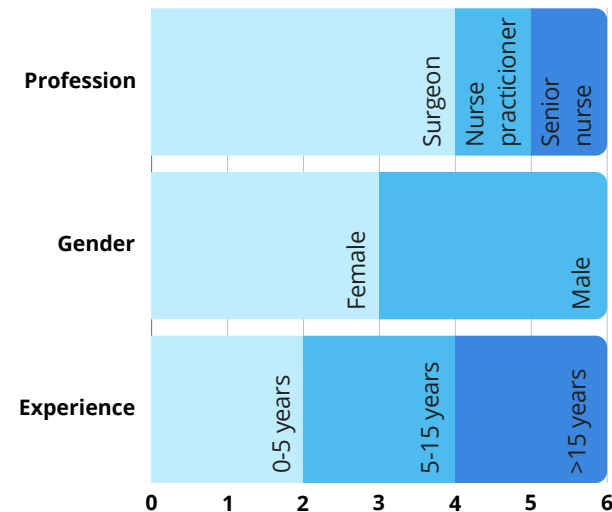
***Key take away 1.6 Occupational commitment is crucial in jobs like healthcare and is the key determinant on whether someone is considering leaving the profession*

Interview format

A semi-structured interview format was employed to allow for a guided yet flexible conversation. This approach enabled the exploration of specific topics while also providing the opportunity to delve deeper into areas of interest that emerged during the discussion. The interview guide can be found in appendix 2.

Participant selection

The study focused on a specific subset of healthcare professionals: gastro-intestinal oncology surgeons and nurse practitioners from the Erasmus MC. These individuals were chosen due to their direct involvement in the treatment process of patients with gastro-intestinal cancer, which requires a high level of expertise and patient interaction. The research group consisted of the following specifics:



Interview guide & tools

The interviews were conducted using a pre-designed interview guide, which ensured that all relevant topics were covered while still allowing for the natural flow of conversation. Additionally, a treatment journey was used as a tool to help participants identify and articulate the problem areas they encounter throughout the treatment process. This journey was created by example of Sun, Y. (2023), who already created the gastro-intestinal oncology journey from the patients perspective and of Peters, T. (2021) who included the different stakeholders in the patient journey. The journey created can be seen in figure 8, 9 and 10.

Duration

Each interview was designed to last approximately 30 minutes. This duration was chosen to allow sufficient time to cover the necessary topics without causing significant disruption to the participants' busy schedules.

Setting & consent

The interviews were conducted face-to-face, providing a personal and direct way to engage with the participants. Prior to the interview, each participant signed a consent form, which outlined the purpose of the research, the use of the information gathered, and the confidentiality measures in place to protect their privacy.

Diagnosis

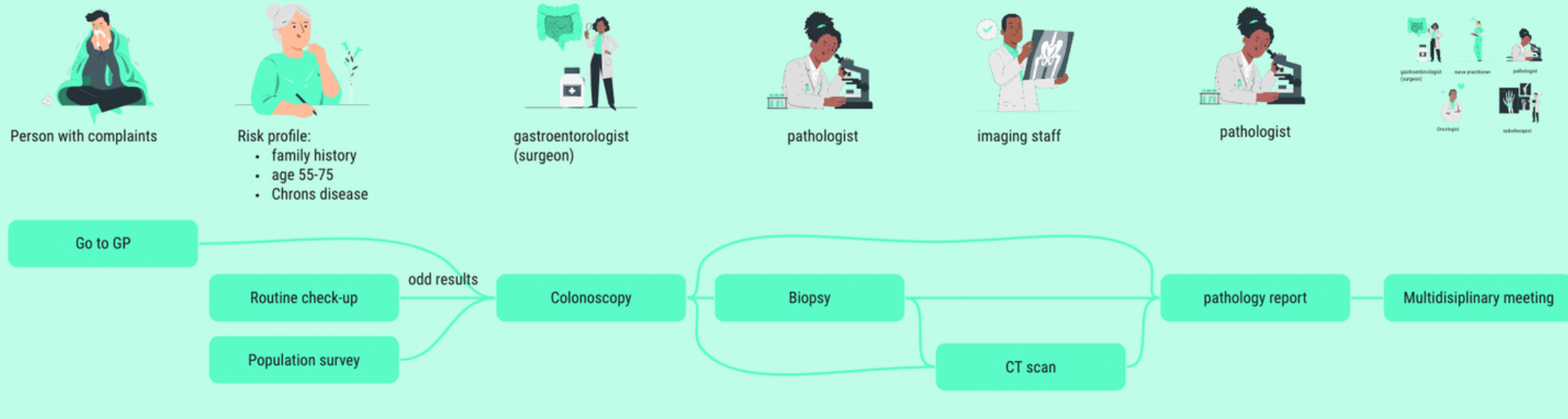


Figure 8 - Treatment journey diagnosis phase

Treatment

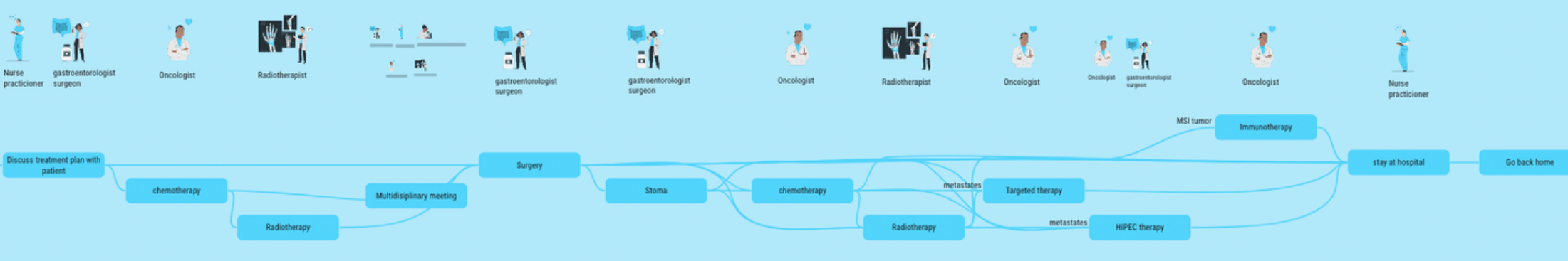


Figure 9 - Treatment journey treatment phase

5 year follow up

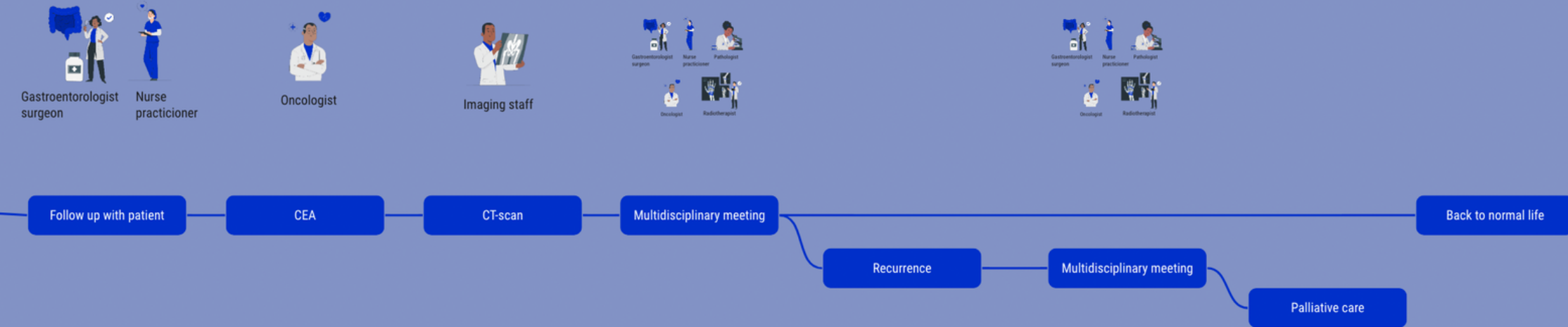


Figure 10 - Treatment journey follow-up phase

3.2 Themes & analysis

In the coding part of the analysis of the interview, the insights that were found can be categorized in multiple themes. The insights that were found in the interviews were around the following topics:



Administrative tasks



Communication



Peripheral matters



Time management & autonomy



Work culture & support



Work-life balance

For each of the topics some themes can be formed, accompanied with insights found in the interviews

These themes and insight can be classified under the 3 domains of wellbeing, described in the first chapter. Some of the themes and insights are also specific for a period in the journey.

The interviews were also used to get a better understanding of the treatment journey from the perspective of the healthcare professional & optimizing the journey using this information.

The rough output of the coding can be found in appendix 3.

3.3 Findings



Domain: Efficiency of practice

Efficient work methods in the domain of healthcare administration are crucial but often challenging due to the extensive and time-consuming nature of administrative tasks. These tasks, often imposed by regulations and financial matters, can lead to repetitive data entry and increased workload. The fear of litigation and the need for meticulous documentation further exacerbate the administrative burden. Ineffective support systems and the lack of evaluation of task usefulness contribute to the problem. Communication, while a rewarding aspect of the job, can be inefficient due to incomplete patient files and the involvement of multiple parties in procedures. Peripheral matters, such as technology issues and the inability to work ahead towards patient discharge, can also hinder efficiency. Time management and autonomy are critical, but meetings and procedural requirements can consume significant time.



Topic: administration

Theme 1: Efficiency and Time Management

*"I don't know the exact number, but I think I spend 70% of my time on administration." **

- **Time Consumption:** Administration tasks, particularly due to the use of EHRs, are highly time-consuming, detracting from patient care.
- **Data Redundancy:** The requirement to enter the same information across multiple forms leads to repetitive data entry, contributing to inefficiency and frustration.
- **Specialization Requirements:** The need for different specialists to access and input varying information adds to the time burden.
- **Medical Record Compilation:** Assembling a complete medical record is a time-intensive process, often hampered by inefficient EHR systems.
- **Outpatient Clinic Administration:** The administrative workload for outpatient clinics frequently exceeds the time spent in actual patient contact.
- **Inefficient Referral Transfers:** The process of transferring referrals to EHR systems is inefficient, lacking automation and necessitating manual input.

- **Multidisciplinary Team Meetings:** Preparation for these meetings involves considerable manual work, from compiling files to summarizing discussions.

Theme 2: Regulatory Compliance and Financial Management

"Of course the finances have to be right and I understands that it has to be done. There are also all kinds of quality registrations that are considered important by professional associations or insurers."

- **Regulatory and Financial Burdens:** Extensive administrative requirements are driven by regulations and financial matters, such as insurance paperwork and policy documentation.
- **Increasing Amount of Tasks:** New laws and regulations contribute to a growing list of documentation tasks, adding to the administrative load.
- **Diverse Operation Report Opinions:** Opinions vary on the necessity of operation reports, with some viewing them as unnecessary and others valuing them for reflection and research.

**To preserve the anonymity of the participants, I did not add personal information to the quotes*



Topic: administration

Theme 3: Support and Evaluation

"I did contact HiX myself and you get one conversation with someone who then recommends feature and then it turns out that it doesn't exist."

- **Inadequate Support:** The support systems in place, including software packages and help desks, are often deemed insufficient, leaving healthcare professionals feeling unsupported.
- **Lack of Task Evaluation:** There is an absence of systematic evaluation to assess the usefulness or necessity of administrative tasks, despite the increasing workload.
- **Fear of Inaccuracy:** Healthcare professionals fear the repercussions of incorrect paperwork, such as complaints or the need for corrections, even in environments without a prevalent claim culture like the U.S.



Topic: communication

Theme 4: Communication and Patient Experience

"the data we need to receive is not always complete."

- **Optimal Patient Communication:** Challenges in reaching patients and long wait times can negatively impact the patient experience, especially when patients have traveled significant distances for care.
- **Complete Patient Files:** The time-consuming process of obtaining complete patient files from referring parties often requires additional communication and can delay care delivery.

Theme 5: Team Coordination and Care Planning

"It depends a bit on what your plan is, so when you want to operate on someone, you have to request an operation."

- **Multidisciplinary Team Meetings (MDO):** These meetings are essential for discussing patient care among colleagues and are most effective when all participants are well-prepared.
- **Operation Requests:** Coordinating operations involves numerous requests to different specialists, which can be a time-intensive process.

Theme 6: Patient Care Transitions and Workflow

"Well, the discharge, it's really a pain in the ass. Getting the help that patients need at home simply does not fit in well with a patient's medical readiness."

- **Home Care and Discharge Delays:** The availability of home care or care hotels is a bottleneck in discharging patients, leading to extended hospital stays and a lack of available beds for new patients.
- **Discharge Process Complexity:** The discharge process involves multiple parties and coordination issues among them can lead to delays and frustration.



Topic: Peripheral matters

Theme 7: Technological Integration and Limitations

"Yes, you notice that for the patients in particular. Web consult is nice, because of course they often come here from far."

- **Web Consultations:** They offer the convenience of reducing travel stress but may be perceived as impersonal and are subject to technical difficulties.
- **Technology Limitations:** Healthcare professionals encounter challenges with technology, such as incompatible codes or suboptimal system performance, which can impede their work.

Theme 8: Administrative Efficiency and Support

"The secretariat is limited medically trained, so they do not have the insight to assess the files and we have to do it."

- **Medically Trained Secretariat:** A secretariat with medical training can alleviate the workload by pre-assessing patient files, ensuring necessary documents are prepared in advance.
- **Discharge Process:** Limitations in the system's ability to facilitate advance preparation for patient discharge lead to inefficiencies and potential delays.



Topic: Time management & autonomy

Theme 9: Time Management and Allocation

"We have quite a few meetings about all kinds of things."

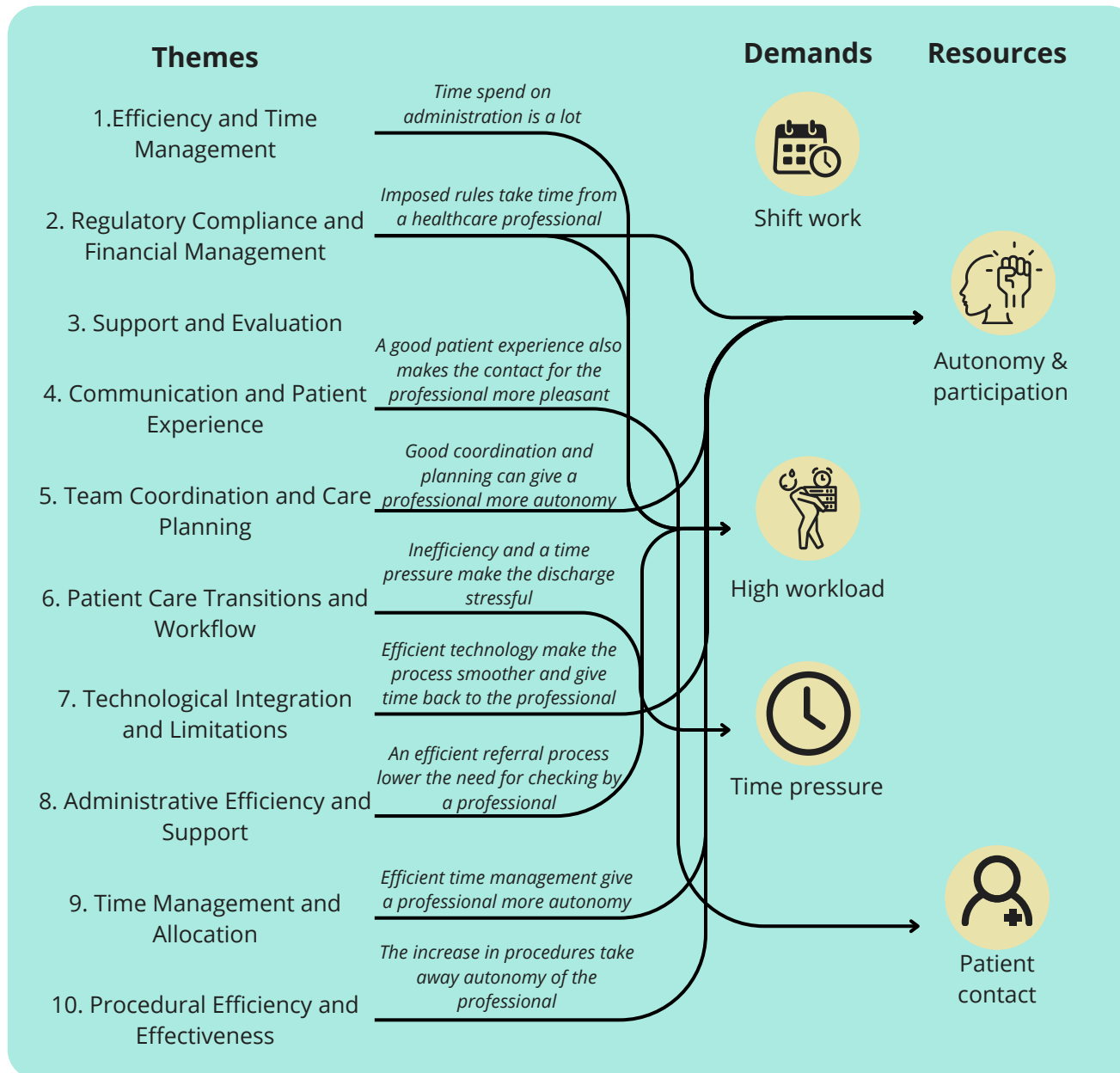
- **Meetings:** A significant amount of healthcare professionals' time is consumed by meetings, reducing the time available for direct patient care and research activities.
- **Procedural Time Consumption:** The time required to implement various procedures, such as the TOP procedure and obtaining informed consent, places a substantial burden on healthcare professionals.

Theme 10: Procedural Efficiency and Effectiveness

"I used to have 45 minutes to do all kinds of things. Now it should be OR for the TOP procedure."

- **Implementation of Procedures:** While procedures are theoretically beneficial, the practical time burden they impose can detract from the overall efficiency and effectiveness of healthcare delivery.

How do these factors interact with the job demands and resources?





Domain: Culture of wellness

In the domain of Culture of wellbeing, insights reveal that while there are few formal mechanisms to handle the emotional aspects of the work, the support culture within healthcare teams is generally positive. Young healthcare professionals experience stress due to the lack of permanent contracts, and long working hours can take a toll both physically and mentally. The ability to disconnect from work during off-hours can be challenging, and personal life is often dictated by work schedules. Additionally, time for research and education often comes at the expense of patient contact or personal time.



Theme: work-life balance

Theme 11: Work-Life Integration

"Those oncology patients, that is very intense. Especially if they are people with whom you have a good relationship or who are in a similar situation to mine, like families with young children."

- **Difficulty Disconnecting:** Healthcare professionals struggle to disengage from work responsibilities during personal time, often completing tasks or engaging with work during evenings or days off.

Theme 12: Work Schedule Demands

"I've had a point where I had to work 72 hours straight, with one hour of sleep and that's just incredibly tough."

- **Workweek Structure:** The structure of the workweek, including on-call duties, can intrude on personal life and impose restrictions that are particularly burdensome for those living far from the hospital.



Theme: time management & autonomy

Theme 13: Professional Development vs. Patient Care

"Everything you want to do on the side, research or a project that you like in the field of sustainability or education or whatever. That is on your own time"

- **Investing Personal Time:** Healthcare professionals often use personal time for research and education, which can be neglected due to job demands.
- **Impact on Patient Contact:** Allocating time to research and education often reduces the time available for direct patient care, highlighting a trade-off between professional development and patient interaction.



Theme: work culture & support

Theme 14: Workplace Support and Culture

"I think it is especially at the micro level in your own team like that. If you have one or two people there to talk to, that is most important."

- **Supportive Team Culture:** Healthcare professionals benefit from a supportive environment where colleagues offer understanding and empathy, often exceeding the support from non-medical partners.
- **(Emotional) Support Mechanisms:** Formal support for training and the emotional aspects of work is limited, with professionals preferring to discuss matters within their own group of colleagues.

Theme 15: Job Security and Workload

"The feeling that you don't know whether you can get a permanent position or build towards something is a very unpleasant feeling."

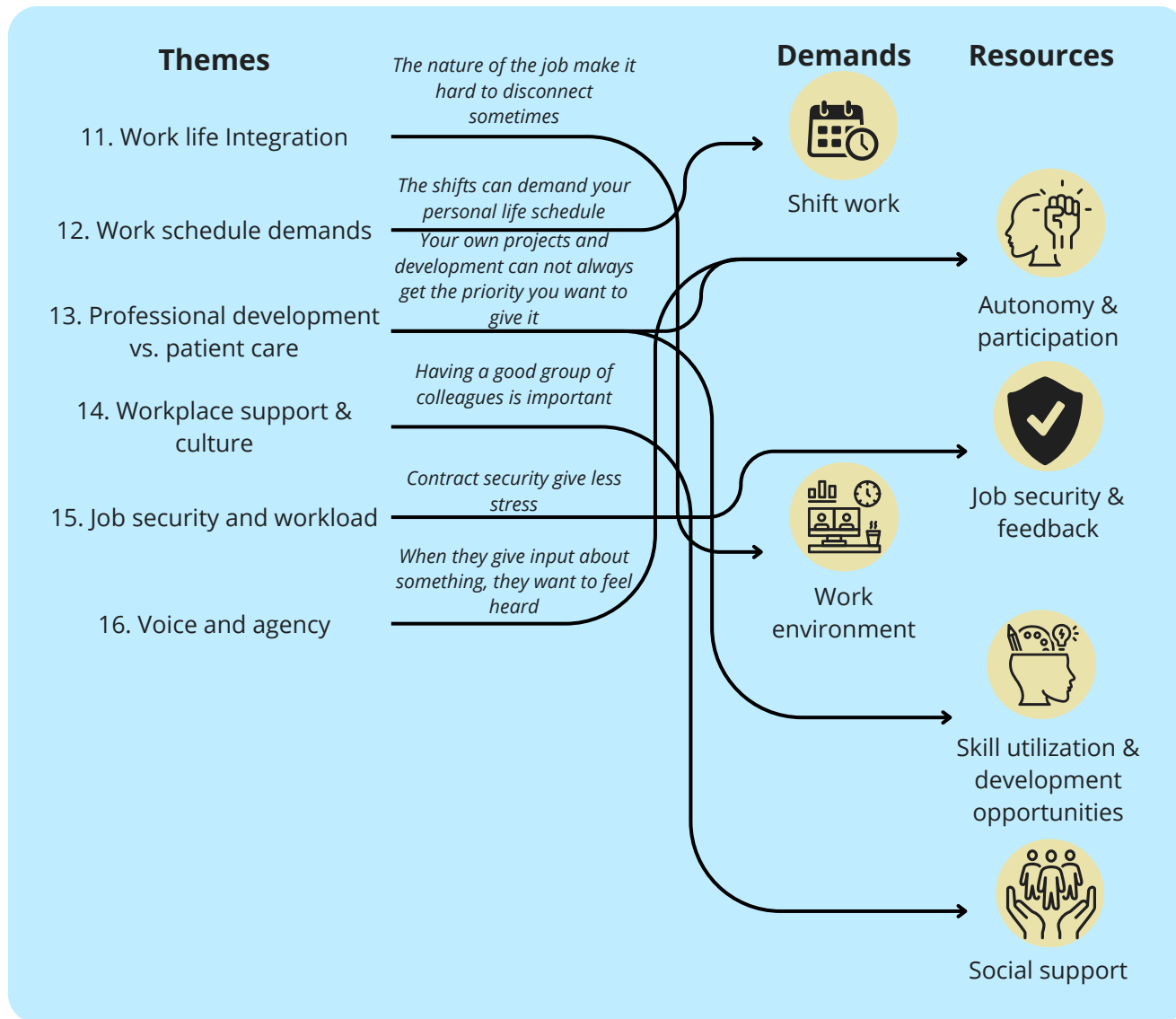
- **Contractual Uncertainty:** Young healthcare professionals face stress due to the lack of permanent contracts, leading to job insecurity and increased pressure to perform.
- **Long Working Hours:** The physical and mental toll of long working hours is a significant concern, impacting healthcare professionals' wellbeing.

Theme 16: Voice and Agency

"We had all kinds of ideas in all kinds of processes and meetings, we came up with a kind of work plan and three months later the organizations decided to go back to the old way."

- **Unheard Suggestions:** Healthcare professionals feel their suggestions for improving work conditions are often ignored or not sustained, leading to a sense of disenfranchisement.

How do these factors interact with the job demands and resources?





Domain: Personal resilience

In the domain of Personal Resilience, insights reveal that the emotional weight of healthcare work, such as delivering bad news, can significantly impact professionals. This emotional burden can carry over into personal life, leading to stress symptoms and sleep disturbances. Additionally, personal circumstances, such as having a busy home life or being single, can exacerbate the difficulty of managing work-related stress. These insights underscore the importance of personal resilience in healthcare professions, where the emotional demands of the job can be high and often intersect with personal life.



Theme: work culture & support

Theme 1: Emotional Impact and Wellbeing

"If I have a complication with an operation or if I have to tell 3 people in one day that they can not be cured, yes, that's very hard."

- **Emotional Weight of Work:** Healthcare professionals frequently face emotionally challenging situations, such as delivering bad news, which can have a significant impact on their well-being and resilience.



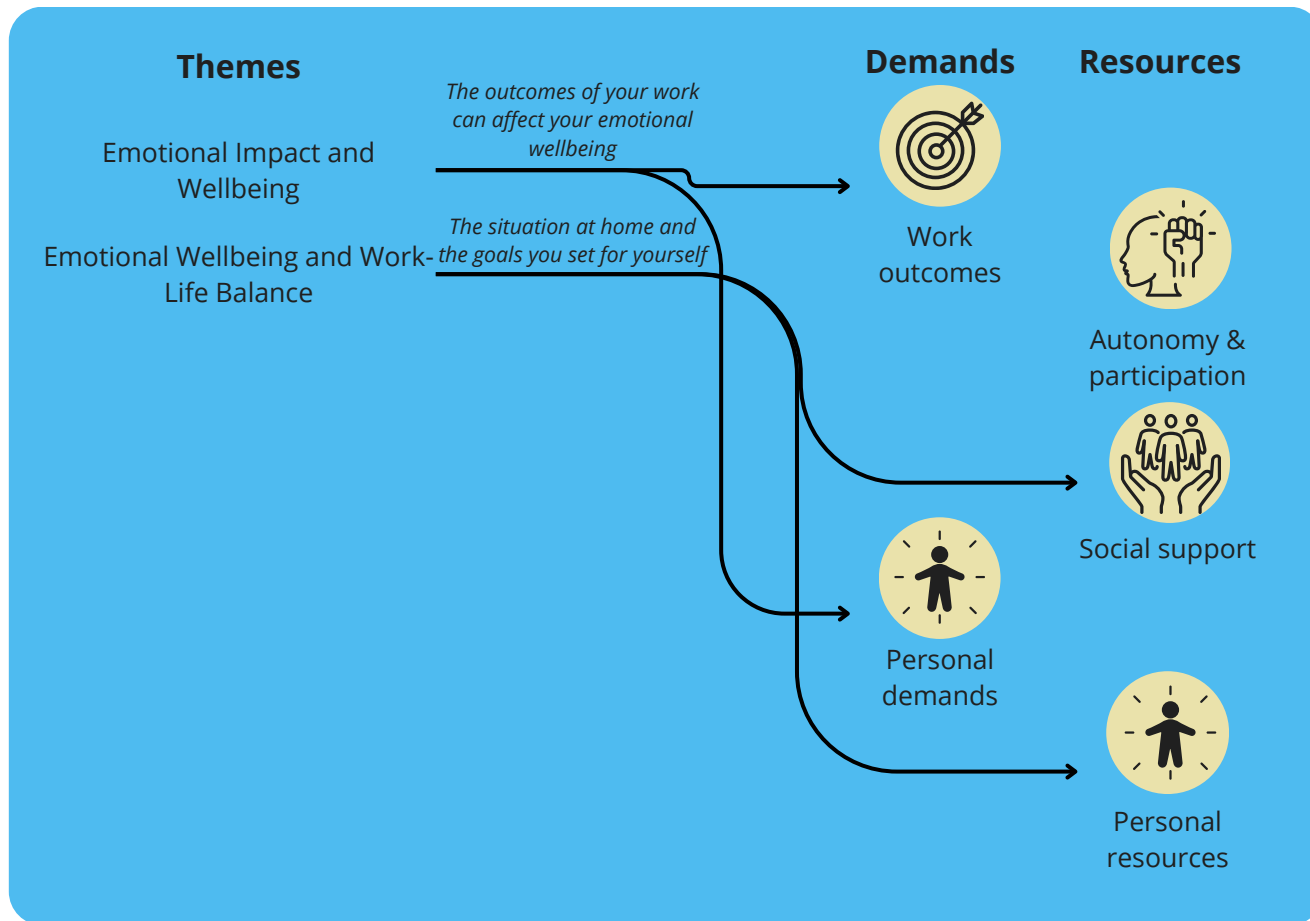
Theme: work-life balance

Theme 1: Emotional Wellbeing and Work-Life Balance

"Now everyone has to do everything, right? So if you look at it as an assistant, yes, they all have a partner who also works. They all have to run a marathon and they all have to have a family where everything is right and they still want to see their friends."

- **Emotional Carryover:** Healthcare professionals may experience difficulty in separating work emotions from home life, leading to stress symptoms and sleep disturbances.
- **Home Life Stress:** High responsibilities at home, such as childcare or lack of a supportive partner, exacerbate the challenge of managing work-related stress.

How do these factors interact with the job demands and resources?



3.4 Discussion

The findings from the semi-structured interviews revealed several key themes impacting the efficiency of practice, culture of well-being, and personal resilience among healthcare professionals.

The use of a treatment journey as a tool in the interviews provided valuable insights into the healthcare professional journey, highlighting differences in the treatment phases from the perspective of healthcare professionals.



Efficiency of practice

The study highlighted the extensive and time-consuming nature of administrative tasks, which often detract from patient care. Issues such as data redundancy, inadequate support systems, and the lack of task evaluation exacerbate the administrative burden. Communication challenges, particularly in obtaining complete patient files and coordinating care, further hinder efficiency. Peripheral matters, including technology limitations and the inefficiency of the discharge process, were also identified as significant obstacles.



Domain: Culture of wellness

The research underscored the generally positive support culture within healthcare teams, despite the lack of formal mechanisms to handle the emotional aspects of work. Young professionals face stress due to contractual uncertainty, and long working hours impact both physical and mental well-being. Challenges in achieving a work-life balance were evident, with difficulties in disconnecting from work and the intrusion of work responsibilities into personal life.



Domain: Personal resilience

The emotional weight of healthcare work, particularly in delivering bad news, significantly impacts professionals. This emotional burden often carries over into personal life, leading to stress symptoms and sleep disturbances. Personal circumstances, such as having a busy home life or being single, can exacerbate the difficulty of managing work-related stress.

Conclusion

The interviews offer critical insights into the factors affecting the occupational well-being of healthcare professionals in the field of gastro-intestinal oncology. The findings emphasize the need for strategies to:



Reduce the administrative burden



Improve communication and support systems



Address the challenges of work-life balance and personal resilience.

By addressing these issues, healthcare institutions can enhance the work experience and satisfaction of healthcare professionals, ultimately leading to better patient care and more efficient healthcare delivery. The revised healthcare professional journey, informed by the study's findings, presents a valuable framework for understanding and optimizing the treatment process from the healthcare professional's perspective.

4. The journey of gastro-intestinal oncology surgery

- 4.1 Pre-patient journey
- 4.2 During-patient journey
- 4.3 Post-patient journey



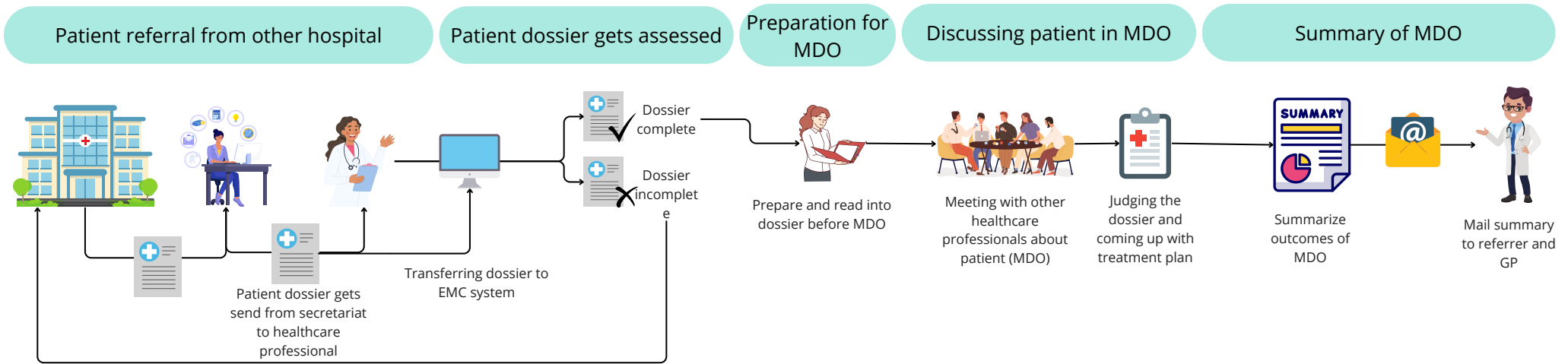
Source Image: Taliban maakt jacht op artsen die in Nederland zijn opgeleid. (2024, January 11). Amazing Erasmus MC. <https://amazingerasmusmc.nl/chirurgie/taliban-maakt-jacht-op-artsen-die-in-nederland-zijn-opgeleid/>

Introduction

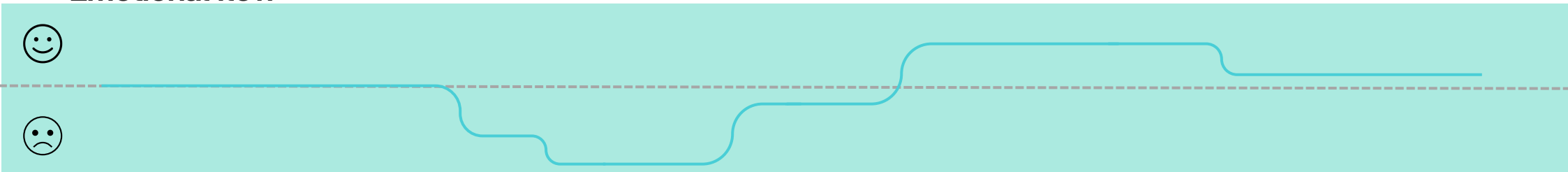
With the use of the treatment journey as a tool in the interview, and the information gathered in the interviews, a new version of the treatment journey could be designed. This treatment journey is from the perspective of the healthcare professional, and can therefore be called the healthcare professional journey. The main point as to where this differs in the fact that the diagnosis phase is not as prevalent. This is mainly because of the specialistic nature of the EMC on the domain of gastrointestinal oncology. This means that almost all patients come from a referral, and the diagnosis part does not happen at the EMC. This revised version of the treatment journey, using the 3 main phases: pre-patient (from the referral to the MDO), during patient (from the outpatient clinic to the surgery), and post patient (from the discharge to the 5 year follow up), can be seen in this chapter. With this healthcare professional journey, we can better understand how the workflow of healthcare professionals looks like and can we identify the main points to intervene.

4.1 Pre-patient journey

Referral to MDO



Emotional flow

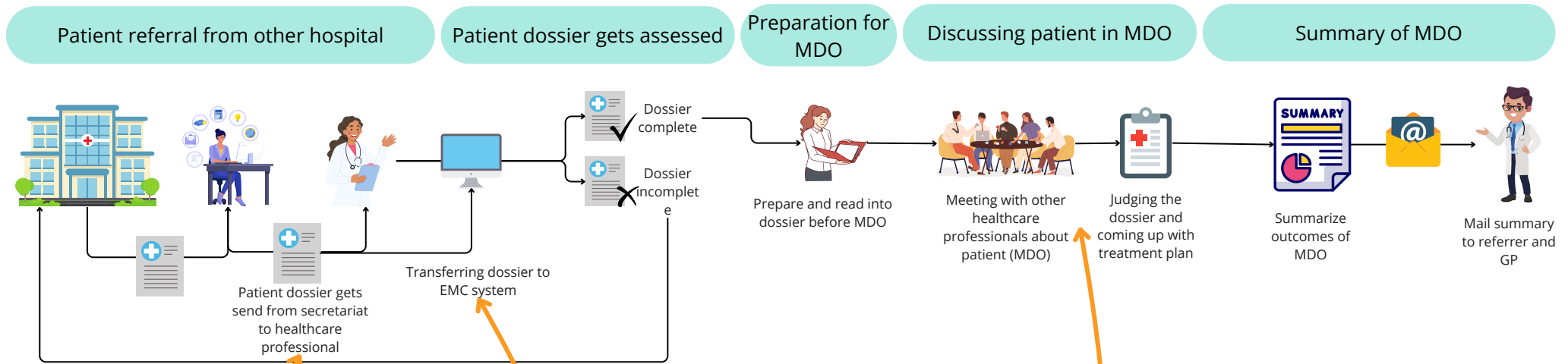


Key insights

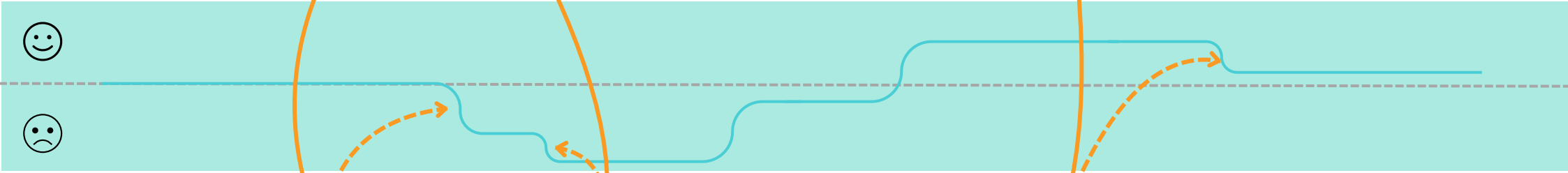
- Administrative efficiency & support** - Medically trained secretariat
- Efficiency and time management** - Medical record compilation
- Efficiency and time management** - Inefficient referral transfers
- Efficiency and time management** - Multidisciplinary team meetings

Touchpoints to intervene & effects on emotion in pre-patient phase

Referral to MDO



Emotional flow



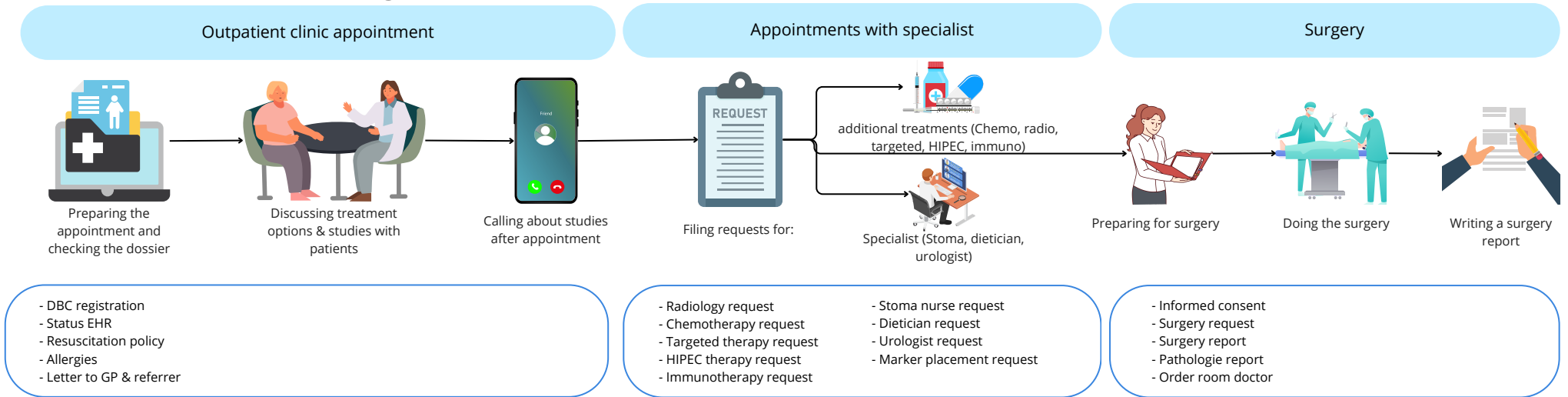
Key insights

- Administrative efficiency & support - Medically trained secretariat**
- Efficiency and time management - Medical record compilation**
- Efficiency and time management - Inefficient referral transfers**
- Efficiency and time management - Multidisciplinary team meetings**

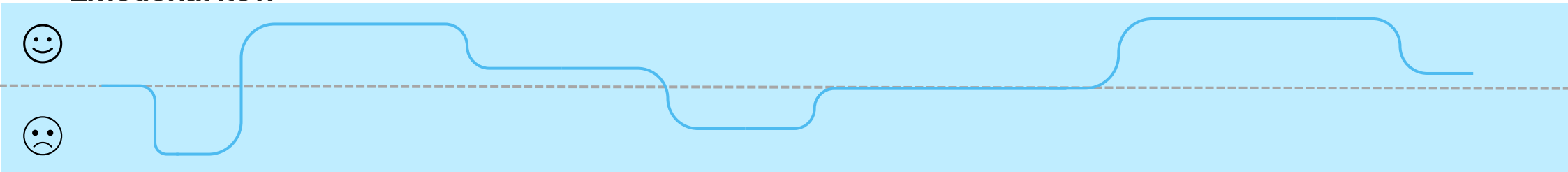
Touchpoint to intervene
 Effect on emotional flow

4.2 During patient journey

Outpatient clinic to surgery



Emotional flow

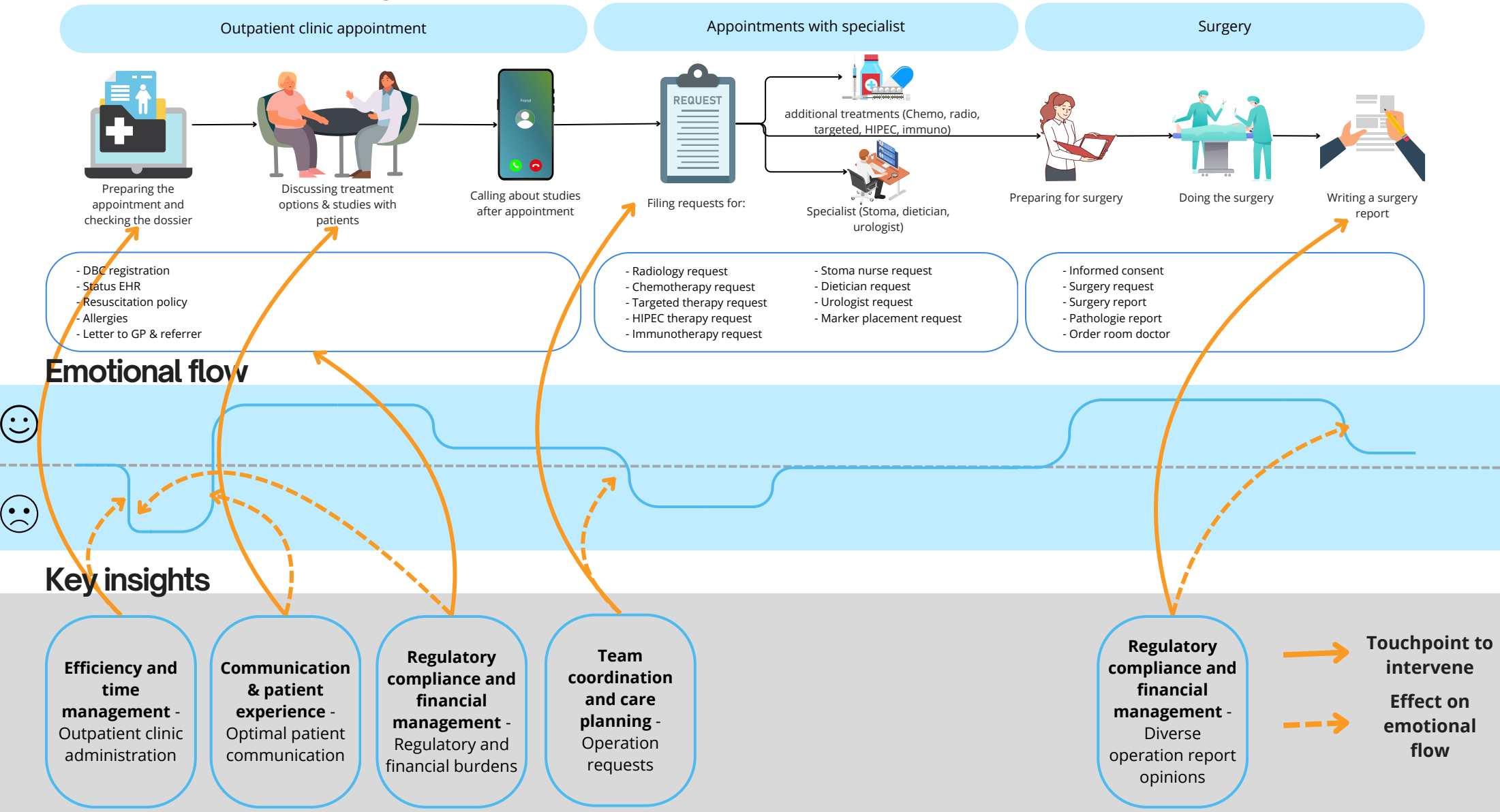


Key insights

- Efficiency and time management** - Outpatient clinic administration
- Communication & patient experience** - Optimal patient communication
- Regulatory compliance and financial management** - Regulatory and financial burdens
- Team coordination and care planning** - Operation requests
- Regulatory compliance and financial management** - Diverse operation report opinions

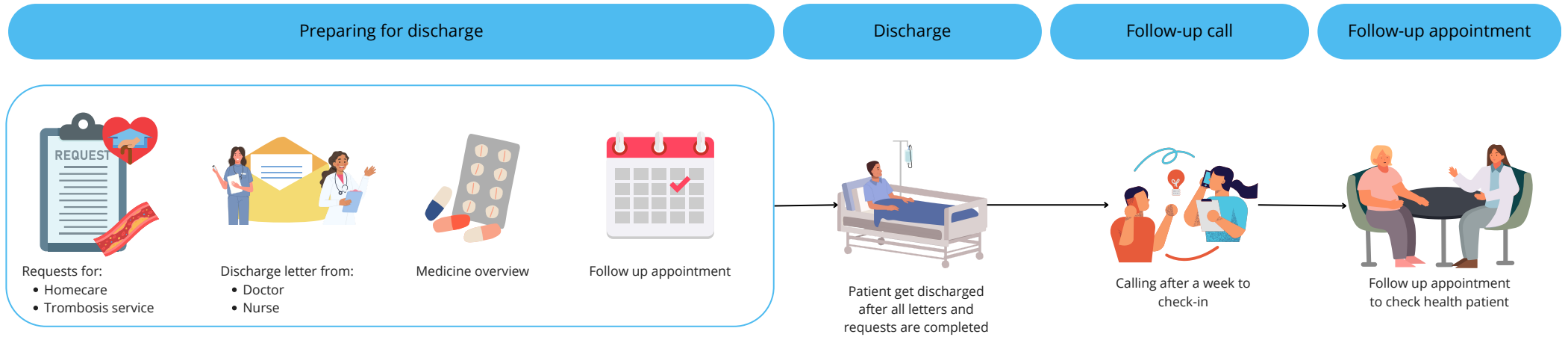
Touchpoints to intervene & effects on emotion in pre-patient phase

Outpatient clinic to surgery

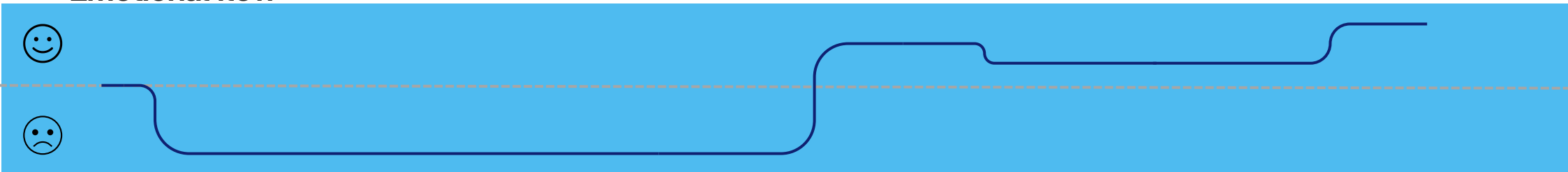


4.3 Post patient journey

Discharge from the hospital



Emotional flow

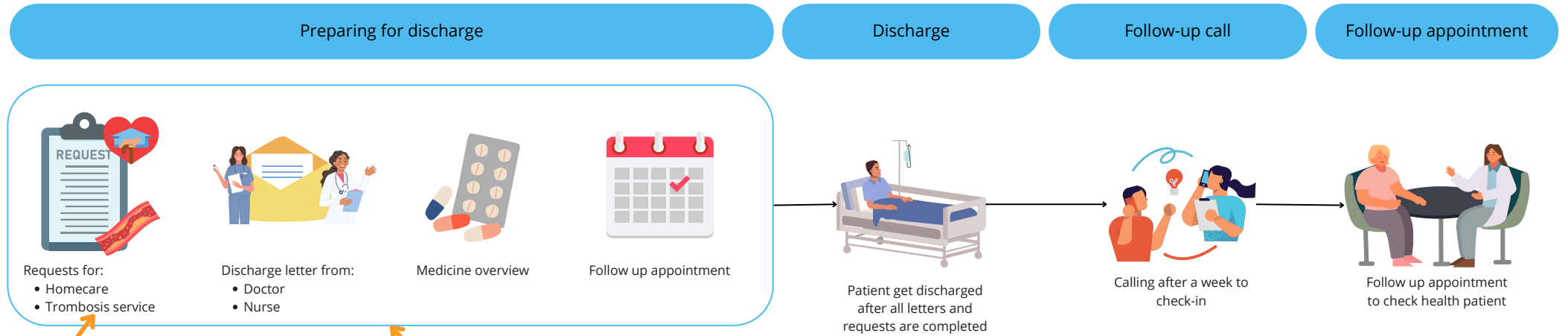


Key insights

- Patient care transitions and workflow - Homecare and discharge delays**
- Patient care transitions and workflow - Discharge process complexity**

Touchpoints to intervene & effects on emotion in pre-patient phase

Discharge from the hospital



Emotional flow

Key insights

Patient care transitions and workflow - Homecare and discharge delays

Patient care transitions and workflow - Discharge process complexity

→ Touchpoint to intervene
- - - Effect on emotional flow

5. AI in healthcare

- 5.1 The impact of AI on technology & healthcare
- 5.2 AI models in healthcare
- 5.3 AI applications to improve the workflow



Source Image: Bouwwereld. (2024, March 5). Inschrijving Rotterdam Architectuurprijs 2021 van start. Bouwwereld.nl. <https://www.bouwwereld.nl/rubrieken/vakprijzen/inschrijving-rotterdam-architectuurprijs-2021-van-start/>

Introduction

The integration of Artificial Intelligence (AI) into healthcare is transforming the landscape of medical practice and administration. AI's ability to process vast amounts of data with speed and accuracy presents a unique opportunity to enhance the workflow of healthcare professionals. By incorporating AI into healthcare solutions, we can address several challenges that impede efficiency and effectiveness in patient care. The solutions guided by AI are structured around three strategic pillars: reducing the administrative burden, improving communication and support systems, and addressing the challenges of work-life balance and personal resilience.



Reducing the administrative burden is crucial as it allows healthcare professionals to allocate more time to patient care rather than being entangled in time-consuming clerical work.



Improving communication and support systems is another strategic focus. It can facilitate seamless collaboration among healthcare teams, ensuring that communication is efficient and effective. This centralization of communication tools helps in reducing errors and improving the coordination of care.



Lastly, **addressing work-life balance and personal resilience** is essential for maintaining a healthy and sustainable work environment for healthcare professionals. It can provide flexibility and support for managing personal well-being, which is vital for the overall resilience of healthcare workers.

5.1 The impact of AI on technology & healthcare

Artificial Intelligence (AI) is revolutionizing technology by streamlining tasks, refining processes, and facilitating decisions based on data analysis. These advancements lead to heightened productivity, cost efficiency, and improved customer experience. AI's contribution to digital transformation is critical, as it empowers organizations to enhance their operations and foster innovation. The capacity of AI to emulate cognitive functions such as learning and problem-solving is crucial for the evolution of business strategies (Moore, 2023). Consequently, AI is an invaluable asset in redefining and improving the workflows of healthcare professionals (Alowais et al., 2023).

AI's role in healthcare enhancements



Diagnostic and therapeutic advancements: AI's ability to process extensive datasets enables the enhancement of disease diagnosis, the selection of appropriate treatments, and the accuracy of clinical tests, potentially outperforming human capabilities.



Precision and streamlining: AI promises greater precision, cost-effectiveness, and time efficiency, while also reducing the likelihood of human error. This is especially advantageous in tailoring treatments to individual patients, fine-tuning medication dosages, and improving the management of population health.



Professional support in healthcare: AI's automation of mundane tasks can significantly reduce the administrative load on healthcare workers, thereby allowing them to dedicate more time to patient care and less to clerical work.



Patient involvement: AI aids in the development of individualized treatment plans and the enhancement of communication tools, leading to improved patient involvement in their own care.



Ethical and legal implications: It is essential to consider the ethical and legal implications of AI in healthcare, particularly in terms of patient privacy and informed consent, to ensure

responsible use of the technology. (Alowais et al., 2023)

The necessity of AI in healthcare

The implementation of AI in healthcare is projected to substantially decrease annual healthcare costs in the United States, demonstrating the technology's significant economic potential. AI is a key player in the progression of precision medicine, the refinement of diagnostic procedures, and the bolstering of patient engagement. With AI's help in automating routine tasks, healthcare practitioners could see up to a 70% reduction in their administrative workload, affording them more time for patient care. The healthcare AI sector is poised for rapid expansion, underscoring the critical need for healthcare providers to embrace AI to maintain a competitive edge (Bohr & Memarzadeh, 2020; Davenport & Kalakota, 2019).

Considerations and challenges in AI adoption

Despite the many advantages AI presents, its adoption is not without its challenges. Issues surrounding ethics and legality, such as safeguarding patient privacy and ensuring consent, are paramount. Moreover, strategic planning and change management are essential to facilitate the adoption and scaling of AI within the healthcare sector. (Bohr & Memarzadeh, 2020).

5.2 AI models in healthcare

When looking at suitable solutions for the problem addressed and defined in the previous chapter, we will mainly look at the problems that will improve the workflow of healthcare professionals. Different so called “branches” of AI can be used to help improve this workflow.

Machine learning

Machine learning enables computers to learn from data and improve their performance over time without being explicitly programmed. It works by identifying patterns in data and making predictions or decisions based on these patterns. How machine works can be seen in figure 11 (Sarker, 2021; Glaz et al., 2021)

To better understand Machine learning, an interview was conducted with Jan-Mark, a computer science student. The interview guide for this can be found in appendix 4. As already explained, machine learning is an efficient tool to identify data patterns and make predictions or decisions based on that. Because of that, it is good in identifying trends, but could also be used for judging the completeness of a dossier. What is good to note about this is that all the data used has to be labeled. This means that the data is recognizable for the AI model. To

actually build an AI model for the healthcare setting that can do this, it has to be properly trained. This takes a lot of time, and requires the hospital to already start collecting the data they need, months to years in advance of using the AI system. And even after the system is in use, continuous learning, in the form of feedback an more data, is essential

In healthcare, machine learning can be used to automate repetitive tasks, predict patient outcomes, and improve the efficiency of administrative processes. For example, machine

learning algorithms can be trained to recognize triggers for specific actions, such as sending out appointment reminders when a patient's visit is approaching or rescheduling appointments based on real-time patient availability. Machine learning can also be used to analyze large volumes of administrative data, identifying trends and anomalies that indicate inefficiencies (Habehh & Gohel, 2021).

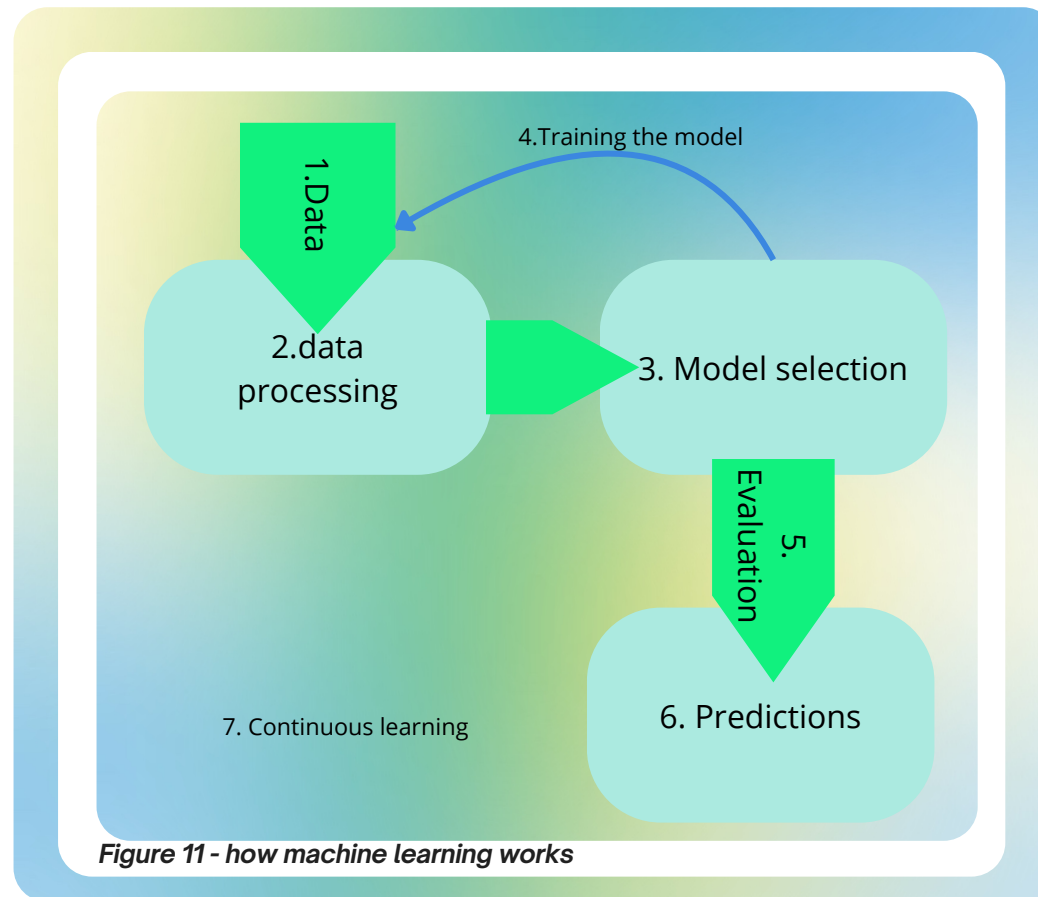


Figure 11 - how machine learning works

Natural language processing

Natural Language Processing (NLP) focuses on the interaction between computers and humans through natural language. The ultimate objective of NLP is to read, decipher, understand, and make sense of the human language in a valuable way. How NLP works can be seen in figure 12. (Glaz et al., 2021; Hao et al., 2021)

In the interview, Jan-Mark explained that NLP is the processing of all sorts of language (long text, speech, etc.) without labels. Natural language processing can transform the “natural language” to labels, needed for example in machine learning (tokenization). After this processing, the data can be used in other AI models. The model has to be trained through feedback.

In the context of healthcare, NLP can be used to extract relevant information from unstructured clinical notes, thereby reducing the need for manual data entry. The AI system is also designed to learn from each interaction, continuously improving its ability to capture and process relevant data, and enhancing its data validation capabilities (Hossain et al., 2023).

Ethical and practical considerations

Jan-Mark and I talked about the main ethical consideration in implementing this: bias (gender, age, ethnic, etc.). There are 3 ways to work with this, however all of them are suboptimal. The first one is anonymize all the data that can lead to bias, the second one is randomizing the data that can lead to bias. Both will completely ignore the data that is

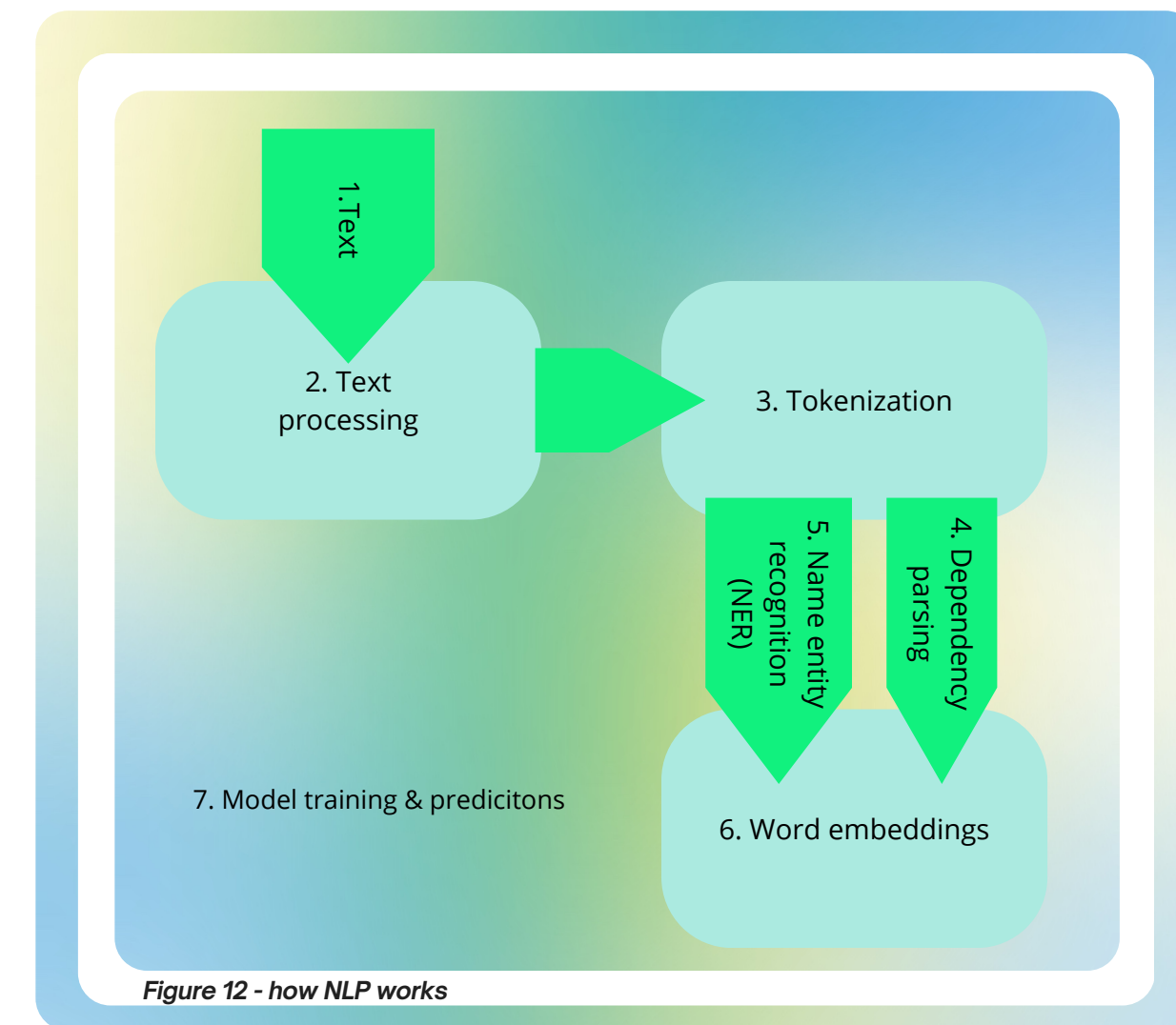


Figure 12 - how NLP works

associated with bias. However, this completely disregards the biases that might actually be important in the process. The third way is not disregarding bias and keeping the human in the loop. Which, especially in the beginning, might not reduce the time spend by healthcare professionals. What is good to note about this, is

that in administrative tasks, the bias is not as important as when using AI in diagnosis. Since the healthcare professional will still be in the loop for diagnosis anyway. My recommendation would be to further research these and other considerations when EMC is thinking about implementing AI models in administration. 60

5.3 AI applications to improve workflow

With the possibilities of AI in mind and the insights from chapter 3, three strategies could be formed to improve the workflow of healthcare professionals. The following concepts were designed by using the SCAMPER method. You can see this process in appendix 5.



Reducing the administrative burden

- Concept 1: IntelliFlow automation
- Concept 2: AI enhanced EHR assistant
- Concept 3: Documentor AI
- Concept 4: InsightAI Admin
- Concept 5: SecureHealth AI



Improving communication & support systems

- Concept 1: MedComm Sync
- Concept 2: AdminAI Bot
- Concept 3: Feedback AI enhancer
- Concept 4: AI LinkHealth



Address the challenges of work-life balance and personal resilience

- Concept 1: AI-TrainEase
- Concept 2: CustomAid Health
- Concept 3: AI TimeTuner
- Concept 4: AI Wellness Companion



Strategy: Reducing the administrative burden

Concept 1: IntelliFlow Automation

IntelliFlow Automation is a suite of AI-powered tools designed to automate repetitive administrative tasks within healthcare settings. It seamlessly integrates into existing workflows, enabling healthcare professionals to focus on patient care rather than time-consuming clerical work.

Which problem does it solve?

This concept addresses the issue of healthcare professionals being bogged down by routine administrative tasks such as scheduling appointments, entering patient data, and generating reports. These tasks are essential but do not directly contribute to patient care, often leading to increased work hours and decreased job satisfaction.

Advantages over current situation

IntelliFlow Automation offers a significant improvement over the current situation by reducing the manual workload on healthcare staff. It allows for more efficient use of time, as the AI system handles mundane tasks swiftly and accurately. This leads to a more streamlined workflow, higher productivity, and the potential for reduced wait times for patients.

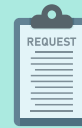
Use of AI in application:

AI is utilized in IntelliFlow Automation to identify patterns in repetitive tasks and establish automated processes. Machine learning algorithms are trained to recognize triggers for specific actions, such as sending out appointment reminders when a patient's visit is approaching or rescheduling appointments based on real-time patient availability. Natural language processing (NLP) can be used to generate and interpret complex reports.

Touchpoints in journey



Transferring dossier to EMC system



Filing requests

Key insights

Theme 1 Efficiency and time management: Data redundancy





Strategy: Reducing the administrative burden

Concept 2: AI-Enhanced EHR Assistant

The AI-Enhanced EHR Assistant is an advanced tool designed to augment Electronic Health Record systems by streamlining data entry and improving overall usability. It aims to optimize the user interface of EHRs, minimize redundant interactions, and introduce smart data validation features.

Which problem does it solve?

Healthcare professionals often face challenges with EHR systems that are time-consuming and cumbersome to use. Common issues include complex navigation, excessive clicking, and manual entry of patient data, which can lead to errors and reduce time available for patient care.

Advantages over current situation

Compared to the current EHR systems, the AI-Enhanced EHR Assistant significantly reduces the time and effort required for data entry. By providing a more intuitive user experience and reducing the risk of data entry errors, it enhances the efficiency of healthcare professionals and allows them to allocate more time to direct patient care.

Use of AI in application:

AI is integral to the design of this concept, particularly through the use of Natural Language Processing (NLP). NLP enables the system to understand and extract pertinent information from unstructured clinical notes and transcriptions. This intelligent data capture minimizes the need for manual input, while AI algorithms ensure data validation, checking for inconsistencies or missing information. The system learns from interactions, continuously improving its accuracy and the relevance of the data it captures and processes.

Touchpoints in journey



Transferring dossier to EMC system

Key insights

Theme 1 Efficiency and time management:
Inefficient referral transfer

Theme 4 Support & evaluation: Fear of inaccuracy

Theme 7 Technology integration & limitations:
Technology limitations





Strategy: Reducing the administrative burden

Concept 3: DocuMentor AI

DocuMentor AI is a concept designed to streamline the documentation and reporting process for healthcare professionals. It provides simplified, user-friendly templates that focus on capturing only the essential information, significantly reducing the time spent on paperwork. The system includes intelligent algorithms that can auto-populate fields based on context and historical data.

Which problem does it solve?

Healthcare professionals often spend excessive time on documentation and reporting, which can be repetitive and detract from patient care. The current process can be tedious, prone to errors, and often requires entering the same information across multiple forms.

Key insights

Theme 1 Efficiency and time management:
Specialization requirements & Medical record compilation

Advantages over current situation

DocuMentor AI offers a more efficient approach to documentation by reducing manual data entry and minimizing the risk of errors. It simplifies the reporting process, allowing healthcare professionals to complete paperwork more quickly and accurately, thereby freeing up more time for patient care.

Touchpoints in journey



Transferring dossier to EMC system

Use of AI in application:

AI is utilized in DocuMentor AI to provide smart text suggestions and auto-complete features within documentation templates. Machine learning algorithms analyze historical data and common patterns to predict and fill in information, reducing the need for manual input. Additionally, AI is used to automatically generate reports by collating data from various sources and organizing it into predefined formats, streamlining the entire reporting process.





Strategy: Reducing the administrative burden

Concept 4: InsightAI Admin

InsightAI Admin is a strategic concept that leverages AI-powered data analytics tools to scrutinize and enhance administrative processes within healthcare settings. It aims to provide actionable insights that can streamline operations and improve workflow efficiency.

Which problem does it solve?

Healthcare professionals often encounter bottlenecks and inefficiencies in administrative processes that can lead to delays in patient care and increased workload. Common issues include scheduling delays, documentation errors, and suboptimal resource allocation.

Key insights

Theme 3 Support and evaluation: Lack of task evaluation

Advantages over current situation

InsightAI Admin offers a substantial improvement by identifying and addressing the root causes of administrative inefficiencies. By providing a clear analysis of where and why delays or errors occur, healthcare organizations can implement targeted improvements, leading to a smoother workflow and better resource management.

Touchpoints in journey



Transferring dossier to EMC system



Preparing the appointment and checking the dossier



Filing requests



Writing a surgery report

Use of AI in application:

AI is used in InsightAI Admin to analyze large volumes of administrative data, identifying trends and anomalies that indicate inefficiencies. Machine learning algorithms can detect patterns of delays in scheduling, frequent documentation errors, and other process bottlenecks. The system can then suggest optimizations, such as changes to scheduling algorithms or updates to documentation procedures, to enhance the overall efficiency of administrative tasks.





Strategy: Reducing the administrative burden

Concept 5: SecureHealth AI

SecureHealth AI is a concept designed to prioritize security and compliance within healthcare administrative systems. It incorporates features such as data encryption, access controls, and audit trails to safeguard patient data and ensure adherence to healthcare regulations.

Which problem does it solve?

Healthcare professionals often handle sensitive patient data, and any breach of this data can have serious consequences. Additionally, non-compliance with healthcare regulations can result in penalties. Current systems may not have robust enough security measures or may not adequately enforce compliance rules.

Key insights

Theme 3 Support and evaluation: Fear of inaccuracy

Advantages over current situation

SecureHealth AI offers a significant improvement over the current situation by providing robust security and compliance features. By continuously monitoring data access and usage patterns, it can quickly detect and alert on potential security breaches or non-compliance, ensuring that issues are addressed promptly.

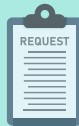
Touchpoints in journey



Transferring dossier to EMC system



Preparing the appointment and checking the dossier



Filing requests



Writing a surgery report

Use of AI in application:

AI is used in SecureHealth AI to continuously monitor data access and usage patterns, detecting potential security breaches or non-compliance. AI algorithms enforce access controls based on roles and permissions, ensuring that only authorized individuals can access sensitive data. The AI system learns from each interaction, improving its ability to detect anomalies and enforce compliance rules.





Strategy: Improve communication and support systems

Concept 1: MedComm Sync

MedComm Sync is a unified communication platform tailored for the healthcare environment. It integrates essential communication tools such as instant messaging, file sharing, and task management into a single, streamlined interface, facilitating seamless collaboration among healthcare professionals.

Which problem does it solve?

Healthcare teams often struggle with disjointed communication systems that can lead to inefficiencies, missed messages, and delays in patient care. The lack of a centralized platform makes it difficult to track conversations, share important patient information, and coordinate tasks effectively.

Key insights

Theme 4 Communication and patient experience:

Complete patient files

Theme 6 Patient care transitions and workflow:

Discharge process complexity

Advantages over current situation

MedComm Sync improves upon the current situation by providing a cohesive communication ecosystem that connects healthcare professionals. This centralization reduces the likelihood of communication errors, streamlines the sharing of patient data, and enhances the coordination of care. The platform's intuitive design simplifies task management and ensures that all team members are on the same page.

Touchpoints in journey



Transferring dossier to EMC system



Requests for:

- Homecare
- Trombosis service

Use of AI in application:

AI plays a pivotal role in MedComm Sync through the deployment of AI-powered chatbots equipped with natural language understanding capabilities. These chatbots offer real-time assistance, intelligently route messages to the appropriate parties, and handle routine inquiries. They can also schedule meetings and reminders, further optimizing the workflow. The AI system continuously learns from interactions, improving its ability to assist healthcare professionals and adapt to the dynamic needs of the healthcare setting.





Strategy: Improve communication and support systems

Concept 2: AdminAid Bot

AdminAid Bot is a concept that integrates artificial intelligence into the healthcare administrative workflow. It employs AI-powered chatbots to assist healthcare professionals with common queries, provide reminders, and guide users through various processes.

Which problem does it solve?

Healthcare professionals often face a high volume of administrative tasks that can be time-consuming and detract from patient care. Additionally, they may encounter difficulties or delays when seeking answers to common queries or guidance on specific processes.

Advantages over current situation

AdminAid Bot offers a significant improvement over the current situation by providing immediate, AI-powered assistance for administrative tasks. This reduces the time spent searching for information or waiting for assistance, allowing healthcare professionals to complete administrative tasks more efficiently and devote more time to patient care.

Touchpoints in journey

Whole journey

Use of AI in application:

AI, specifically natural language understanding, is used in the design of AdminAid Bot. The chatbot can understand and respond to common queries, provide step-by-step guidance on administrative tasks, and even anticipate user needs to proactively offer assistance. The AI system continuously learns from each interaction, improving its ability to provide relevant and timely assistance.

Key insights

Theme 3 Support & evaluation: Inadequate support





Strategy: Improve communication and support systems

Concept 3: FeedAlback enhancer

FeedAlback Enhancer is a concept designed to implement a robust feedback mechanism within healthcare administrative systems. It allows healthcare professionals to provide input on the usability and effectiveness of administrative features, with the aim of driving continuous improvements.

Which problem does it solve?

Currently, there may be a lack of structured channels for healthcare professionals to provide feedback on administrative tools and processes. This can lead to unaddressed issues and missed opportunities for improvement, resulting in less than optimal workflows.

Key insights

Theme 3 Support & evaluation: Lack of task evaluation

Advantages over current situation

FeedAlback Enhancer offers a significant improvement over the current situation by providing a dedicated platform for feedback. This ensures that user experiences and suggestions are systematically captured and addressed, leading to a more user-centric and effective administrative system.

Touchpoints in journey



Transferring dossier to EMC system



Preparing the appointment and checking the dossier



Filing requests



Writing a surgery report



Discharge letter from:

- Doctor
- Nurse

Use of AI in application:

AI is utilized in FeedAlback Enhancer to analyze feedback data, identify recurring issues, and understand user preferences. Machine learning algorithms categorize feedback and prioritize areas for improvement based on sentiment analysis. This allows for a more targeted and effective approach to system enhancements, ensuring that changes are driven by user needs and experiences. The AI system continuously learns from the feedback, improving its ability to identify and address key issues.





Strategy: Improve communication and support systems

Concept 4: AI Linkhealth

AI LinkHealth is a strategic initiative aimed at ensuring that various administrative systems within the healthcare sector are interoperable. The concept focuses on enabling seamless data exchange and coordination among different healthcare providers and platforms.

Which problem does it solve?

A common issue in healthcare is the lack of interoperability between disparate administrative systems, which can lead to fragmented patient records, inefficiencies in data exchange, and potential errors in patient care coordination.

Key insights

Theme 4 Communication and patient experience:

Complete patient files

Theme 6 Patient care transitions and workflow:

Discharge process complexity

Advantages over current situation

AI LinkHealth provides a significant advantage by facilitating the smooth transfer of data across various healthcare systems. This interoperability reduces the risk of errors, saves time otherwise spent on manual data reconciliation, and improves the continuity of care for patients.

Touchpoints in journey



Transferring dossier to EMC system



Preparing the appointment and checking the dossier



Filing requests



Discharge letter from:

- Doctor
- Nurse

Use of AI in application:

AI is utilized in AI LinkHealth to perform data mapping and translation tasks between different healthcare systems. By using machine learning algorithms, the concept ensures that administrative data is accurately and efficiently exchanged. AI also helps to reconcile discrepancies in data formats, ensuring that information is consistent and usable across all connected systems. This AI-driven approach to interoperability streamlines communication and data sharing among healthcare providers.





Strategy: Address the challenges of work-life balance and personal resilience

Concept 1: AI-TrainEase

AI-TrainEase is a concept that provides tailored training programs and continuous support for healthcare professionals to ensure they are adept at utilizing AI-optimized administrative tools and systems. The platform adapts to individual learning paces and styles, offering a personalized educational experience.

Which problem does it solve?

Healthcare professionals often face challenges in keeping up with rapidly evolving technology and may not fully utilize the capabilities of administrative tools due to a lack of training or support. This can lead to underutilization of resources and inefficiencies in workflow.

Advantages over current situation

AI-TrainEase is superior to the current situation as it offers customized learning paths that cater to the varying proficiency levels of users, ensuring more effective training outcomes. Additionally, the on-demand support provided by chatbots can resolve issues promptly, minimizing disruptions in the workflow.

Touchpoint in journey

Whole journey

Use of AI in application:

AI is used in AI-TrainEase to design adaptive training modules and quizzes that respond to the user's performance, focusing on areas that require additional learning. Chatbots equipped with natural language processing provide real-time support, answering questions, and guiding users through troubleshooting steps, thereby enhancing the learning experience and support system. AI analytics also track progress and provide feedback to users and administrators, facilitating continuous improvement in proficiency with administrative tools.

Key insights

Theme 14 Workplace culture & support: (Emotional) support mechanisms





Strategy: Address the challenges of work-life balance and personal resilience

Concept 2: CustomAid Health

CustomAid Health is a concept designed to provide healthcare professionals with the ability to customize administrative workflows according to their specific needs and preferences. This includes the ability to adjust the user interface and workflow settings to create a more personalized and efficient work environment.

Which problem does it solve?

Healthcare professionals often have to adapt to rigid administrative systems that may not align with their preferred way of working. This can lead to inefficiencies, user dissatisfaction, and a steep learning curve for new systems.

Advantages over current situation

CustomAid Health offers a significant improvement over the current situation by allowing healthcare professionals to tailor administrative workflows to their specific needs. This can lead to increased user satisfaction, improved efficiency, and a more intuitive user experience.

Touchpoint in journey

Whole journey

Use of AI in application:

AI is used in CustomAid Health to analyze user preferences and suggest customization options for administrative workflows. It can adapt the user interface based on individual preferences, such as font size and color schemes. The AI system learns from each user's interactions, improving its ability to suggest relevant and personalized customization options.

Key insights

Theme 12 Work schedule demands: Workweek structure





Strategy: Address the challenges of work-life balance and personal resilience

Concept 3: AI TimeTuner

AI TimeTuner is a concept that involves the development of AI-driven time management tools tailored for healthcare professionals. These tools are designed to assist in effective time allocation, task prioritization, and maintaining a healthy work-life balance.

Which problem does it solve?

Healthcare professionals often face challenges in managing their time due to unpredictable workloads, leading to extended work hours and difficulty in separating professional responsibilities from personal time. This can result in burnout and reduced job satisfaction.

Advantages over current situation

AI TimeTuner provides a more efficient approach to time management by using AI to analyze workload and suggest task prioritization. It offers insights into time allocation and productivity patterns, helping healthcare professionals work more efficiently and achieve a better work-life balance.

Touchpoint in journey

Whole journey

Use of AI in application:

AI is used in AI TimeTuner to intelligently analyze various aspects of a healthcare professional's workload, including urgency and importance of tasks. The app can learn individual preferences and work habits over time, offering increasingly personalized recommendations for task prioritization and time management. AI also helps identify productivity patterns, providing actionable insights to further optimize the use of time both at work and at home.

Key insights

Theme 12 Work schedule demands: Workweek structure





Strategy: Address the challenges of work-life balance and personal resilience

Concept 4: AI Wellness Companion

AI Wellness Companion is a concept that integrates AI-driven resources and features into the healthcare professional's workflow to support their mental health and overall well-being. It provides stress management tips, facilitates access to support networks, and offers reminders for self-care practices.

Which problem does it solve?

Healthcare professionals often experience high levels of stress and burnout due to the demanding nature of their work. The lack of easily accessible resources for mental health support and self-care can exacerbate these issues, impacting their well-being and productivity.

Advantages over current situation

AI Wellness Companion is an improvement over the current situation as it provides on-demand, personalized support directly within the healthcare professional's workflow. This immediate access to wellness resources can help mitigate stress, encourage self-care, and prevent burnout, leading to a healthier work environment and better patient care.

Touchpoint in journey

Whole journey

Use of AI in application:

AI is used in the design of AI Wellness Companion through the implementation of chatbots that utilize natural language processing to interact with healthcare professionals. These chatbots can offer tailored coping strategies, suggest stress management techniques, and connect users with support groups. Additionally, the AI system can schedule and send reminders for self-care activities based on the individual's schedule and preferences, ensuring that wellness is a consistent part of their routine.

Key insights

Theme 14 Workplace culture & support: (Emotional) support mechanisms



Conclusion

In conclusion, the application of AI in healthcare is not just a technological advancement but a strategic necessity. The three strategies—reducing the administrative burden, improving communication and support systems, and addressing work-life balance and personal resilience—serve as guiding principles for the development of AI solutions that cater to the needs of healthcare professionals. By embracing AI, healthcare organizations can enhance the efficiency of their workflows, improve the quality of patient care, and support the well-being of their staff. As we continue to innovate and integrate AI into healthcare, we pave the way for a more responsive, efficient, and human-centered healthcare system.

6. Co-creating the solution

- 6.1 Method
- 6.2 Findings
- 6.3 Discussion



Source Image: Erasmus MC. (n.d.-a). Interne oncologie - Kliniek - Erasmus MC. <https://www.erasmusmc.nl/nl-nl/kankerinstituut/patientenzorg/klinieken/interne-oncologie-kliniek>

Introduction

The healthcare industry is on the start of a transformation, with Artificial Intelligence (AI) at the forefront of this change. AI's potential to enhance the workflow of healthcare professionals is immense, particularly in addressing the challenges of administrative burden, communication, and work-life balance. To explore this potential, a co-creation session was conducted with gastro-intestinal oncology surgeons and nurse practitioners from Erasmus MC. The session aimed to delve into the current workflow issues, ideate on concept solutions, and evaluate existing ones. The participants, chosen for their expertise and patient care involvement, engaged in various activities designed to foster collaboration and elicit valuable insights into improving their daily work processes.

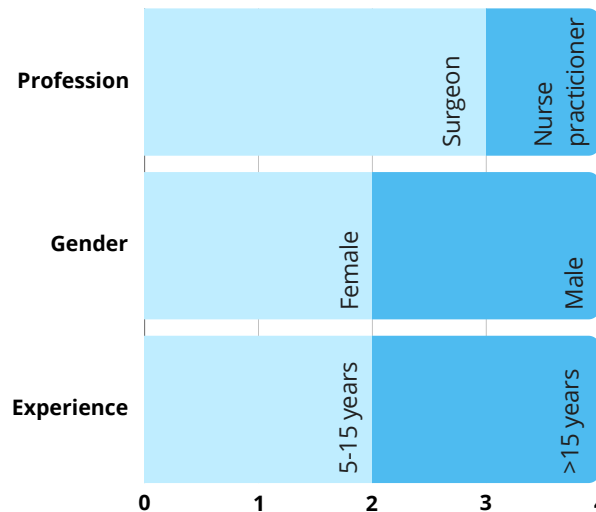
6.1 Method

Research purpose

The research was conducted through a co-creation session, aimed at gaining a deeper understanding of the current problems in the workflow of healthcare professionals, identifying the most significant issues, generating concept solutions, and evaluating existing concept solutions.

Participant selection

The participants were selected from the same pool as the interviews. The study focused on a specific subset of healthcare professionals: gastro-intestinal oncology surgeons and nurse practitioners from the Erasmus MC. These individuals were chosen due to their direct involvement in the treatment process of patients with gastro-intestinal cancer, which requires a high level of expertise and patient interaction. The research group consisted of four professionals



Co-creation session

The co-creation session was conducted face-to-face in a group setting and lasted for one hour. Prior to the session, all participants signed a consent form. The session utilized several tools to facilitate co-creation:

- Sailboat Exercise: This exercise, a variation on the SWOT analysis, was used to deepen the understanding of the problem chosen by the healthcare professionals.
- Brainstorming: A brainstorming session was conducted to generate ideas for addressing the identified problem.
- Concept Transformation: The best ideas from the brainstorming session were selected and transformed into a concept format.
- Investment Game: This game, a variation on dot voting, was used to evaluate the concept solutions that had been designed.

The co-creation session was designed to encourage active participation and collaboration among the participants, fostering a shared understanding of the problems and potential solutions in their workflow.

The role of the healthcare professional journey

The healthcare professional journey, together with the touchpoints that have been identified are used as a starting point for the healthcare professionals to pick a main theme and insight they want to improve. This is done by having a banner of the journey, with the touchpoints and insights on it, and letting them take the insight they see as most important.

Co-creation exercises

Sailboat Exercise

The goal

This exercise, a variation on the SWOT analysis, was used to deepen the understanding of the problem chosen by the healthcare professionals. This is done by creating a vision for the problem they want to solve, thereby creating the desired future. Next, they look at the strengths, opportunities, threats and weaknesses in the way a sailboat analogy. The template can be seen in figure 13.

The outcomes

The rough outcomes can be seen in appendix 6. The healthcare professionals say that they struggle the most with the referral process and how inefficient and manually they have to work. What they want for this is streamlined communication between hospitals.

Brainstorming

The goal

A brainstorming session was conducted to generate ideas for addressing the identified problem of the referral process. The goal was to open up for many ideas

The outcomes

The rough outcomes can be seen in appendix 6. The main solutions that the healthcare professionals came up with is a need for knowledge about AVG and a streamlined communication platform for referrals. The goal of getting many



Figure 13 - Template for sailboat exercise

ideas was not achieved. I believe the practical characteristics of the healthcare professionals are a reason for this. You can clearly see that they are creative, but when they know what they want, they mainly focus on that.

Concept Transformation

The goal

The best ideas from the brainstorming session were selected and transformed into a concept format. By giving them the template, we can help them guide to make a design concept. The template can be seen in figure 14.

The outcomes

The rough outcomes can be seen in appendix 6. The two main ideas of a need for knowledge about AVG and a streamlined communication platform for referrals were transformed to a concept.

Investment game

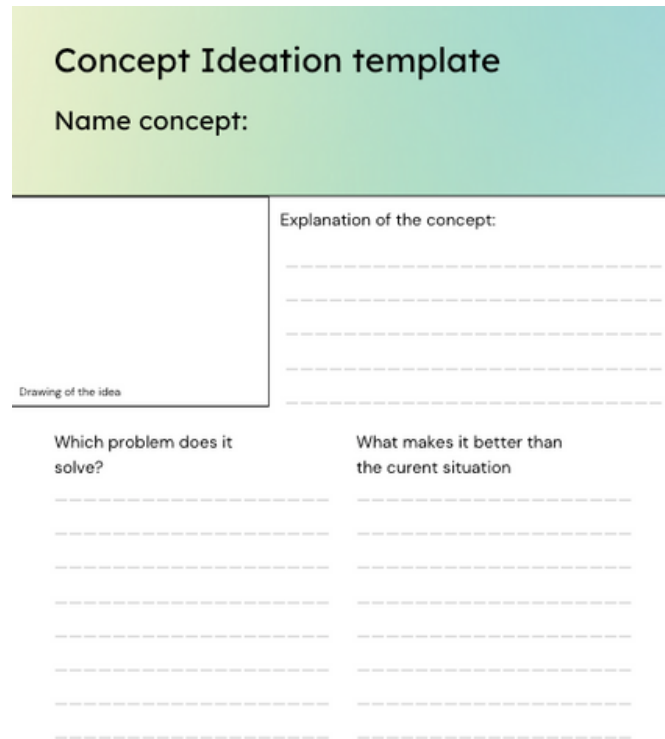
The goal

This game, a variation on dot voting, was used to evaluate the concept solutions that had been designed in chapter five. This all with the goal of finding the most promising solutions

The outcomes

Most promising concepts:

- AI LinkHealth
- SecureHealth AI
- Intelliflow
- AI-enhanced EHR



The form is titled "Concept Ideation template" and is divided into several sections. At the top, there is a header area with a light green background containing the title and a field for "Name concept:". Below this, the form is split into two columns. The left column is labeled "Drawing of the idea" and contains a large empty space for a drawing. The right column is labeled "Explanation of the concept:" and contains several horizontal dashed lines for text. Below these two columns, there are two more columns. The left one is titled "Which problem does it solve?" and the right one is titled "What makes it better than the current situation". Both of these columns also contain several horizontal dashed lines for text.

Figure 14 - Template for Concept transformation

6.2 Findings

The main struggle identified by the participants was the preparation before the Multidisciplinary Team Meeting (MDO), which was found to be time-consuming and highly inefficient. The desired situation expressed by the participants was smooth data transfer and easy communication between hospitals.

The participants suggested that a National Electronic Patient Dossier (EPD), including General Practitioner (GP) data, and an easy and relevant summary of the EPD could help improve the situation. However, they also identified barriers to these improvements, including AVG (General Data Protection Regulation) compliance and the collaboration with Chipsoft, a healthcare information system.

The participants identified risks associated with central coordination and financial constraints. They proposed solutions to these problems, including increasing knowledge about AVG within the hospital to facilitate better data exchange, and implementing direct digital transfer of data between hospitals through HIX (Healthcare Information Xchange). They believed that these solutions would ensure easy access to patient data, reduce unnecessary administrative time, and

prevent data loss.

The participants also evaluated existing concept solutions and expressed a preference for those that aimed to reduce the administrative burden and improve communication and support systems. These included AI LinkHealth, which facilitates smooth data transfer across various healthcare systems, and SecureHealth AI, which provides robust security and compliance features. Other concepts that were well-received included IntelliFlow Automation, which automates repetitive administrative tasks, and AI-Enhanced EHR Assistant, which streamlines data entry and improves the overall usability of Electronic Health Record systems.

6.3 Discussion

The co-creation session revealed that the preparation before the Multidisciplinary Team Meeting (MDO) is a significant time sink and inefficiency in the current workflow. Participants expressed a need for smoother data transfer and more straightforward communication between hospitals. They proposed the adoption of a National Electronic Patient Dossier (EPD), inclusive of General Practitioner (GP) data, and a concise EPD summary to address these issues. However, they recognized barriers such as AVG (General Data Protection Regulation) compliance and the limitations of existing healthcare information systems like Chipsoft.

Participants identified central coordination and financial constraints as risks to implementing new solutions. They suggested that enhancing knowledge about AVG within the hospital could lead to better data exchange, while direct digital transfer of data between hospitals through HIX (Healthcare Information Xchange) could reduce administrative time and prevent data loss. The favored solutions aligned with strategies to reduce administrative burdens and improve communication and support systems. Concepts such as AI LinkHealth, which ensures smooth data transfer, and SecureHealth AI, which focuses on robust security and compliance features, were particularly well-received. Other notable concepts included IntelliFlow Automation for task automation and AI-Enhanced EHR Assistant for streamlining EHR systems.

Conclusion

The co-creation session provided valuable insights into the practical application of AI in healthcare. By focusing on strategies to reduce administrative burdens, enhance communication, and support systems, and address work-life balance and personal resilience, AI can significantly improve the efficiency and satisfaction of healthcare professionals. The session underscored the importance of understanding regulatory barriers and the need for secure, interoperable systems to facilitate better patient care. As the healthcare industry continues to evolve, AI stands as a pivotal tool in reshaping the future of healthcare workflows, driving towards a more integrated, efficient, and user-friendly environment for healthcare professionals.

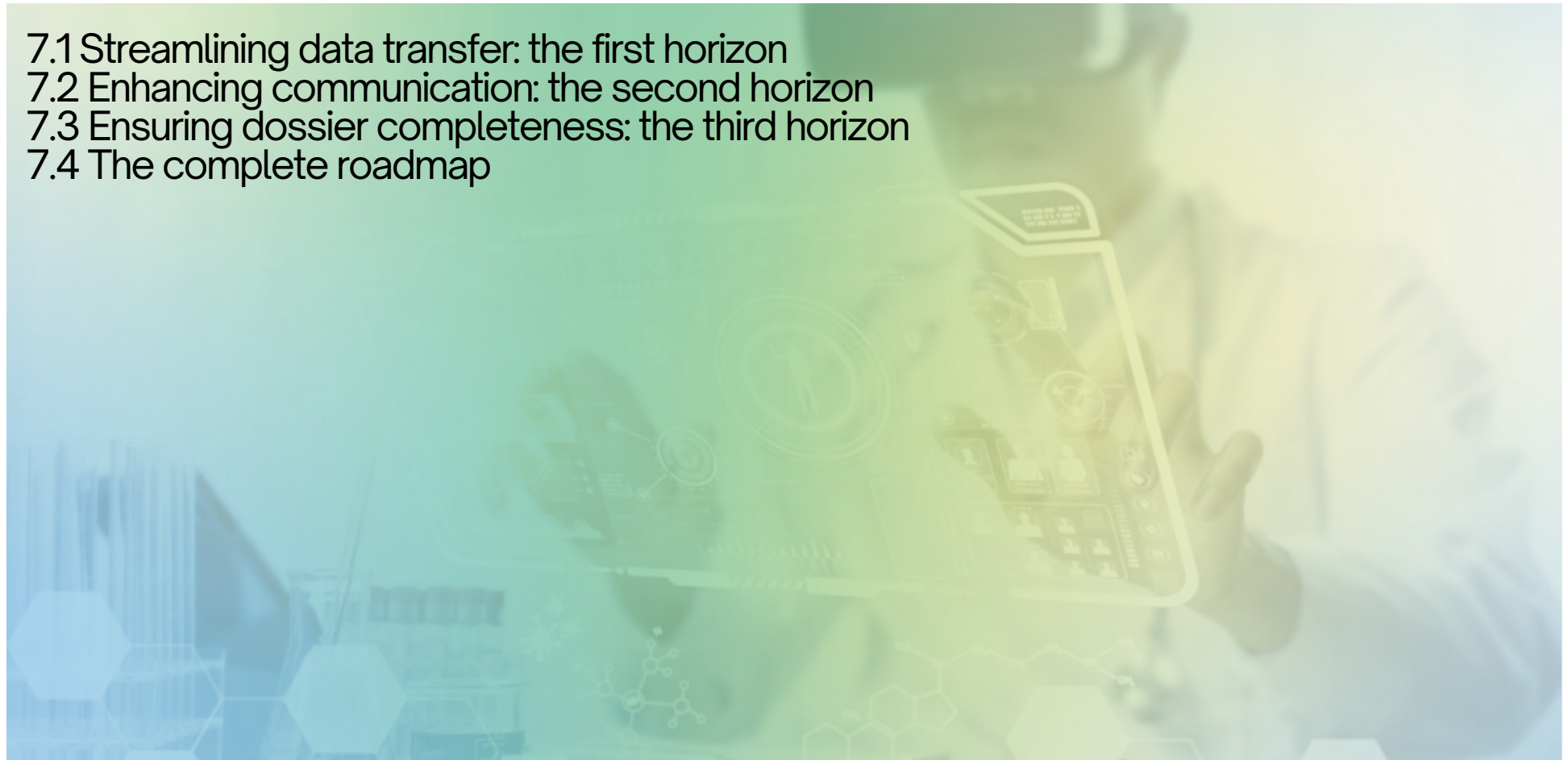
Key take-aways

6.1 The main problem area in the journey is the referral

6.2 Streamlining communication in the referral process is the biggest need for healthcare professionals

7. Roadmapping the solution

- 7.1 Streamlining data transfer: the first horizon
- 7.2 Enhancing communication: the second horizon
- 7.3 Ensuring dossier completeness: the third horizon
- 7.4 The complete roadmap



Source Image: Van Altena, W. (2023, October 17). Eerste longtumorresectie met nieuwe augmented reality technologie is een feit in Erasmus MC - NTVO. NTVO. <https://www.ntvo.nl/eerste-longtumorresectie-is-een-feit-in-erasmus-mc-dankzij-nieuwe-augmented-reality-technologie/>

Introduction

In the rapidly evolving landscape of healthcare, the integration of technology has become a cornerstone for enhancing patient care and operational efficiency. As healthcare systems struggle with the challenges of data management, communication, and administrative burdens, strategic roadmapping emerges as a vital tool for navigating the future. This chapter delves into a comprehensive strategic roadmap designed to revolutionize healthcare administration through the phased implementation of innovative solutions. Spanning three distinct horizons of development phases for technology.

The 3 horizon roadmap aims to:



*Streamline
data transfer*



*Improve
communication
platforms*



*Ensure dossier
completeness*

By addressing each phase, this roadmap not only anticipates the needs of healthcare providers but also aligns with the broader trends of digital transformation and AI integration in healthcare. The ultimate goal is to foster a healthcare environment where technology enhances efficiency, reduces administrative load, and, most importantly, elevates patient care.

6.1 Streamlining data transfer: the first horizon

The first horizon focuses on facilitating easy digital and printed data transfer between healthcare information systems (HiX), significantly reducing manual data handling. This phase aims to create a seamless, efficient, and secure digital data transfer process within healthcare systems, thereby reducing administrative burdens and enhancing the speed and accuracy of information exchange.

Goal & value proposition

The primary goal of this phase is:



Create a seamless, efficient, and secure digital data transfer process within healthcare systems.

The value proposition lies in:



Reducing administrative burdens



Minimizing the risk of errors associated with manual data entry



Enhancing the speed and accuracy of information exchange

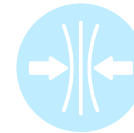
This will lead to:



Improve patient outcomes



Increased staff satisfaction



More resilient healthcare system

Product service system

The product service system for this horizon includes digital platforms that enable data interoperability, cloud storage solutions, and AI-powered analytics tools.

How this system connects to the three strategies:



Reducing administrative burden

Automating data transfer processes to free up healthcare professionals' time.



Improving communication & support systems

Ensuring real-time data availability for better decision-making.



Addressing work-life balance and personal resilience

Minimizing stress related to data management tasks for healthcare workers.



Users

The emotions that play in this horizon are:



Trust

Reducing errors will make the system more reliable



Security

To ensure patient privacy, a secure system is needed



Efficiency

By streamlining the referral process, it will become more efficient

The values that are important in this horizon are:



Patient centric care

By making the referral easier, there is more time available for the patient



Innovation

To keep up with the needs of the end user, innovation is needed



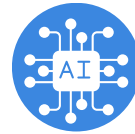
Collaboration

Streamlining the process can help collaboration between hospitals

The trends that are related to this phase are:



Telemedicine
(Gupta, 2024)



Increasing use
of AI
(PricewaterhouseCoopers,
n.d.)



Machine learning
(Marley, 2023)

Scaling of this horizon

Since HiX to HiX communication is already possible, this horizon is not hard to implement. To make it more successful, collaboration between HiX, EMC and other healthcare providers is crucial.

This feature might also be interesting to implement in other phases of the journey, like the letter to the GP and the referrer and when referring to specialists.

Technology

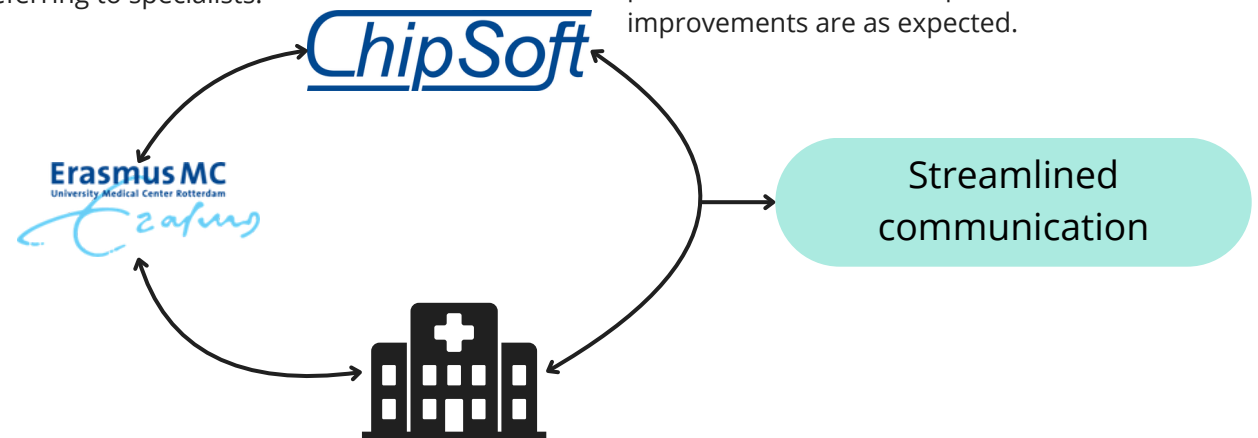
The technology needed to streamline the communication is already in place to implement this horizon. To make it more successful, technology for support and training is needed

Case study

The case study that supports this is by Chipsoft themselves (Zuid-Hollands Ziekenhuiscollectief Verwijst Patiënten Naar Elkaar via Innovatieve ICT-ondersteuning, n.d.). In this study, we can see that, because of the collaborations between hospitals, it is made easier to exchange data between hospitals. The healthcare professionals in the pilot are happy with the improvements that is delivers:

- Reducing time of sending a referral
- Reducing time to get a complete referred dossier.

This case study shows that the technological possibilities are in place and that the improvements are as expected.



6.2 Enhancing communication: the second horizon

The second horizon aims to develop an accessible, user-friendly communication platform and a system for generating concise patient referral summaries. This phase seeks to optimize communication between healthcare professionals and external parties, providing quick access to essential patient information.

Goal & value proposition

The primary goal of this phase is:



Optimize communication between healthcare professionals and external parties



Provide quick access to essential patient information through well-structured referral summaries

The value proposition lies in:



Improving the speed of healthcare services



Reducing the time healthcare professionals spend on administrative tasks



Enhancing patient care through more informed decision making

Product service system

The product service system comprises two main components: a communication platform and a referral summary tool. The communication platform facilitates direct and efficient interaction among healthcare providers and external parties. The referral summary tool automatically generates patient summaries, highlighting critical information for quick review.

How this system connects to the three strategies:



Reducing administrative burden

Automating the creation of referral summaries and simplifying communication processes.



Improving communication & support systems

Providing a centralized platform for all communication needs, ensuring timely and accurate information exchange.



Addressing work-life balance and personal resilience

Decreasing the time healthcare professionals spend on administrative tasks, allowing for better focus on patient care and personal well-being.



Users

The emotions that play in this horizon are:



Confidence

The easier communication between different parties give healthcare professionals confidence they have all the info they need.



Satisfaction

It reduces the frustration of the inefficient way of communicating



Relief

It reduces the frustration of the inefficient way of communicating

The values that are important in this horizon are:



Transparency

Easy communication between parties can lead to more transparency



Efficiency

The inefficient channels of communication are being reduced



Patient centric care

Streamlining the process ensures more patient time

The trends that are related to this phase are:



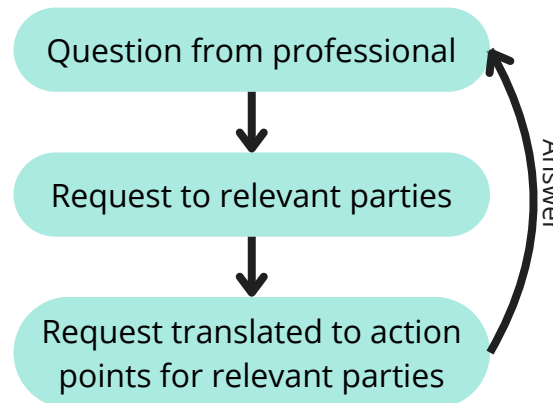
Digital transformation
(Reddy, 2024)



Interoperability
(Interoperability Trends for 2022, 2023)

Scaling of this horizon

This horizon consists of two parts. The first one is about communication between different parties. When integrating a communication platform in HiX, we need to make sure it is operable between different healthcare instances. For this, no AI is needed. However, when communicating between different instances, we need to make sure that the information is transferred in a user friendly way by translating it into action points. If this is proven to be successful, it can also be implemented in other parts of the journey, like the summary to the GP and referrer, the request for specialists, and the preparation of the discharge.



The second part is about summarizing the output they get from a referral. This can already be done in HiX, however, everyone has different wishes for how they want the summary to look. This summary following from the referral will be used to prepare for the MDO, but can also be used in other parts of the journey, like the summary of the MDO, the summary of the outpatient clinic, the surgery report and the discharge letter.

Technology

First, a communication platform in HiX needs to be designed to ensure easy communication between parties. Once this is in place, the system needs to be trained on the questions the professionals have. With this training the NLP system can be trained to translate questions into labels. These labels can then be used to translate into action points for the relevant parties using machine learning.

The summarizing tool in HiX can also be improved by using AI, this will mainly mean catering the summary to the needs of the professional writing it and receiving it. For this, training of a machine learning system is needed. It has to be trained on the changes a healthcare professional makes on the summary they get, what they add to it and what they leave out.

Case study

The case study that supports the need for seamless communication is about the omni channel solution of FissionLabs (Fission Labs Team, 2023). Here, they integrated the different communication channels in one platform, making it more accessible for healthcare professionals. By using AI, we can not only bring all these channels together, but create valuable action points for professionals

6.3 Ensuring dossier completeness: the third horizon

The third horizon introduces an AI-powered verification tool to check the completeness of patient dossiers, aiming to minimize the time healthcare professionals spend on verifying document completeness.

Goal & value proposition

The primary goal of this phase is:



Automate the preliminary verification of patient dossiers to ensure they are complete before they reach healthcare professionals.

The value proposition lies in:



Minimizing the administrative burden on healthcare staff



Reducing the potential for delays in patient care due to incomplete documentation



Enhancing the overall efficiency of healthcare delivery

This will lead to:



Improved patient outcomes



Increased staff satisfaction

Product service system

an AI-powered verification tool that checks the completeness of patient dossiers.

How this system connects to the three strategies:



Reducing administrative burden

Automating the initial check of dossier completeness to save healthcare professionals' time.



Improving communication & support systems

Ensuring that all necessary documentation is complete before it is reviewed by healthcare professionals, thereby improving the flow of information.



Addressing work-life balance and personal resilience

Reducing stress and workload on healthcare professionals by eliminating the need for manual checks of dossier completeness.



Users

The emotions that play in this horizon are:



Confidence

This horizon takes away human error in checking dossiers



Reassurance

By having a neutral extra vision on the dossier, professionals are secured of the completeness



Relief

It reduces the amount of time spend on dossier checking

The values that are important in this horizon are:



Accuracy

Errors have to be reduced when checking the dossier



Efficiency

The time spend on checking dossiers is reduced



Patient centric care

Streamlining the process ensures more patient time

The trends that are related to this phase are:



Digitalization (American Medical Association & American Medical Association, 2020)



Automation (Administrator, 2024)

Scaling of this horizon

When integrating a dossier checking tool in HiX, training of the system is needed. The system has to be able to recognize the different parts of the dossier and see which parts are missing. To make sure this is implementable in the long run, a long period of collecting data on patient dossiers and which information is essential has to be collected and analysed.

Technology

For this horizon, machine learning is needed. Since a dossier is already labeled, NLP is not needed. The machine learning can check if there is information in the labels needed and check which additional information is needed. To build this feature, a long period of collecting data on referral dossiers and the changes that are being made is needed.

Case study

The case study that supports the possibility of checking documents is Document AI from Google (Document AI | Google Cloud, n.d.). This feature can extract and judge the content of dossiers. This proves that a feature of judging electronic health dossiers might also be possible.

6.4 THE ROADMAP

1st horizon
0-2 years

2nd horizon
2-5 years

3rd horizon
5-10 years

GOAL

Value proposition

Seamless data transfer
Reducing administrative burdens, minimizing the risk of errors associated with manual data entry, and enhancing the speed and accuracy of information exchange

Optimization of communication
Improving the speed and quality of healthcare services, reducing the time healthcare professionals spend on administrative tasks, and enhancing patient care through more informed decision making

Automate verification
Minimizing the administrative burden on healthcare staff, reducing the potential for delays in patient care due to incomplete documentation, and enhancing the overall efficiency of healthcare delivery

USERS

Key factors

Emotions

Trust

Security

Efficiency

Confidence

Satisfaction

Relief

Confidence

Reassurance

Relief

Values

Patient centric care

Innovation

Collaboration

Transparency

Efficiency

Patient centric care

Accuracy

Efficiency

Patient centric care

Trends

Telemedicine

Increasing use AI

Machine learning

Digital transformation

Interoperability

Digitalization

Automation

PRODUCTS & SERVICES

Reducing administrative burden

Automating data transfer processes

Simplifying communication processes

Save healthcare professionals' time

Improving communication & support

Ensuring real-time data availability

Ensuring timely and accurate information exchange

Improving the flow of information

Addressing work-life balance

Minimizing stress related to data management tasks

Allowing better focus on patient care and personal wellbeing

Eliminating the need for manual checks of dossier completeness

TECHNOLOGY

Natural Language processing

Questions to labels

Machine learning

Labels to action points
Summarizing

Others

Technology for support & training

User friendly communication dashboard

Checking dossier completeness

8. Stakeholders in technology

- 8.1 Overview stakeholders in technology
- 8.2 Technology implications HiX perspective
- 8.3 Technology implications EMC perspective



Source Image: Monterie, A. (2023, October 17). Kuipers ontvouwt nieuwe visie op digitalisering zorg. Computable.nl. <https://www.computable.nl/2023/04/11/kuipers-ontvouwt-nieuwe-visie-op-digitalisering-zorg/>

Introduction

With the needs of the healthcare professionals in mind to better the administrative processes, I wanted to understand the background of the technology better. The question here is: healthcare professionals know what needs to be improved, so why doesn't it reach the people who need to make these improvements?

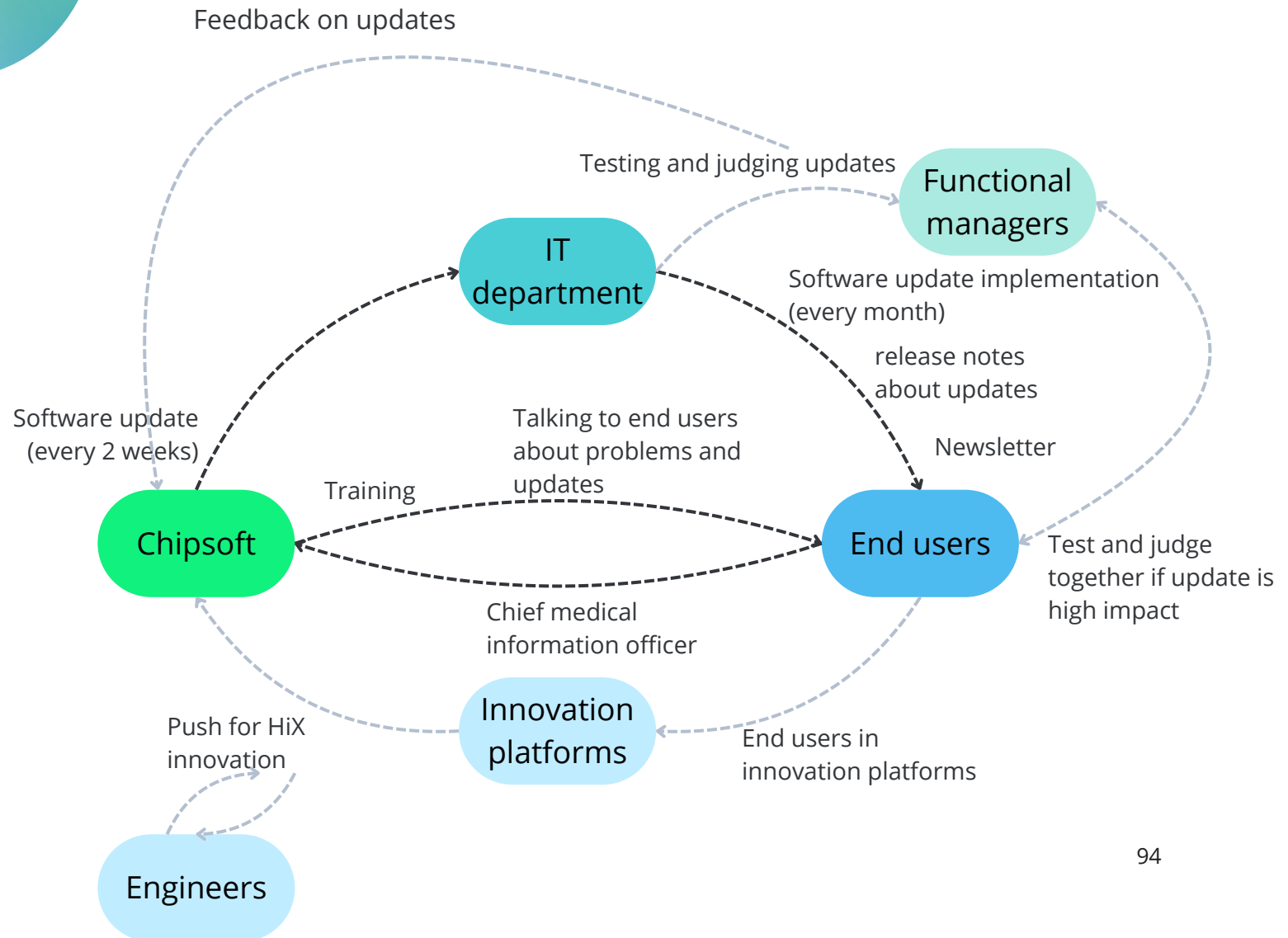
I spoke to three different people:

- Key accountmanager HiX at Chipsoft
- Engineer at Chipsoft
- Manager HiX at EMC

The interview guides can be found in appendix 7

What we can learn from these interviews is who the stakeholders are that are involved. We also see that a lot of tools are already in place to fulfill the needs of healthcare professionals, and there are tools in place to evaluate and get feedback from all parties involved. However, in practice, we see that updates and possibilities in HiX do not always reach the end-user properly.

8.1 Overview Stakeholders in technology



8.2 Technology implications HiX perspective

So let's take a look at the perspective from HiX, and what Chipsoft already has in place to make sure the needs of the end users are fulfilled.

Contact with end users about needs

The first aspect I want to highlight is the contact they have with end users. The goal of this contact is to get input on the needs they have for innovation within HiX. They have contact via 3 channels:

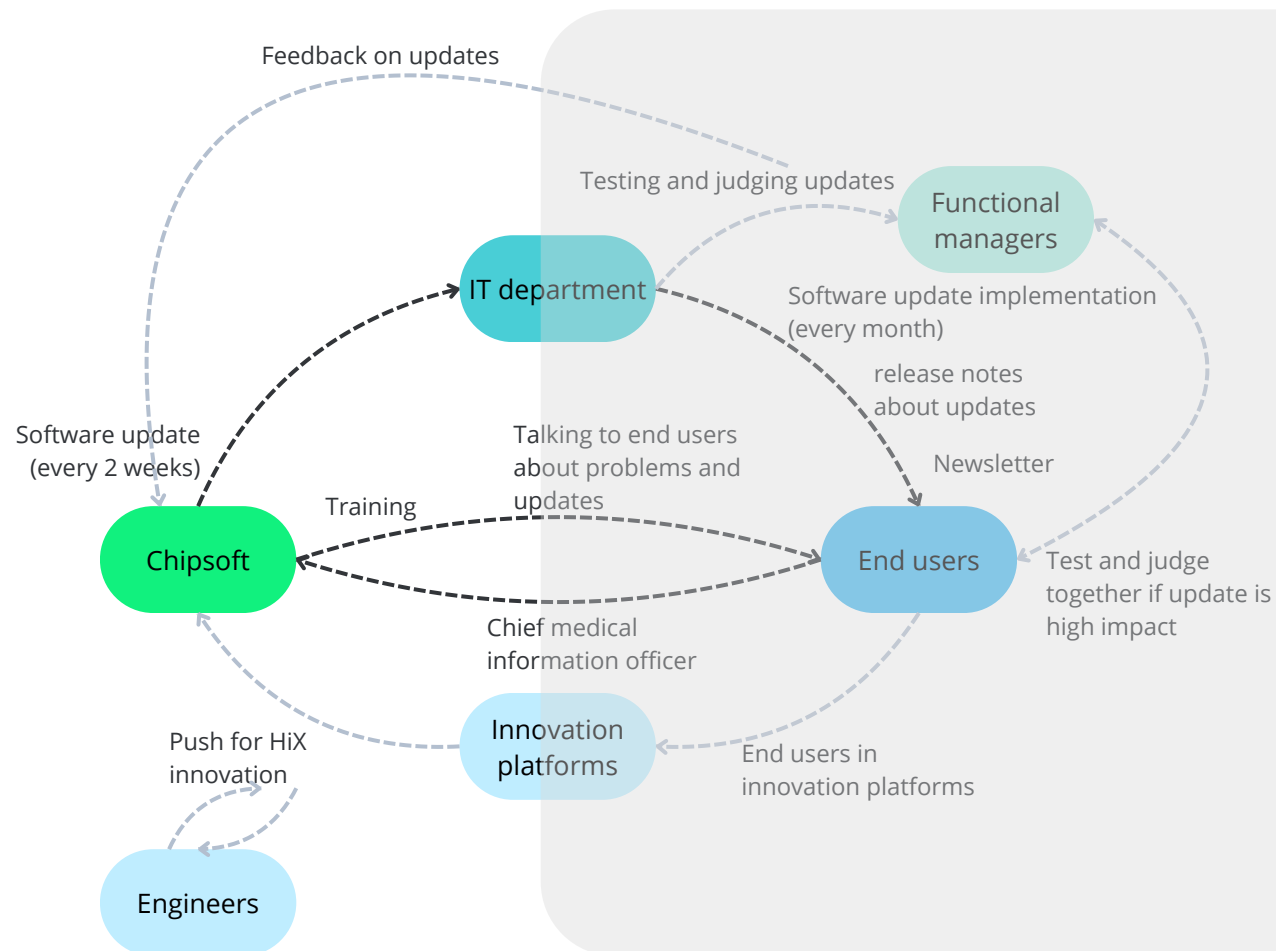
- Direct contact with end users by talking to them
- A chief medical officer for HiX who is also an end user to ensure the update can be used properly in practice
- Innovation platforms with end users who have meetings about the new updates they would like to see

Software updates

There are new software updates every 2 weeks, that come with release notes on how to install it and what it can do. This ensures the IT department has the right information about the possibilities

Feedback loops

HiX tries to get in contact with end users to gather information about their updates and get the feedback from the testing that is being conducted by the IT department and the end-users.



8.3 Technology implications EMC perspective

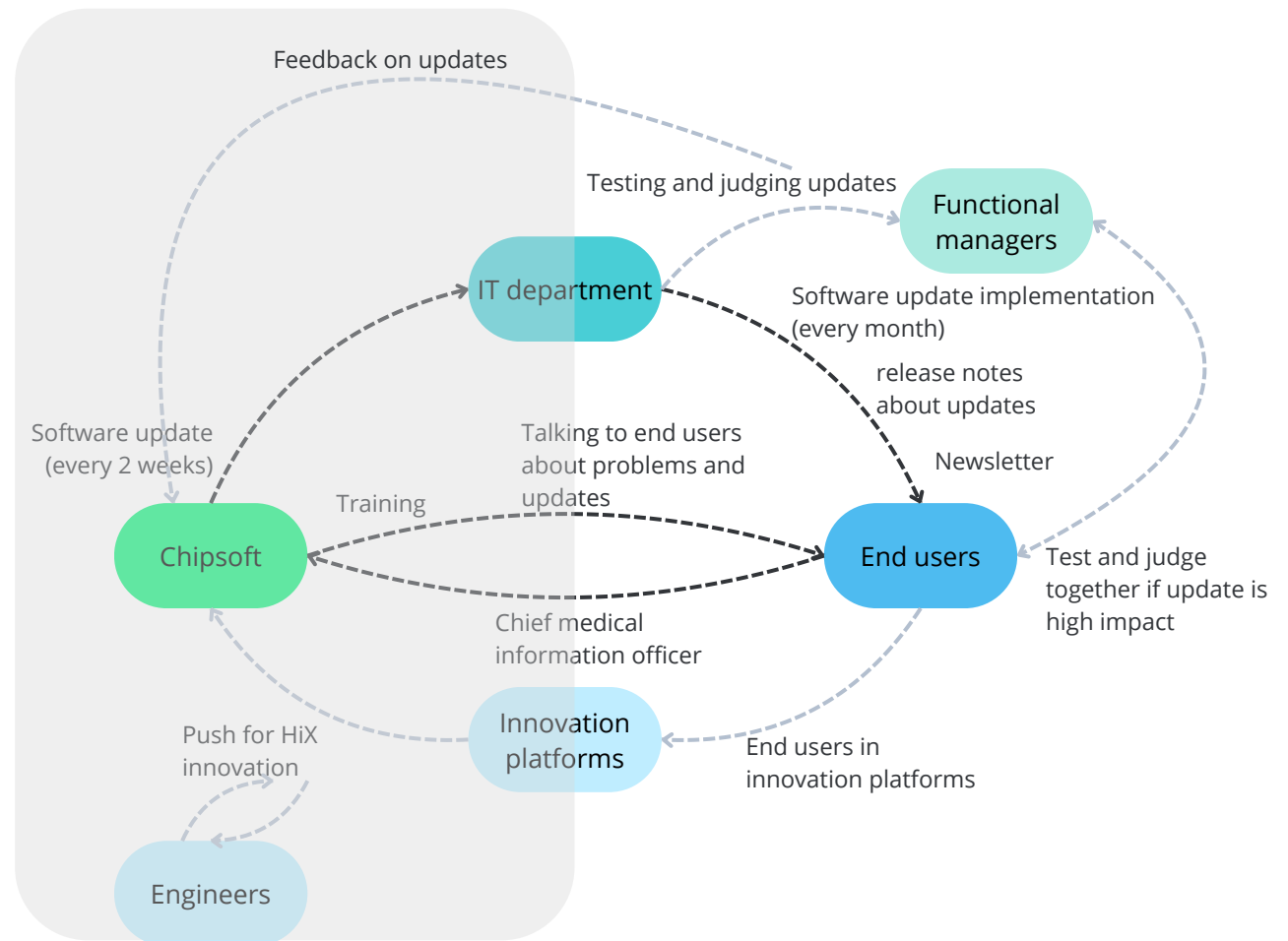
The other side of the perspective is from the IT department of the EMC. What do they do with the updates they get and how do they communicate it to the end user?

Newsletter

Whenever a software update is installed (every month), the release notes, together with a newsletter, explaining about the updates goes out to the end users. This with the aim to inform them about the changes and new possibilities.

Testing the updates

Whenever a big update has been installed, it will be tested and judged together with end-users and functional managers on the functionality & impact. If it is proven to be efficient and has a high impact, it will be installed for the whole organization and the possibility of training is introduced.



9. Empowering the healthcare professionals

9.1 AI-driven training & support
9.2 Continuous roadmap



Source Image:Erasmus MC. (n.d.). Onze visies - Erasmusarts2030 - Erasmus MC. <https://www.erasmusmc.nl/nl-nl/erasmusarts2030/onze-visies>

Introduction

As we saw in the previous chapter, the tools are in place to make sure the new features in HiX reach the end user the right way. On top of that, everyone seems to be doing its part bringing the right information to the right people. Still, healthcare professionals do not feel supported by the technology and don't feel listened to their needs, because they don't see the new features being installed.

This shows that the right information does not reach the end-user in a way that they actually notice it. To better this, I propose an additional roadmap, a continuous roadmap on personalized training and support, with the goal empowering the healthcare professional to use the possibilities in HiX the right way.

9.1 AI-driven training & support

To ensure the effective implementation and utilization of developed technologies, a continuous phase focuses on AI-driven training and support systems, providing tailored training programs and continuous support for healthcare professionals.

Goal & value proposition

The primary goal of this phase is:



Empower healthcare professionals with the knowledge and skills necessary to effectively use AI-enhanced tools and systems

The value proposition lies in:



offering personalized, adaptive learning experiences and real-time support

This will lead to:



Increased efficiency



Reduced errors



improved satisfaction among healthcare professionals

Product service system

The AI-Driven Training and Support System serves as a comprehensive platform that offers adaptive learning modules, real-time feedback, and personalized support.

How this system connects to the three strategies:



Reducing administrative burden

Efficient training on AI tools



Improving communication & support systems

Providing ongoing support and updates



Addressing work-life balance and personal resilience

Streamlining learning processes and reducing time spent on administrative tasks.



Users

The emotions that play in this horizon are:



Confidence

This horizon gives healthcare professionals the tools they need to work with new technology



Reassurance

The support helps them with whatever questions they need



Empowerment

By learning them about the possibilities, they can be their best version

The values that are important in this horizon are:



Continuous learning

With the continuous improvement, continuous learning is essential



Innovation

For every new need, new features might be needed



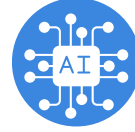
Patient centric care

By providing optimal training and support, the professional can focus on the patient

The trends that are related to this phase are:



Digital transformation
(Reddy, 2024)



AI integration
(PricewaterhouseCoopers, n.d.)



Personalized learning (Ai, 2023)

Technology

The main focus of this horizon is for AI to understand the most efficient way of learning of an individual, and understanding how learning fits in the schedule of the healthcare professional. For this NLP, Machine learning & adaptive learning should be implemented.

For the support part of this horizon, an AI chatbot can help the professionals with their questions regarding HiX.

What is important to note is that it takes time to train the system on learning patterns of an individual. To shorten this time span, we can take healthcare professionals as a group and first cater the learning patterns to all of them, since it will ensure quicker data collection. In a later stage, we can cater the learning patterns to the individual

Case study

AI is already used in education (Ai, 2023) for personalization purposes. It is used to analyze student data to understand strengths, weaknesses and learning pace. It is also used to assess the understanding of a student about the subject and give personalized recommendations. These insights prove the potential of using AI to personalize a learning and support experience.

9.2 THE ROADMAP

Continuous

GOAL	Value proposition	Empower healthcare professionals Offering personalized, adaptive learning experiences and real-time support, leading to increased efficiency, reduced errors, and improved job satisfaction among healthcare professionals		
	Key factors	Emotions	Confidence	Empowerment
Values		Continuous learning	Innovation	Patient centred care
Trends		Digital transformation	AI integration	Personalized learning
PRODUCTS & SERVICES	Reducing administrative burden	Efficient training on AI tools		
	Improving communication & support	Providing ongoing support & updates		
	Addressing work-life balance	Streamlining learning processes and reducing time spent on administrative tasks		
TECHNOLOGY	Natural Language processing	Understanding the learning patterns of individuals		
	Machine learning	Understanding the learning patterns of individuals		
	Others	AI chatbot Adaptive learning		

Limitations & recommendations

Generalisability

- Due to the specific subset of healthcare professionals, it is not possible to generalize these findings for all healthcare professionals. To understand better if these findings are true for other departments, further research must be done.
- Because of the specific stage in the journey, the findings might not be relevant for the whole journey, or for the Gastro intestinal oncology department of other hospitals. To determine this, further research must be done.

Ethics & AI

- At this moment, some implications surrounding ethics and AI can be found, however, they are not yet completely researched. Before determining the implementability and feasibility of the roadmaps, Ethical, regulatory and privacy is important to research further.

Implementation

- Right now, a general overview of implementation of AI is given in a roadmap. To make this roadmap more actionable, further development is needed. Both from a design perspective, in determining how to make it user centered, as well as from a computer science perspective, in seeing how to implement AI successfully.
- From the side of the ErasmusMC, if they want to successfully implement these ideas, they have to start collecting the necessary data.

Stakeholders in technology

- The perspective of the stakeholders in technology is a surprising finding and gives us a new perspective to look at the problem. It is a perspective to further develop, research and understand to see how this can be streamlined better.
- To help this streamlining and improve the collaboration, a co-creation session with the healthcare professionals and the stakeholders in technology could be beneficial.

Conclusion & discussion

The graduation project aimed to explore and address the challenges healthcare professionals face, particularly focusing on the administrative burden and its impact on their wellbeing. Through a co-creation session that employed tools like the Sailboat Exercise and brainstorming, healthcare professionals collaboratively identified key issues and potential solutions. This approach not only deepened the understanding of the chosen problem but also fostered a sense of ownership and engagement among participants.

The administrative load was highlighted as a significant concern, detracting from direct patient care and contributing to emotional exhaustion, depersonalization, and reduced personal accomplishment. These findings align with existing literature on healthcare professional burnout and the negative impact of excessive administrative tasks on job satisfaction and overall wellbeing.

The co-creation session underscored the importance of involving healthcare professionals in the problem-solving process, revealing that solutions to reduce the administrative burden could significantly enhance occupational wellbeing. Moreover, the session revealed a collective desire for strategies that bring healthcare professionals back to their core tasks, emphasizing patient care over paperwork.

The project's approach, utilizing the double diamond model and focusing on AI application to improve workflow, suggests that technology could play a crucial role in addressing these challenges. However, it also highlights the need for careful consideration of how such technologies are implemented to ensure they meet the needs of healthcare professionals without adding to their workload.

In terms of AI integration, the research suggests prioritizing areas where administrative burdens can be significantly reduced, such as documentation and data entry. The development and handling of AI models must be approached with a focus on privacy and security, especially concerning patient data. Assessing the impact of AI on healthcare delivery and administrative tasks will be crucial in determining the success of these interventions.

Personal reflection

Reflecting on this project, it has truly opened my eyes to the intricate web of challenges healthcare professionals navigate daily, especially concerning the administrative burdens that weigh heavily on their shoulders. Diving into this issue through a co-creation session, where we used tools like the Sailboat Exercise and brainstorming, was an eye-opener. It wasn't just about identifying problems and brainstorming solutions; it was about hearing it straight from those experience it every day. This approach didn't just enrich our understanding of the issue; it also sparked a sense of ownership and commitment among everyone involved.

The administrative load, as we uncovered, is a massive barrier, using the precious time that could be spent on patient care. This not only leads to emotional exhaustion and a sense of depersonalization among healthcare professionals but also takes away some of their sense of achievement. These insights mirror what's been documented in the literature about burnout in healthcare and the negative spiral excessive administrative tasks can trigger in terms of job satisfaction and overall wellbeing.

Our co-creation session really highlighted the importance of involving healthcare professionals in the search solutions. It was clear that easing the administrative load could significantly boost occupational wellbeing. There was a collective agreement for solutions that would allow healthcare professionals to go back to what they do best: caring for patients, rather than drowning in paperwork.

This project has been a reaffirmation of my belief in the power of user-centered design in healthcare technology. It's highlights the vital role empathy plays in coming up with solutions that genuinely support healthcare professionals, ensuring technology acts as support to their work, not an additional weight.

On a personal note, this journey has been incredibly enlightening. It's underscored the critical importance of engaging directly with the end-users of healthcare technologies right from the start. My commitment to user-centered design in healthcare has only deepened, fueling my drive to keep pushing the boundaries and find innovative ways to help healthcare professionals focus on what they do best.

Moreover, this project has been a gateway into the world of AI for me, a domain I was not very familiar with at the start. It's not just about the technology itself but about stepping out of my comfort zone and embracing the learning curve. This experience face new challenges head-on and trust in my ability to understand new concepts quicker than I might have previously thought possible.

Appendix

References

Appendix 1. Project Brief

Appendix 2. Interview guide

Appendix 3. coding interviews

Appendix 4. Interview guide Jan-Mark

Appendix 5. SCAMPER

Appendix 6. Co-creation exercises

Appendix 7. Interviews stakeholders in technology



Source image: Erasmus MC. (2022, October 12). Erasmus MC zet licht logo's uit voor het klimaat. ErasmusMC. <https://www.erasmusmc.nl/nl-nl/artikelen/licht-uit-voor-het-klimaat>

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Appendix 1. Project brief

Designing for the wellbeing of healthcare professionals _____ project title

Please state the title of your graduation project (above) and the start date and end date (below). Keep the title compact and simple. Do not use abbreviations. The remainder of this document allows you to define and clarify your graduation project.

start date 05 · 10 · 2023 _____ 18 · 03 · 2023 _____ end date

INTRODUCTION **

Please describe, the context of your project, and address the main stakeholders (interests) within this context in a concise yet complete manner. Who are involved, what do they value and how do they currently operate within the given context? What are the main opportunities and limitations you are currently aware of (cultural- and social norms, resources (time, money, ...), technology, ...)

The workload of healthcare professionals is currently too high and there is a lot of pressure on healthcare in the Netherlands. If this will not change in the coming years, one in three dutch people have to work in healthcare in the future to keep up with the demand. One of the reasons that the workload is increasing is because there is an increase in "side-tasks" (such as a high administrative load), which keeps healthcare professionals from their main purpose of helping people. In this project, I will map out which side tasks they face and how they keep them from their main goal of helping people (figure 1). In this project, I will mainly focus on the medical staff of the Erasmus MC and more specifically the surgical department of colorectal cancer.

Stakeholders (figure 2)

Doctors - They are in the category of healthcare professionals and are the people with too high a workload. Because of all the side-tasks they have to do, it takes them from their core tasks and the reason why they are doing this. What they gain by this is being able to do more of the core tasks, which is essentially why they are doing this and this can higher their professional wellbeing and job satisfaction

Nurses - They are in the category of healthcare professionals and are the people with too high a workload. Because of all the side-tasks they have to do, it takes them from their core tasks and the reason why they are doing this. What they gain by this is being able to do more of the core tasks, which is essentially why they are doing this and this can higher their professional wellbeing and job satisfaction

Hospital - The hospital is the instance for which the doctors and nurses are working, but on the other side, where the patients come to get treated properly. They see an increase in patients and on the other side, they face doctors who do not want to work too long hours and don't want to have too high a workload. This they have to balance in a proper way and come up with new ideas to make sure that they can keep up with the demand of healthcare and help as many people as possible

Health insurance - The main concern of health insurances is keeping healthcare affordable. For them to judge whether a procedure is done right and was necessary, the paperwork needs to be done right.

Dutch Society - Everyone has the right to be healthy. With the increase in demand, partly because people are getting older, there is growing a bigger burden on healthcare if nothing changes. For society, this can mean multiple things, the two main ones being: more people having to work in healthcare, who might not want to or having proper access to healthcare for all people.

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introduction (continued): space for images



image / figure 1: Current workload of healthcare professionals



image / figure 2: Stakeholders

PROBLEM DEFINITION **

Limit and define the scope and solution space of your project to one that is manageable within one Master Graduation Project of 30 EC (= 20 full time weeks or 100 working days) and clearly indicate what issue(s) should be addressed in this project.

We see a dramatic increase of workload in the healthcare sector over the past 20 years. These high workloads lead to burnout, job dissatisfaction, high departure rates and a critical (nursing) staff shortage. This is not only harmful for professionals, but also for the quality and access of patients to healthcare (Gesner et al., 2022). Most nurses and doctors pursue their career to help people, but we see an increase in other tasks they have to perform in their day to day life. By streamlining these responsibilities, we can bring up morale of the healthcare staff, and thus the job satisfaction. Research has shown a correlation between decreased work satisfaction and patient access to healthcare, which means solving this issue will benefit patients, but also will result in a higher quality of care for society in the long run (Woolhandler & Himmelstein, 2014). De Visser et al. (2021) states the 3 dimensions of sustainability of care as: financial sustainability, staff sustainability and social-cultural sustainability. These 3 have to be balanced to ensure the overall sustainability of care, and currently staff shortages are the reason why we don't have sustainability of staff. By restructuring the healthcare to be more efficient, less people and resources are needed.

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De Visser, M, Boot, A. W. A., Werner, G., Van Riel, A., & Gijbels, M. (2021). Kiezen voor houdbare zorg: Mensen, middelen en maatschappelijk draagvlak.

ASSIGNMENT **

State in 2 or 3 sentences what you are going to research, design, create and / or generate, that will solve (part of) the issue(s) pointed out in "problem definition". Then illustrate this assignment by indicating what kind of solution you expect and / or aim to deliver, for instance: a product, a product-service combination, a strategy illustrated through product or product-service combination ideas, ... In case of a Specialisation and/or Annotation, make sure the assignment reflects this/these.

To design a strategy, backed with a product/service to support healthcare professionals to focus on their main tasks. _____

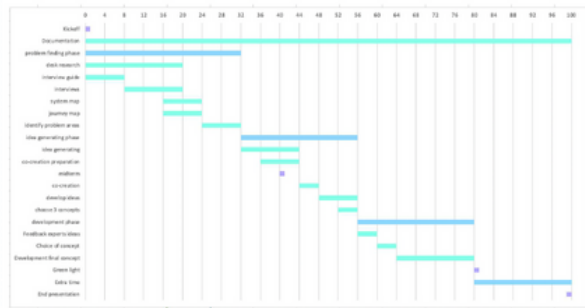
In this project, I am going to research the problems the healthcare professionals face daily that keep them from their core tasks of helping people. For these tasks, I am going to create some possible solutions to help them lowering the time it takes to finalise these tasks successfully. My aim to deliver is a strategy, backed with a product/service to help healthcare professionals towards this strategy. Right now, talking to some healthcare professionals, they feel like the main thing that they face is too high a administrative load. In the first phase, I want to look a bit broader to see whether this is actually the reason, or if there are other reasons. After finding out the main reasons that keep them from their main task, I will propose a strategy to bring them back to their main tasks and some ideas to work towards this strategy.

The main focus of this project is in the problem finding phase, finding out which areas can be improved. This will be done by conducting desk research and qualitative interviews. The insights from this will be summarized in a system map and a healthcare professionals journey. From this, a few problem areas can be derived. (+/- 8 weeks) After some problem areas have been found, a focus will be placed on one, which is seen as most crucial by me and the client. For this problem, I will find new ideas by using idea finding methods and using co-creation tools to involve stakeholders in the process. This stage will end with some developed concepts. (+/- 6 weeks) These concepts will be weighted and for one of these, we will develop further into an implementation plan. (+/- 6 weeks)

PLANNING AND APPROACH **

Include a Gantt Chart (replace the example below - more examples can be found in Manual 2) that shows the different phases of your project, deliverables you have in mind, meetings, and how you plan to spend your time. Please note that all activities should fit within the given net time of 33 EQ = 20 full time weeks or 100 working days, and your planning should include a kick-off meeting, mid-term meeting, green light meeting and graduation ceremony. Illustrate your Gantt Chart by, for instance, explaining your approach, and please indicate periods of part-time activities and/or periods of not spending time on your graduation project, if any, for instance because of holidays or parallel activities.

start date 5 - 10 - 2023 18 - 3 - 2023 end date



In the gantt chart planning, you can see the process mapped out. I chose to work on my graduation 4 days a week, with the christmas break (2 weeks) and the TU break (1 week) inbetween. This means I have 25 working weeks and in total 28 weeks.
 This means the following for the important dates.
 Kickoff: 5th of september
 Midterm: 9th of november
 Green light: 8th of february
 End presentation: 14th of march

MOTIVATION AND PERSONAL AMBITIONS

Explain why you set up this project, what competences you want to prove and learn. For example: acquired competences from your MSc programme, the elective semester, extra-curricular activities (etc.) and point out the competences you have yet developed. Optionally, describe which personal learning ambitions you explicitly want to address in this project, on top of the learning objectives of the Graduation Project, such as: in depth knowledge a on specific subject, broadening your competences or experimenting with a specific tool and/or methodology, ... Stick to no more than five ambitions.

For me, I chose to do the medesign specialisation because I believe there is a lot to improve in the healthcare sector. However, this is a sector that is about making people healthy, which I believe is a fundamental right. As opposed to designing for a normal company, who most of the time just want their product to be a bit better, to help normal people to make their life a bit easier, in the healthcare sector, you can help people to actually get better, which I believe is a good cause.

In this project, my main focus is not on making people better, but focussing on the people who do contribute their daily life to making people better. This is a different perspective on medesign as I had expected in the first place, but just as important, as healthcare professionals are very often overlooked. With this project, I want to see how we can help these people who are often overlooked, and find out how this can translate in them being able to help more people get healthy.

Learning ambitions:

- Learning about system mapping
- Becoming more comfortable with conducting interviews
- Finding new methods to get insights from hospital staff
- Use my roadmapping skills acquired in the master in the implementation phase.

FINAL COMMENTS

In case your project brief needs final comments, please add any information you think is relevant.

Appendix 2. Interview guide healthcare professionals

Introduction (2 minutes)

Goal: To explain the purpose of the research, to get to know each other, and to determine the personality type of the interviewee.

Points to mention: Recording the interview, signing the consent form.

General Introduction:

- Can you tell me a bit about yourself?
- How would your friends/family describe you? Please use three characteristics.

Topic 1: The Reason for Entering the Profession (5 minutes)

Goal: To discover their motivation for choosing their career (*Occupational wellbeing*)*.

- Let's go back to the beginning, what was your reason for entering healthcare?
- How does this reason translate to your work now?
- Are there also tasks in your work that take you away from this reason? (*examples of job demands*)**

If administrative burden -->

- Looking at the entire process, where do you experience the most administrative burden?

Topic 2: The Journey (20 minutes)

Goal: To deepen and further understand the treatment journey.

- Let's look at the entire treatment journey and what your role and tasks are in it.

For each step of the journey:

- Can you tell me what happens in this step, what are the administrative tasks? (*documentation burden****)
- What is your role in this step?

If the healthcare professional has a dominant role:

- Can you describe how you feel during this step?
- How much time does this step approximately take you?
- How much energy does this task cost you?
- How closely do these tasks align with why you do this?
- Have you already thought of ways to ensure it takes less time?

Overall:

- If you look at the entire process, what is the biggest problem in your workflow?

Ending (5 minutes)

Goal: To thank the participant and to find initial ideas.

- Are there things I have forgotten in the process?
- Do you have any tips for things I should look at/read about?
- What are the first ideas you have to solve the problems at work?/What features would you like to have in a solution?

***Key take away 1.6 Occupational commitment is crucial in jobs like healthcare and is the key determinant on whether someone is considering leaving the profession**

****Key take away 1.7 Mainly quantitative research is done on the subject and is mostly on how we can measure wellbeing, lacking concrete examples of where improvement is needed**

*****Key take away 2.2 Documentation burden, a significant job demand, affects healthcare professionals' autonomy and workload, impacting their efficiency of practice**

Appendix 3. coding interviews

Topic: work culture & support			
<i>Insight</i>	<i>Subtheme</i>	<i>Journey phase</i>	<i>Domain</i>
The work can be emotionally heavy due to the situations you see on the work floor. Although everyone sees the importance of delivering bad news well, this can still hit hard due to circumstances (many bad news conversations, a situation similar to yours).	Emotionally demanding job	Overall	Personal resilience
The support culture within the team is experienced as pleasant. Everyone sees the importance of having people around you where you can share your story if you find it difficult. The participants also experience that they can go to their colleagues for this and that the atmosphere within the EMC is suitable for this. What they also appreciate is that colleagues often understand this better than their (non-medical) partner.	Support of your peers	Overall	Culture of wellness
There are few to no fixed mechanisms in place to deal with the emotional aspects of the work, but the need for this is also low. Only for traumatic events is help offered from the EMC. However, participants indicate that they do not need this and prefer to talk about these kinds of things within their own group of colleagues.	Set support mechanisms at EMC	Overall	Culture of wellness
For young healthcare professionals, not having a permanent contract causes extra stress. The long road to a permanent contract at the EMC causes uncertainty and stress. This also influences the behavior of the healthcare professionals in question, as they feel more pressure to prove themselves, work a lot, keep everyone friendly, and perform tasks they find less enjoyable (e.g., extra research)	Job insecurity	Overall	Culture of wellness
The long working hours weigh heavily on healthcare professionals physically and mentally.	Long working hours	Overall	Culture of wellness
If healthcare professionals think about how the work situation can be improved, and then nothing is done with it or it is stopped after a short time, healthcare professionals feel unheard.	Creating better working conditions together	Overall	Culture of wellness

Topic: Peripheral matters			
<i>Insight</i>	<i>Subtheme</i>	<i>Journey phase</i>	<i>Domain</i>
<p>Web consultations can reduce stress for patients, but not everyone likes working with a web consultation. Due to travel distance and time, patients can experience stress, and it makes it harder for someone to join the consultation; this stress can transfer to the healthcare professional. A web consultation can be a solution for this, but not everyone likes to work with it due to its less personal nature and the possibility of it not working properly.</p>	Lower the burden on the patient	Overall	Efficiency of practice
<p>The technology sometimes fails the healthcare professionals. This is because some codes, for example, do not want to link, and the system does not work optimally.</p>	Inefficient technology	Overall	Efficiency of practice
<p>Working ahead towards a discharge is almost not allowed by the system. It is almost impossible to prepare the files for patient discharge in advance. This results in last-minute sending back and forth of required documents and frustration when people are not readily available due to busyness.</p>	Inefficient technology	Discharge from hospital	Efficiency of practice
<p>A medically trained secretariat that can assess incoming patient files relieves the pressure on healthcare professionals and keeps the lines short with the referring hospital. When the secretariat can already do a (first) check to see if all the necessary files have been sent by the referring hospital, it saves the healthcare professionals time and stress over getting a complete file.</p>	Role of the secretariat	Referral to MDO	Efficiency of practice

Topic: Communication			
<i>Insight</i>	<i>Subtheme</i>	<i>Journey phase</i>	<i>Domain</i>
<p>Participants see communication with the patient as one of the most beautiful parts of their work. Both in good news conversations and finding solutions, as well as in guiding the patient with less good news, healthcare professionals see tremendous value and the important role they have in this. They are happy to pay attention to this.</p>	Communication with patient	Outpatient clinic to surgery	Efficiency of practice
<p>The practical matters surrounding communication with the patient are not always optimal. Healthcare professionals find it less pleasant not to get a patient on the line, or to let a patient who has traveled far wait a long time.</p>	Communication with patient	Overall	Efficiency of practice
<p>The MDO is the most important moment to discuss patients with colleagues. All important patients are discussed here and healthcare professionals also appreciate it when everyone prepares and reads in advance.</p>	Meetings with other professionals	Referral to MDO	Efficiency of practice
<p>Getting a complete file from a referring party takes time. Often the file that has been sent is not complete and an email has to be sent back to get the missing documents, this can take a few days and is already experienced as annoying.</p>	Communication with external parties	Referral to MDO	Efficiency of practice
<p>Home care is one of the biggest reasons that someone cannot yet be discharged from the hospital. There is often no place at home care or a care hotel, which is partly because it cannot be applied for in time, which means that patients stay longer than necessary and no new free beds become available for other patients.</p>	Communication with external parties	Discharge from the hospital	Efficiency of practice
<p>There are many different requests for an operation, which takes a lot of time. A radiologist, a stoma nurse, urologist, dietitian, etc. may all be needed for an operation and this all requires a separate request.</p>	Communication with in-hospital parties	Outpatient clinic to surgery	Efficiency of practice
<p>Too many parties are involved in the discharge of the patient from the hospital, this causes a lot of delay in the discharge. The doctor, the nurse, the pharmacy, the transfer nurse, the home care/the care hotel. These are all parties that may be involved in the discharge, if one is not in order, the discharge can already be delayed. This causes frustration for all parties.</p>	Communication with in-hospital parties	Discharge from the hospital	Efficiency of practice

Topic: Administration

<i>Insight</i>	<i>Subtheme</i>	<i>Journey phase</i>	<i>Domain</i>
Administration is seen as the number 1 activity where healthcare specialists waste most of their time. It is seen as not fun, too much, and takes away time from what they do it for: the patient.	Time consuming	Overall	Efficiency of practice
Getting a complete medical record takes time. It often takes a lot of time to transfer the correct information to the electronic patient record. It cannot be automated, but often cannot be copied and pasted either, which requires a lot of manual work.	Time consuming	Referral to MDO	Efficiency of practice
Administration for the outpatient clinic takes more time than patient contact itself. From noting what has been discussed to the requests that follow, participants spend more time on administration than on the discussion with the patient.	Time consuming	Outpatient clinic to surgery	Efficiency of practice
The administration imposed by rules and financial matters is a lot. From a DBC request and insurance work to resuscitation policy and medication, all administration that must be correct takes a lot of time.	Rules & finances	Outpatient clinic to surgery	Efficiency of practice
With many administrative forms, the same data is asked, which means having to fill in the same thing very often. This causes frustrations among healthcare professionals.	Inefficiency	Overall	Efficiency of practice
Each request must be filled in separately. The urologist, for example, does not need the same information as the dietitian. However, this costs the healthcare professionals a lot of time.	Administration each step of the way	Overall	Efficiency of practice
A lot of manual input and checking is required for an MDO. From a complete file, with possible new requests for research, to preparing, checking and summarizing the MDO. All this has to be done manually.	Administration each step of the way	Referral to MDO	Efficiency of practice

Topic: Administration			
<i>Insight</i>	<i>Subtheme</i>	<i>Journey phase</i>	<i>Domain</i>
Everyone has different wishes about the operation report. One person does not find it useful, the other uses it to reflect and uses it for research.	Administration each step of the way	Outpatient clinic to surgery	Efficiency of practice
Even though there is no American claim culture here, healthcare professionals are still afraid that they have not filled in everything correctly. This, for example, for the complaints committee, or to ensure that they do not get it returned.	Uncertainties in administration	Overall	Efficiency of practice
More and more administration is being added. Due to laws and regulations, more and more things need to be documented. This ensures that the administrative burden becomes even higher, while it is already the least fun part of their job for healthcare professionals.	Increase in administrative load	Overall	Efficiency of practice
The support they receive with their administrative burden falls short. From limited packages in Hix, as a poorly functioning helpdesk, healthcare professionals do not always feel heard in their problems.	Support in administration	Overall	Efficiency of practice
A lot of administration is added, especially if something goes wrong once, but nothing is ever taken off. It is not evaluated whether it is useful or makes sense.	Evaluation	Overall	Efficiency of practice

Topic: Work-home balance			
<i>Insight</i>	<i>Subtheme</i>	<i>Journey phase</i>	<i>Domain</i>
No matter how well you can handle emotional circumstances at work, sometimes you take it home. This can cause stress symptoms, lying awake, and a less pleasant feeling.	Emotional impact of the job	Overall	Personal resilience
If there is also a lot of work at home, it is harder to deal with stress at work. Consider, for example, situations with children or single people who do not have a partner at home.	Stress at home	Overall	Personal resilience
It can be difficult to "switch off" at home. If something is forgotten, it often tends to be done at home in the evening, but even on days off, it is difficult to not be busy with work.	Working at home	Overall	Culture of wellness
Due to the way the work week is structured, your personal life is sometimes dictated by your work. For example, if you are on duty, you are not allowed to drink, or you have to stay near the hospital, which is especially difficult if you live far away.	Lack of personal freedom	Overall	Culture of wellness

Topic: Time management & autonomy			
<i>Insight</i>	<i>Subtheme</i>	<i>Journey phase</i>	<i>Domain</i>
Meetings take up a lot of time. This is time that cannot be spent on patient contact or research.	Meetings	Overall	Efficiency of practice
Certain procedures are very time-consuming. More and more procedures are being added, which are good on paper, but ultimately take up a lot of time for the healthcare professional. Consider, for example, the Top procedure, informed consent, and other laws and regulations.	Time on procedures	Overall	Efficiency of practice
Investing time in research and education often has to be done in one's own time. Partly due to the many hours and the ad hoc nature that comes with the job, research and education often lag behind. If time does go to this, it is at the expense of patient contact.	Time for research & teaching	Overall	Culture of wellness

Appendix 4. Interview guide Jan-Mark

Questions

What type of AI technologies are already used in healthcare?

What is machine learning?

- What are the potential benefits and challenges of using machine learning for streamlining data transfer, enhancing communication, ensuring dossier completeness, and AI-driven training and support in healthcare?
- What types of data are most valuable for training machine learning models in healthcare, and how is patient privacy protected in this process?

What is NLP?

- How can NLP improve the accuracy and efficiency of clinical documentation in healthcare settings?
- In what ways can NLP techniques be used to extract and organize patient information from various types of medical records?
- What are the challenges in implementing NLP in healthcare, particularly regarding the understanding of medical jargon and ensuring patient privacy?

Ethical and Practical Considerations

- What ethical considerations must be taken into account when implementing AI in healthcare, such as patient privacy, data security, and informed consent?
- What measures are being taken to ensure that AI applications in healthcare are unbiased and equitable?

Appendix 5. SCAMPER

Theme 1: Efficiency and Time Management
Time Consumption

Current situation

Scamper

Concept

Data Redundancy

Specialization Requirements

Medical Record Compilation

Outpatient Clinic Administration

Inefficient Referral Transfers

Repetitive administrative tasks because of multiple forms

Overload of information needed in EHR

Overload of information needed in EHR

Manual transfer of data in referral

Eliminate

Repetitive data entry by data recognition (machine learning)

Modify

How the data is displayed for various professions

Adapt

Use NLP to process the letter to data labels

→Intelliflow

→Documentor AI

→AI-Enhanced EHR Assistant

Theme 2: Regulatory Compliance and Financial Management
Regulatory and Financial Burdens

Current situation

Scamper

Concept

Increasing Amount of Tasks

Diverse Operation Report Opinions

Theme 3: Support and Evaluation
Inadequate Support

No support experienced in use HiX

Adapt

Introduce chatbot to help in the HiX system

→ AdminAid Bot

Lack of Task Evaluation

No evaluation on tasks done

Adapt

Use NLP to process the letter to data labels and reduce chance of errors

→ Insight AI admin

→ Feedback AI enhancer

Fear of Inaccuracy

Manual transfer of data in referral

Combine

Combine AI with support manuals of HiX to streamline the system

→ AI-Enhanced EHR Assistant

Lot of unknowns about data security

Combine

Combine knowledge about security with the system to reduce errors

→ Secure health AI

Theme 4: Communication and Patient Experience
Optimal Patient Communication

Complete Patient Files

Communication about patient files has to be done via different channels

Eliminate

Different communication channels

→ MedComm Sync

→ AI Linkhealth

Theme 5: Team Coordination and Care Planning

Multidisciplinary Team Meetings (MDO)

Operation Requests

Theme 6: Patient Care Transitions and Workflow

Home Care and Discharge Delays

Discharge Process Complexity

Current situation

Communication between parties about patient discharge is highly inefficient

Scamper

Eliminate

Different communication channels

Concept

MedComm Sync
AI Linkhealth

Theme 7: Technological Integration and Limitations

Web Consultations

Technology Limitations

Manual transfer of data in referral

Adapt

Use NLP to process the letter to data labels and streamline process

AI-Enhanced EHR Assistant

Theme 8: Administrative Efficiency and Support

Medically Trained Secretariat

Discharge Proces

Theme 9: Time Management and Allocation

Meetings

Procedural Time Consumption

Theme 10: Procedural Efficiency and Effectiveness

Implementation of Procedures

Theme 11: Work-Life Integration
Difficulty Disconnecting

Theme 12: Work Schedule Demands
Workweek Structure

Workflow and dashboard is standardized

Scamper

Concept

Adapt

Use machine learning to learn about preferred workflow of professional

→ CustomAid Health
→ AI TimeTuner

Theme 13: Professional Development vs. Patient Care
Investing Personal Time

Impact on Patient Contact

Theme 14: Workplace Support and Culture
Supportive Team Culture

(Emotional) Support Mechanisms

Theme 15: Job Security and Workload
Contractual Uncertainty

Long Working Hours

Theme 16: Voice and Agency
Unheard Suggestions

Current situation

Training is not catered to the needs of the individual

Not enough attention for emotional wellbeing

Scamper

Adapt

Use machine learning to learn about preferred training style of professional

Adapt

Use machine learning to learn about emotional needs of professional

Concept

→ AI TrainEase

→ AI wellness companion

Appendix 6. Co-creation exercises

Wat helpt ons hierin?
De wind in de zeilen

① Zorgaanpak is veel aantrekkelijker voor
② Er zijn veel voorkeuren!

Wat is ons doel?
De ideale situatie

① Gegevens direct voor de hand liggend
② Zorgprofessionalisme

Administratie
Het overzetten van een doorverwijzing naar het EMC systeem is niet efficiënt.

Randzaken
Een medisch onderlegd secretariaat dat binnenkomende patientendossiers kan beoordelen verlicht de druk op de zorgprofessionals en houdt de lijntjes met het verwijzende ziekenhuis kort.

Wat houdt ons tegen?
Het anker

① EPD - herroeping
② Geen aansluiting met de voorkeuren

Welke risico's?
de rotsen onder water

① Centrale coördinatie afbreken
② €

Brainstorm

Afhankelijk
van andere
partijen

Togang tot
EPD.

Automatisch
kopieren info
van ander ZH
→ digitaal

manier inlezen
EPD
PDF ?

MDO aanvraag
door verwijzer?

Essentie uit
brief

ICD 10 code
in EPD

manier van
in scan ~~beoordeling~~
bepaald
kopieerbaarheid

Samenvatting
Knop
↳ compleet
↳ essentie

HIX
naar
HIX
invullen in ene
ziekenhuis sturen
naar ander ziekenhuis.

template

Tekening van het idee

Uitleg van het concept:
Directe gegevens -
uitwisseling verschillende
(digitaal!) ziekenhuizen

Welke problemen lost dit op?
- overnemen van gegevens
- onnodige administratieve tijd
- geen verlies van gegevens?

Wat maakt dit beter dan de huidige situatie?
- frustratie!
- vertraging door afwezige gegevens

Kennis over AVG

template

Tekening van het idee
Kennis over AVG

Uitleg van het concept:
AVG - wetgeving die de
bescherming van mensen
op uitwisseling gegevens

Welke problemen lost dit op?
Er is nu meer
uitwisseling mogelijk
als er voldoende
kennis is
[Geen toestemming
van de betrofene]
men =>

Wat maakt dit beter dan de huidige situatie?

Appendix 7. Interviews stakeholders in technology

Topics key accountmanager HiX

- The online referral process
 - Why only in South Holland?
 - What prevents it from being implemented throughout the Netherlands?
 - What are currently the biggest difficulties you encounter?
 - Do you have plans to further improve it?
- System packages
 - How do you make it clear to your client what is possible within Hix?
- In what ways are you generally working on improving technology, and are you also looking into AI integration options?
 - How does this process work to implement changes in the system?

Topics engineer HiX

- Continuous Improvement Process: How does Chipsoft manage the balance between implementing new technologies, such as AI, and ensuring the stability and reliability of HiX for critical healthcare operations?

HiX & AI

- AI Implementation Strategy: How does Chipsoft prioritize areas within the HiX application for AI integration, especially to reduce administrative burdens for healthcare professionals? Are there specific criteria or metrics guiding these decisions?

- Development and Data Handling of AI Models: Can you explain the process of selecting and training AI models for use within HiX? How do you ensure the privacy and security of patient data during this process?
- Assessing the Impact of AI: How does Chipsoft measure the effectiveness of AI implementations in HiX in terms of improving healthcare and reducing administrative tasks? Are there any success stories or case studies you can share?

Innovation Platforms

- Feedback Mechanisms: What formal mechanisms, besides innovation platforms, are available for end-users to submit feedback or suggestions for HiX, and how does Chipsoft ensure this feedback is systematically reviewed and followed up?
- Innovation Platform: How is the input from end-users on the innovation platform ultimately translated into actionable updates?

Reducing Administrative Burdens

- User-Friendly Design: How does Chipsoft's dedicated usability team assess and improve the intuitiveness and efficiency of the HiX interface to ensure minimal administrative effort from healthcare professionals?

Topics manager HiX EMC

- How do you receive software updates from HiX, and how does the process of gathering the right information about these new updates work?
- How do you communicate new capabilities within HiX to the end-users? What steps do they need to take themselves with new software, and what tasks do you handle?

