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**Evaluation and improvement of integrated cardiac care:
efficient and effective care in patients with chronic
coronary artery disease and chronic heart failure**

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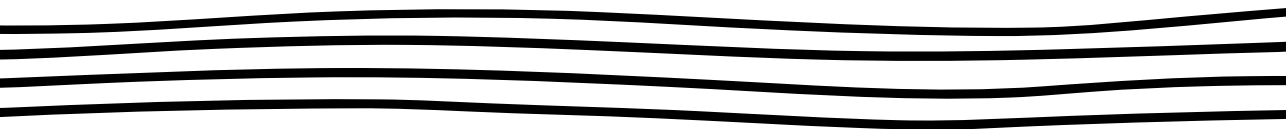
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CHAPTER 6

SUMMARY, CONCLUSIONS, AND FUTURE
PERSPECTIVES



SUMMARY

The aim of this thesis is to evaluate chronic cardiac care in the Netherlands. It accentuates points of improvement in healthcare delivery of primary, secondary, and tertiary care, by focusing on the treatment of chronic coronary artery disease and chronic heart failure (HF). **Chapter 1** starts with the pressure on the sustainability of the current Dutch healthcare system. Furthermore, the healthcare expenses, and their expected global growth are discussed. This growth can be explained by a demographic change in the population: people are getting older and are suffering from multiple chronic diseases (multi-morbidity). An increase in patients is paralleled by a growing need for care, caregivers, and expenditures: it is a fundamental topic on the political agenda. The agreement between the government and the specialist medical care states a maximum growth on the macro level is possible of 0.8% in 2018 and 0.0% in 2022. (1) For primary care a maximum growth of 2% in 2021 and 2022 possible.(2) We should search for ways to increase efficacy and efficiency in healthcare. In the past few years, more attention has been given to individual patients with their needs and experiences during the disease trajectory. By shifting focus to the experiences of the patient the definition of 'value' becomes more important; 'evidence-based' healthcare in combination with the importance of 'value' evolves into 'value-based' healthcare. To create value in healthcare, it is important to measure the outcomes and experiences of patients and to take the costs of a certain treatment or, ideally, of the complete disease trajectory into account. This allows for the quality of care to be determined by the needs of the individual patient and not by their illness. This patient-centred and value-based healthcare requires collaboration on different levels of healthcare, i.e. integrated care. The opposite of integrated care is fragmented care. Our current healthcare system consists of fragmented care: primary, secondary, and tertiary care. Fragmented care hinders communications and collaboration between the different levels of care. The following questions were addressed in this thesis:

1. Are chronic coronary artery disease and chronic HF care efficient and effective in the Netherlands?
2. What are potential areas of improvement in Dutch cardiovascular healthcare delivery?

A possible way to increase the value of care is to move away from the current fragmented care and implement integrated care models. To investigate the suitability of such a care model for suspected cardiac complaints, the 'Support Consultation' was designed. The 'Support Consultation' is a fully integrated care model between general practitioners, cardiologists, and health insurers in a primary care setting. In this care model, the cardiologist visits the general practitioner and advises him or her without seeing the patient. Instead of substituting secondary care to primary care, the

role of the general practitioner as gatekeeper is strengthened. Patients with suspected cardiac complaints, who would normally be referred to the cardiologist, are now discussed during the 'Support consultation'. In **Chapter 2**, the program results for 100 consecutive patients treated in this particular setup are given. Implementation of the 'Support consultation' resulted in fewer referrals from primary to secondary care and a potential net cost reduction of 61%. As the design of the 'Support consultation' can be used as a base for other integrated care models between primary and secondary care, the first results of the 'Support consultation' provide a possible part of the solution for a more effective healthcare system.

In Chapter 2, an evaluation of the current referral system for cardiac patients is given as well as suggestions for improvement in collaboration between primary and secondary care. **Chapter 3** evaluates the performance of the referral system for chronic HF patients. The number of patients with stable chronic HF in secondary care that could be referred back to primary care was used as the main performance metric. Definitions for stable chronic HF were based on the Dutch vertically integrated care program 'Transmural Care of HF Patients Model' (Landelijke Transmurale Afspraak, LTA) and the 'European Society of Cardiology (ESC)-guidelines. They included: 1/ Stable HF with a reduced LVEF, in particular an LVEF of 40-50%. 2/ Stable HF, with a recovered LVEF(>50%) and 3/ Stable HF with a preserved LVEF. Stable HF was defined as no hospitalizations due to decompensated HF or cardiac interventions in the last 12 months, or no significant change in HF medications in the last 6 months. All patients with chronic HF, registered with DOT-code 021.203, were included from two different hospitals in 2015. Of this group, 200 patients were randomly evaluated. From this group, 17% could be referred back to primary care. Awareness and clear care pathways for referral of HF patients from primary care to secondary care and also clear care pathways for active referral back from secondary care to primary care enable integration of care during the whole disease trajectory of the HF patient.

In **chapter 4** financial data are used to provide insight into healthcare utilization and corresponding costs of patients with non-acute chest pain in secondary care. Data of patients with non-acute chest pain were analysed. These data were gathered in four different hospitals between 2012 and 2018. Non-acute chest pain was defined as pertaining to the following diagnostic codes; 'DBC Op weg naar Transparantie (DOT)'-codes: 'No cardiac pathology' (0320.101 corresponding to ICD-10Z13.6), 'Chest wall syndrome (0320.201 corresponding with ICD-10 R07.4) and 'Stable angina pectoris' (0320.202 corresponding with ICD-10 I20.9). A total of 74.091 patients were included based on the aforementioned DOT-codes. During the diagnostic trajectory a total of €142.7 million was spent. Per year the mean expenditure during diagnostic effort was €1.97, €8.13, and €10.7 million, for 'No cardiac pathology', 'Chest wall syndrome, and 'Stable angina pectoris', respectively. In ≥95% of the patients with no cardiac chest pain, no ischemic event took place during 8 years follow-up. It can be concluded that

the Dutch healthcare system is very effective in determining whether chest pain is of cardiac origin or not. However, in times of increasing healthcare expenditures and a permanently high workload for health professionals, we have to ask ourselves what we are prepared to pay to determine the origin of non-acute chest pain, and how we can increase the care-related value of the money spent.

In primary and secondary care, efficient utilization of healthcare is vital to allow the healthcare system to cope with the annual amount of patients. In tertiary care, the number of patients is lower, but each patient requires more care. To provide effective care it is important to know the patients' care needs and outcomes. In this way, a 'continuum of care' for the individual patient can be realized. **Chapter 5** gives insight into the added value of complex chronic HF care in a tertiary care centre. Patients with complex HF (n=454) with impaired left ventricular ejection fraction <40% who were referred from secondary care to the tertiary care centre were included. All patients were treated according to the MISSION!HF!-program. This program offers structural and multi-disciplinary treatment based on the ESC guidelines for HF. When no additional treatment options were proposed, patients were referred back to secondary care. In 52% of the patients, HF medication could be optimised, 39% underwent a cardiac invasive treatment and 34% followed cardiac rehabilitation. After one year of follow-up, a significant improvement was seen in NYHA-class, and hospital admission due to acute cardiac decompensation also decreased significantly. Treatment according to the MISSION!HF-protocol gives promising results. However, the current data also show that chronic HF care can be optimised. Points of interest are optimising HF medication to the maximum dose and giving more attention to cardiac rehabilitation programs.

CONCLUSIONS AND FUTURE PERSPECTIVES

Due to the expected increase of patients with multiple chronic diseases the complexity of care and the healthcare expenditures will increase. This could eventually compromise the accessibility of healthcare delivery. In order to maintain accessibility we should use our medical resources as effectively as possible. This thesis shows that there is still much to gain in delivering the right cardiac care for the right patient in the right place. Improvements can be made in primary, secondary, and tertiary care. **Chapters 2 and 3** demonstrate that a significant number of cardiac patients are referred or treated in secondary care, while they can safely (and should) be treated in primary care. Vertically integrated care models or programs, which increase collaboration and communication between the general practitioner and the cardiologist, help to coordinate the flow of patients to the right care provider, namely primary, secondary or tertiary care provider. **Chapter 4** provides us insight into the high costs of the determination of an underlying cardiac cause for non-acute chest pain in secondary care. In the context of the rising expenditures, we should aim to lower these costs. A possible way is again by vertically integrated care models, which could lead to a lower influx of (non-cardiac) patients in

secondary care. As a consequence, more time and medical resources are available for patients who have a cardiac problem and really should be treated. Chapter 5 draws our attention to the possible improvements of advanced HF care in a tertiary care center. It appears that also the referral pattern from secondary to tertiary care can be optimized, as only 39% of the patients underwent invasive treatment in the tertiary care centre. Better communication and collaboration between cardiologists in secondary and tertiary care could lead to a more efficient patient referral, thereby creating accessibility for the severe HF patient who needs tertiary HF care and time for the cardiologists to provide it. In conclusion, on all levels of cardiac care delivery improvements can be made. We believe that vertically integrated care is the answer to managing and allocating the expected patient flow over primary, secondary and tertiary care, meanwhile keeping the increasing healthcare expenditures under control.

The increasing need to change

The healthcare expenditures comprised €106 billion in the Netherlands in 2019. (3) One-third was spent on hospital or specialist care. With 1.5% of the total healthcare expenditures, cardiac diseases are the third-most costly diseases in the Netherlands. (4) Coronary artery disease and HF are two important items of expenditures; a total of €2.3 billion was spent on coronary artery disease and €817 million was spent on HF, in 2017. (5, 6) As is mentioned earlier, these high expenditures are a major topic on the political agenda and minimal growth on the macro level is available for primary and secondary care for the coming years. (1, 2) Despite these agreements, an enormous influx of patients will be expected. The prediction is that the year prevalence of patients with coronary artery disease will increase by 49% and of patients with HF will increase by 88% from 2015-2040. (7, 8) Subsequently, all these patients need access to care. This requires useful and effective process innovations. The government provides funding that local caregivers could use for projects thriving effective care delivery.

Self-management

An integrated care system comprises multiple levels. This thesis illustrates how integrated care on a primary care level and secondary level results in cost reductions and effective use of medical resources (chapter 2 and 3). Besides professional and organizational caregivers, the patient himself has an important role in his health, too.(9) After all, an integrated care system is focused on the individual patient. To contribute to their healthcare pathway, patients need to be equipped with knowledge on his or her disease. Self-management is defined as a patient deliberately workings on his or her condition and is involved in decisions concerning his or her treatment.(10, 11) It appears that involvement of the patient during its disease trajectory, is associated with a better prognosis.(11, 12) Additionally, in today's society we are used to prompting access to all kinds of information resources and self-sufficiency 24/7. Patients have a growing interest in their disease.(13) The emergence of the internet, and related E-health, increase self-management.

E-health

The Internet changed the way how we communicate drastically. It also enabled us to save and exchange large amounts of data.⁽¹⁴⁾ The term E-health was first introduced by industry and marketing. ⁽¹⁵⁾ Nowadays, the term is frequently used within academic centres, healthcare professionals, and science. However, the term E-health is still broad and lacks a clear definition.⁽¹⁶⁾ Eysenbach et al. use the following definition: *'an emerging field in the intersection of medical informatics, public health, and business, referring to health services and information delivered or enhanced through the Internet and related technologies. ... the term characterizes not only a technical development, but also a state of mind, a way of thinking, an attitude, and a commitment for networked, global thinking, to improve health care locally, regionally, and worldwide by using information and communication technology.'* ⁽¹⁵⁾ One of the aims of E-health is to improve integration between different healthcare providers, - authorities, and - users. For example, one could think of the implementation of the first electronic health records, this strengthened the horizontal integration between general practitioners. Or e-health through telemedicine or telecare, which facilitates communication at a distance and supports vertical integration. ^(9, 17, 18) A large amount of health-related E-health applications enables the patient to gain control, participate, and make choices in his or her health. One could think of IT tools that provide treatment at home, mobile health, or the use of digital access to a patient portal.⁽¹⁹⁾ Despite these promising results, some studies lack the beneficial effects, like effectiveness or increasing self-management, of E-health. ^(20, 21) This could be explained due to various reasons; the e-health applications are not sufficient supported by a functioning IT infrastructure or a joint financial incentive is missing.⁽²²⁾ With the implementation of the integrated care model the Support consultation (chapter 2), we tried to respond to these conditions: an IT infrastructure was developed that facilitated clear scheduling of additional diagnostic testing and a joint financial incentive was ensured as the healthcare insurer paid the general practitioner, and subsequently the general practitioner paid the cardiologist.

Chapter 3 and 5 evaluate chronic HF care in the Netherlands. Chapter 5 shows that only 34% of the patients who received tertiary HF care, followed cardiac rehabilitation. Hamilton et al. assessed the use of mobile health (mHealth) on cardiac rehabilitation and HF care. ⁽²²⁾ MHealth has the potential to be effective for HF patients in terms of acceptance, practice, and compliance with guidelines. It might be possible that by applying mHealth, HF patients could be referred back to primary care even sooner (chapter 3) or the participation of cardiac rehabilitation can be optimized (chapter 5). These are interesting questions that need further investigation.

During the covid-19 pandemic, a lot of experience is gained in the use of e-health applications in a very short period. ⁽²³⁾ This increasing use can lead to the following developments: consultation will take place by telemedicine, additional diagnostics will be cheaper and more easily executed, and more decisions will be made with help from

software models, which have the latest academic literature and big data analyses at their disposal.(10) Subsequently, basic additional diagnostics will not be performed in hospitals anymore but will be transferred to primary care facilities or other healthcare centers and the treatment of complex care will take place in hospitals (chapter 5, figure 3). Collaboration between primary, secondary, and tertiary care (chapter 2 and 3) will intensify, and, in other words, the importance of vertical integration will increase.

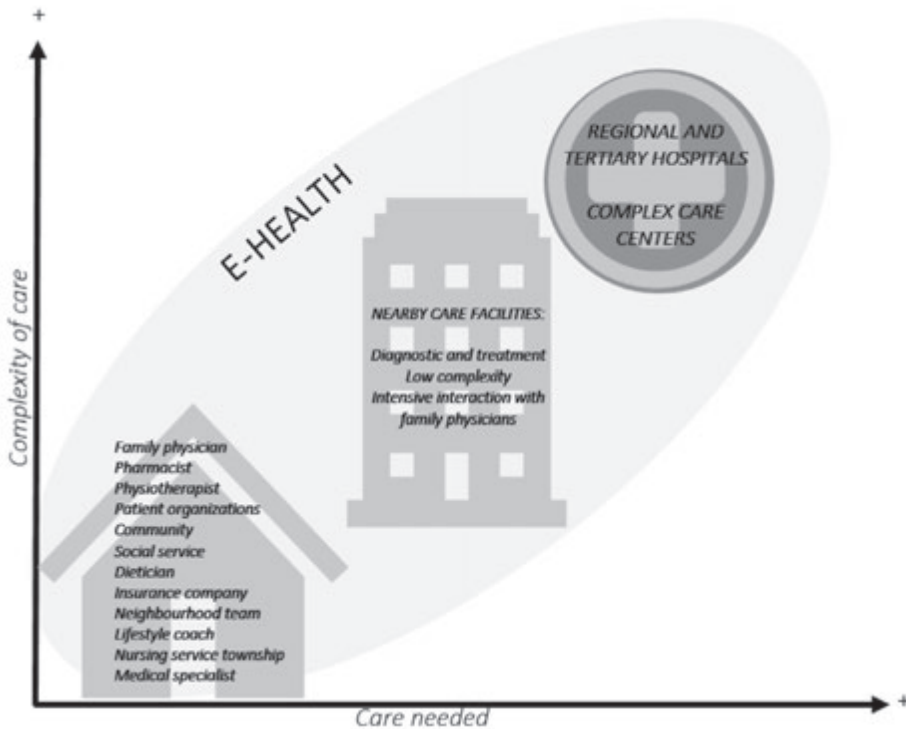


Figure 1. Due to the increased use of e-health basic additional diagnostics will take place in primary care facilities or other healthcare centers instead of in hospitals. This allows more time and opportunities for complex care in hospitals.

Data registration

Chapter 2 uses financial data to evaluate the efficiency and effectiveness of the diagnostic trajectory of non-acute chest pain in secondary care. National registered data, like financial or claim data, are an important source in improving the quality of healthcare.(24, 25) In pursuing quality improvement in healthcare it is also important to be transparent with quality data. Sweden is a pioneer regarding the publication of quality data: multiple hospitals in this country register quality data since 1987 and they provide their cardiac clinical data within one register, the 'SWEDEHEART'-register, since 1995. Because all cardiac data are within one register, comparison of results of different procedures and hospitals are easily made which subsequently improves

quality in the healthcare delivery.(26) In the Netherlands surgeon gained valuable insight by registering quality data in a national database; due to benchmarking the quality of colorectal cancer surgery improved and the corresponding costs decreased. (27) In 2018 cardiology followed in this mutual comparison of delivered quality in healthcare by establishing the 'Netherlands Heart Registration' ('Nederlandse Hart Registratie' (NHR)): a fusion of three established registration organizations aiming at quality monitoring and – improving .(28) Big (national) databases allow performing 'Registry-based randomized controlled trials' (RRCT). (29) A relatively new way of conducting research, which adds extra advantages to a regular randomized controlled trial because it is more cost-effective and less hard to perform. (30)

Communication

The spectrum of integration within an organization ranges from completely fragmented to full integration of different systems. (31) One of the conditions of a fully integrated organization is that professionals collaborate on a personal level.(10) Abovementioned developments within eHealth and increasing self-management of patients provide ways to simplify communication, however, we believe that in defragmenting healthcare delivery, face-to-face communication (or consulting a familiar face) and close collaboration are essential. 'Interprofessional learning' has been proven effective in improving collaboration between healthcare professionals.(32) It refers to moments when different healthcare professionals learn with and from each other to improve quality of care, preferably in a face-to-face setting.(33, 34) Just like the Support Consultation we believe that integrated care models which provide personal communication are a possible solution for making healthcare delivery more effective.

In the past years, we are already on the right track: a lot of innovations with integrated care models are happening.(10) The Netherlands Society of Cardiology has started to optimize and intensify regional integrated cardiac care projects since 2017.(35) To translate the current momentum into actual quality steps forward in healthcare delivery, it is necessary that the obtained results of the different initiatives are measurable and transferable. Nowadays, achieved improvements are reported against current care pathways, in the context of the existing healthcare systems. However, it is hard to put the obtained results and setups of these initiatives into a broader context of another healthcare system, as the care pathways and healthcare systems vary from country to country. In other words, it is hard to reproduce an initiative with its corresponding proven improvements of a certain healthcare system into another healthcare system. Subsequently, this also complicates a scientific discussion on an international level. That is why it is important to devote time and attention to an accepted system that is able to quantify quality of care in an independent way. In chapter 1, 'transition in healthcare' and 'Quality in care', different approaches are described which can serve as a basis for 'quality in care- quantification'.

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