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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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CHAPTER 1

GENERAL INTRODUCTION

INTRODUCTION

Access to healthcare is a basic human right. From a governmental perspective, it is, therefore, necessary to identify how much healthcare is needed for a given population. Also, it is necessary to identify trends to predict future healthcare needs and make sure the supply can meet the demand. Recently, the Dutch government investigated the healthcare demand and came to the conclusion that the demand is rising sharply (1), and identified the following main drivers for this rise:

- Immigration
- Ageing population
- Increase in chronic diseases
- Increase in psychological disorders
- Increase in required healthcare for youth

Currently, the required healthcare resources are increasing at a higher rate than the economic growth, meaning the burden of healthcare on society is increasing. Extending resources on healthcare is in itself a good thing, but it is important to use the resources effectively and efficiently. In this thesis, we will focus on the ageing population and the increase in chronic diseases.

It is expected that in 2050 one in every five people will be aged 60 years or older. (2) Europe experiences a more drastic development of population ageing; the old-age dependency ratio, which reflects people aged 65 years and above relative to those aged 15 to 64 years, will increase from 29.6% in 2016 to 51.2% in 2070. The very old-age dependency ratio, which reflects people aged 80 years and above relative to those aged 15 to 64 years, will increase from 8.3% in 2016 to 22.3% in 2070.(3) A combination of lower birth rates and a longer life expectancy explains the increase in the elderly population.(3, 4) A longer life expectancy is partly the result of achievements made in human health. These achievements induce a shift from infectious and parasitic diseases to noncommunicable diseases and chronic conditions, as the leading causes of illness and death. With increased longevity, the risk of developing multiple chronic conditions in a single person at the same time, i.e. multimorbidity, increases.(5) Other factors that contribute to the increase in the estimated prevalence of chronic diseases and conditions, are improved early detection and advances in treatment.(5) In the Netherlands, 25% of the population has one chronic condition, 13% has 2 chronic conditions and 14% has 3 or more chronic conditions. Of the people who are 75 years or older, almost 66% have 3 or more chronic conditions.(6) Because multimorbidity raises clinical complexity in a patient, it is associated with the increased use of inpatient and ambulatory care.(7)

The increase in chronic diseases and the ageing population has an especially big impact on cardiac diseases, since they increase both due to the ageing population, and due to the rise in chronic diseases. Cardiac diseases are the third most prevalent chronic diseases in the Netherlands.(8) Treatment of cardiac diseases accounts for 1.5% of the total health expenditure in the Netherlands.(9) Globally, the same trends are identified. The Global Burden of Disease study reported a prevalence of approximately 423 million patients suffering from a form of cardiovascular disease (CVD) in 2015.(10) In western Europe the age-adjusted prevalence rate of CVD is 5106 per 100.000, this is comparable with the prevalence rate of 5302 per 100.000 in high-income North America. Ischemic heart disease has a prevalence rate of 1.244 per 100.000 and 1.226 per 100.000 in western Europe and high-income North America, respectively. (10) Zooming in more closely to the Netherlands, the most prevalent and therefore resource-intensive cardiac diseases are coronary artery disease (CAD) and heart failure (HF). (11, 12) One expects that the prevalence of patients with CAD and HF will increase by 49% and 88% from 2018 to 2040, respectively. (13, 14) Similar observations are also done outside of the Netherlands. Khavjou et al. stratified the prevalence of CAD and congestive HF per year in America. They report a prevalence of 6.8% (N= 16.835.804) for CAD and 2.3% (N=5.781.675) for congestive HF in 2015.(15) The demographic trends underlying the rise of cardiac diseases (ageing population, increase of chronic diseases) are interrelated and very difficult to change.

Cardiac care in the Netherlands

Striving for efficient and effective use of healthcare resources is not new. In the 1970s, the Dutch government implemented the current 'tiered' healthcare setup, comprising primary, secondary, and tertiary care. Primary care is the most accessible to the patient. For healthcare, the primary care provider is the general practitioner. When the complexity of the disease increases, the primary care provider can transfer the patient to secondary care, which is usually a regional hospital. Similarly, the secondary care provider can transfer the patient to tertiary care. When the condition of the patient becomes less severe after the appropriate care is received, the patient is transferred back to secondary and primary care. Each increasing tier is more specialized and can perform more resource-intensive diagnostics. I.e. a general practitioner can perform many diagnostic tests, but for an MRI you have to go to the hospital. But, an MRI is only performed if the general practitioner transfers the patient to a higher tier. This way, the number of MRI scans performed is limited to only the necessary amount. To provide cost-effective care, this concept hinges on the role of the different levels of care providers to know which tier of care is fit for the patient. In 2006, to further increase the cost-effectiveness of the healthcare system, controlled market competition between healthcare providers and between health insurers was introduced. In this system, the health insurers buy services from healthcare providers, who in turn can compete with each other to provide the best care for the best price.

Transition in healthcare

The goal of healthcare is not only to provide high-quality care, but also to provide affordable care. Determining the effectiveness of a treatment by looking at outcomes is different from looking at the quality of care as a whole. For instance, for the last 10 years, the Dutch population feels the quality of care is declining, despite better treatments being available and increasing expenses.(16) Evidently, to provide high-quality care requires a better definition than 'how effective was the treatment?'. Furthermore, with the ageing population which suffers from multimorbidity and chronic conditions, 'being healthy' is becoming very rare. The WHO defines health as "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity". Yet, as ageing with multimorbidity is the norm last decades, this definition becomes obsolete. Huber came up with a new concept of health.(17) It defines health as a dynamic phenomenon; it is about resilience and self-management. This definition makes us reconsider what health is, what the most suitable way of delivering healthcare is, and how we should measure it. Porter et al. described the necessary changes in healthcare delivery and measurement in 2010: more attention should be made to the individual patient, their disease trajectory, and their quality of life. The paradigm is shifting from evidence-based medicine toward value-based medicine. There is still no consensus on the definition of "value" because it is determined by the perspective of the patient, provider, or payer.(18, 19) However, the most general definition is "the health outcomes achieved that matter to patients relative to the cost of achieving those outcomes"(Equation 1).(20) As value-based healthcare emphasizes the importance of quality of life, one could say that it takes evidence-based medicine to a higher level.(19)

$$\text{VALUE} = \frac{\text{QUALITY OF CARE}}{\text{COSTS}} = \frac{\text{OUTCOMES + PATIENT EXPERIENCE}}{\text{DIRECT COSTS + INDIRECT COSTS}}$$

Eq 1. The value equation. The definition of value should include outcomes, patient experience, and costs.

Quality in care

The Institute for Healthcare Improvement (IHI), is a not-for-profit organization and a leading innovator in health and healthcare improvement worldwide based in Boston. It developed a framework of three goals (21), the Triple Aim, which should be pursued equally and simultaneously by a healthcare system to achieve high value in care on a population level:

1. Improve the individual experience of care
2. Improve the health of populations
3. Reduce per-capita costs of healthcare

To improve the quality of care on an individual level, the following three principles are important:(22)

1. The main goal is value for patients
2. Results are measured
3. Care delivery is organized around medical conditions and care cycles

In providing value-based healthcare, the outcomes and experiences that matter to the patient define the quality of care. Ideally, those outcome measurements are not only measured during one intervention or one individual service but over the full cycle of the patient's care.(22) Patient-reported outcomes measures (PROMs) are a way to measure patient experience. These are very specific questions about the patient's condition at several intervals during the course of treatment.(23) Interpretation of these PROMs is important to provide efficient healthcare. The same applies to the measurement of cost information: the costs of the complete care cycle of the patient should be measured. This means calculating all costs during patients' care, in particular direct and indirect costs of each clinical service. The recommended methodology to determine patient-level resource expenditure is time-driven activity-based costing (TD-ABC).(24) This bottom-up micro-costing method consists of calculating two parameters per activity: the costs per time unit to perform each activity and the overall time units spent performing the activity.(25, 26) Porter underlines the importance of measuring and analyzing outcomes to improve healthcare delivery. (22) When results are systematically tracked, the quality of healthcare will improve while costs will be reduced.(21) Today, the tiered healthcare system is by definition fragmented. A single patient with multimorbidity often receives care from multiple clinicians who work in different facilities e.g. primary care, secondary or tertiary care, diagnostic centers, and pharmacies.(27) Also, different caregivers treat a single patient within each facility, but need to coordinate with each other as well. The high number of individual healthcare professionals that treat a single patient leads to a high risk of losing individual patient information along the care pathway. To create a continuum of care, treatment delivery should be organized around a patient's medical condition (patient-centered care), instead of individual specialties or procedures (disease-centered care).(28, 29) Different studies have shown that patient-centered care improves disease-related outcomes and QoL. (30) Achieving patient-centered care, especially in patients with chronic conditions, requires close collaboration and coordinated care between multiple physicians and other health professionals in an integrated care system.

Integrated care

A review from Armitage et al. about 'integrated care' resulted in 175 different definitions and concepts.(31) When considering integrated care, it is best understood as an organizing principle for care delivery to achieve improved patient care through better coordination of services provided.(32) This should be distinguished from integration,

which is the combined set of methods, processes, and models that facilitate integrated care.(33) The concept of integrated care models is complex and characterized by the dimensions of integration. Integrations can be distinguished by type, mechanism, level, and intensity.(32, 34) One way to describe integration is as horizontal or vertical. Horizontal integration occurs when organizations at the same stage in the process of delivering healthcare collaborate aiming to make healthcare equally accessible across populations (population-based care). (Figure 2)(35) An important and recent example is the merging of primary care facilities. Today, most general practitioners work in multidisciplinary teams in the Netherlands.

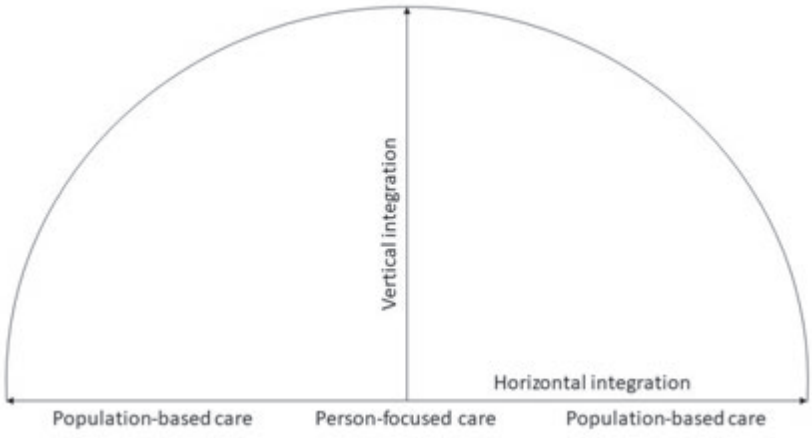

Figure 2. The distinction between vertical and horizontal integration.(37)

Vertical integration has a more disease-focused view. It involves the integration of care across healthcare facilities that are at different stages in the process of delivering care. (Figure 2) Multiple studies show the efficiency and effectiveness of vertical integration in healthcare delivery.(36, 37) A good example is the implementation of transfer points in most Dutch hospitals. These transfer points employ transfer nurses and social workers who provide home care or social services when a patient is discharged. Partly due to this, the Netherlands has the lowest hospital bed occupancy in Europe and the mean length of hospital stay ranks below average.(38) Another example of vertical integration is disease management programs for chronic conditions, for example, the Chronic Care model of Wagner, proposed in the 1990s.(39) The chronic care model comprises six fundamental principles that improve outpatient care delivery: self-management support, decision support, delivery system design, clinical information systems, community, and health system. It aims to enhance the self-empowerment of the patient and the delivery of evidence-based care. Vertical integration is also implemented in the joint, multidisciplinary triage system by general practitioners, emergency departments in hospitals, and ambulances, which results in fewer referrals to the emergency department.(40)

Patients with chronic conditions have ongoing requirements for health services. Higher requirements, in an already tight financial climate, increase the need to deliver care more cost-effectively and reduce the burden on hospitals and caregivers. A review from Stephenson et al. shows that integrated care for people with chronic conditions reduces the utilization of hospital services.(41) Also, a study from McKinsey confirms that integrated care is an effective delivery model for people with chronic conditions, leading to improved patient outcomes and experiences, and reductions in avoidable hospital utilization.(42)

Aims and outline of the thesis

It is discussed that the current healthcare system is under pressure to deliver more care, at a high quality, without further increasing the costs. Chronic cardiovascular diseases are a very important part of the puzzle in this respect as they form a large part of healthcare expenditures and these are expected to increase. From the previous discussion, it is also clear that there may be a possibility to improve healthcare quality by looking at integrated healthcare systems, compared to the fragmented system currently in use in the Netherlands.

To make the discussion tangible, this thesis will focus on chronic CAD and chronic HF. The specific research questions are:

1. *Are chronic CAD and chronic HF care efficient and effective in the Netherlands?*

2. *What are potential areas of improvement in Dutch cardiovascular healthcare delivery?*

Possible improvements are explored by looking at data from a practical setting in primary, secondary and tertiary care. **Chapter 2** focuses on primary care, by evaluating an integrated care model for non-acute suspected cardiac complaints. **Chapters 3 and 4** focus on secondary care, first by investigating the efficiency of chronic HF care in secondary care (Chapter 3), and then giving insight into healthcare utilization and corresponding costs of patients with non-acute chest pain in secondary care (Chapter 4). **Chapter 5** provides insight into complex chronic HF care in a tertiary care center. **Chapter 6** provides a summary of the conclusions of the different chapters and future perspectives.

A brief summary of chronic coronary artery disease and chronic HF is found in Appendix I.

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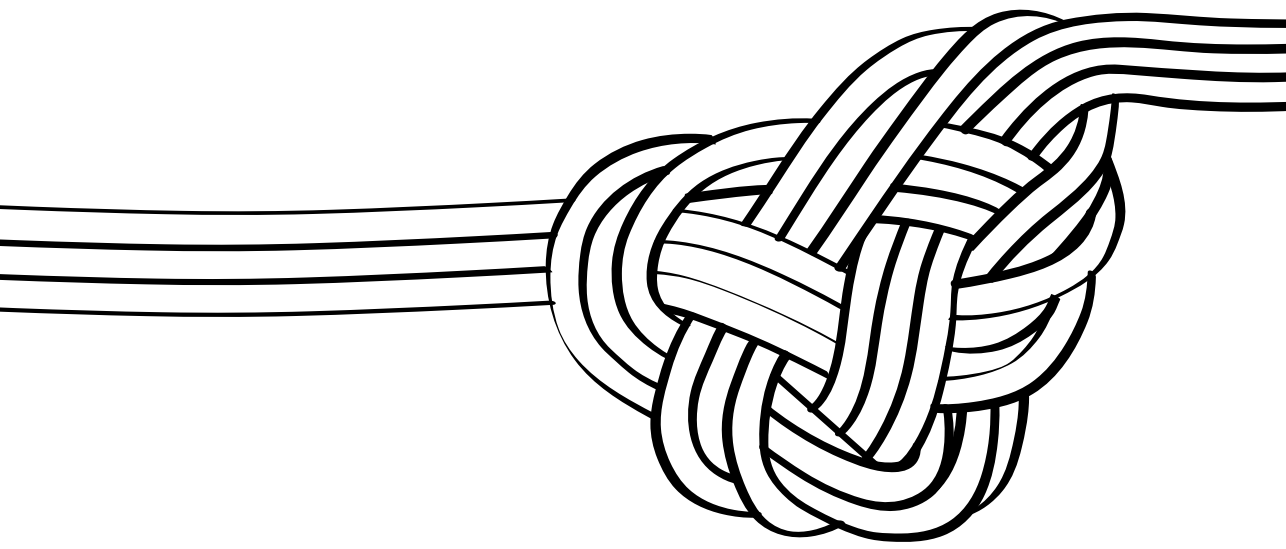
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