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Risk stratification in Dutch primary care: a promising approach to manage population health

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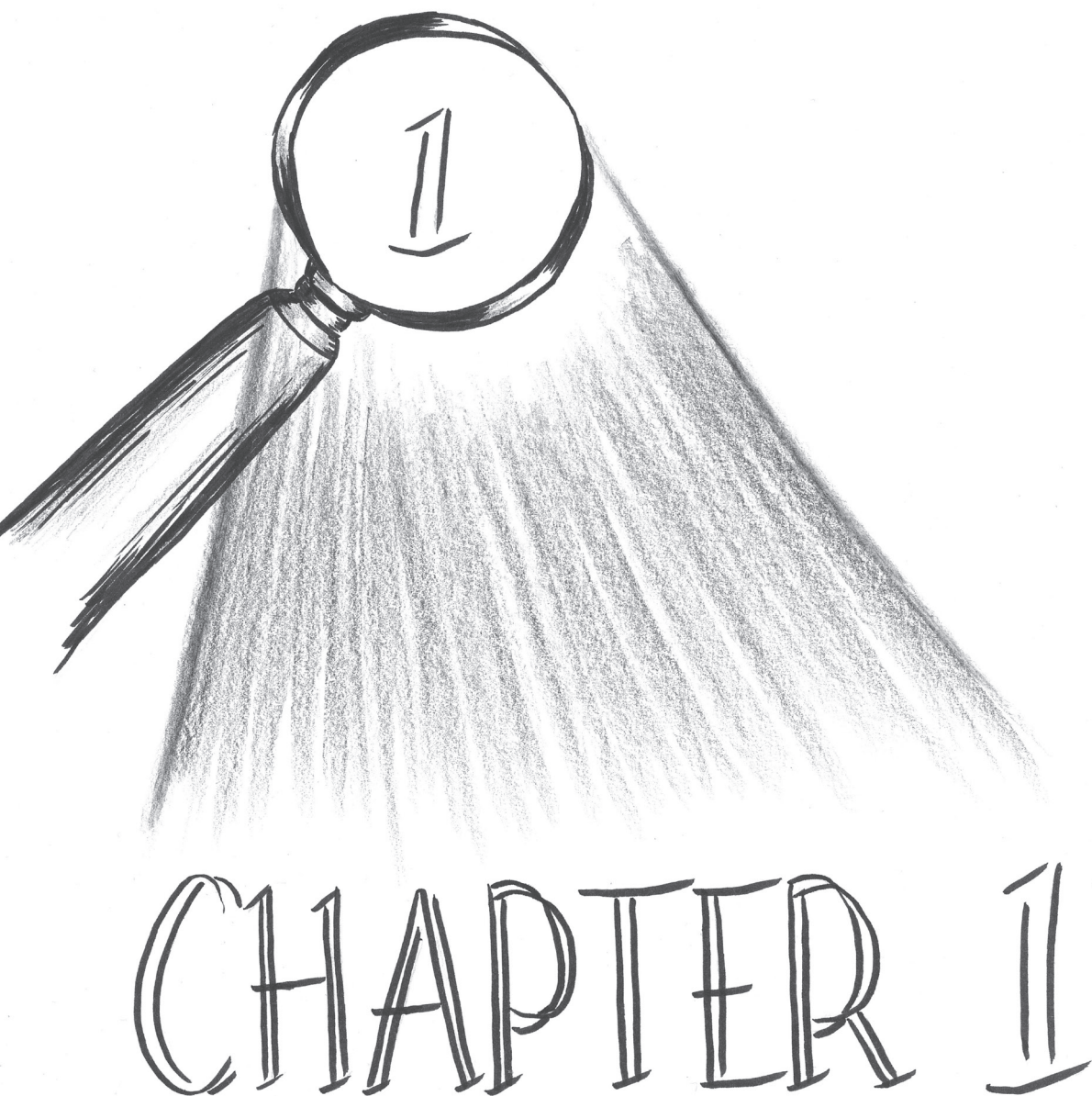
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CHAPTER 1

GENERAL INTRODUCTION

Our personal “data” are widely being collected, stored and (re-)used in a systematic matter. With registries of websites, app subscriptions and even our browsing history, our data become subject to analyses with or without our knowledge and awareness. Besides official authorities such as governmental and legal authorities, commercial businesses such as grocery - and clothing stores are collecting and storing our daily data. Assuming that privacy regulations are taken into account, storage and analysis of our data can be used for our benefit. How easy is it to use for example, the information we receive from a supermarket bonus card scheme, derived from our grocery shopping habits? How convenient is it, that based on our previous clothing purchases, we get information on sales products that match our clothing style? With systematic analyses of our data, we can be provided with tailored advertisement, which we may appreciate much more than large-scale collective advertisement.

Although we also store a lot of data in healthcare, we are not (re-) using these data as efficiently as the commercial industry does. The majority of provided care is offered in a similar way as large-scale collective advertisement, for instance with standardized care programs to fit an assumed persona or population. We still have a lot to learn about systematically using healthcare data in order to provide patients at specific risk with tailored interventions to reduce that risk. This is what risk stratification is all about: systematic analysis of healthcare data in such a way that interventions can be tailored to individuals’ risks of specific adverse outcomes.

Risk stratification

Due to the inequality of healthcare needs within populations, large-scale ‘one-size-fits-all’ healthcare programs are prone to losing their efficacy. Data-driven approaches making these inequities in healthcare needs visible, are therefore potentially very beneficial and routine registry data are increasingly being used to provide proactive care, attempting to lower health costs by reducing expensive and avoidable care such as hospital admissions. Risk stratification, the assignment of individual risk scores to patients based on registered health profiles, has proven to be an efficient and effective tool in the provision of proactive care. In addition, risk stratification can be used to allocate available resources according to needs instead of demands, as healthcare needs are usually unequally distributed within populations. Various studies have shown the use of risk stratification tools to determine morbidity burden (1, 2) and identify healthcare utilization inequities (3). Risk stratification has also proven to be

effective in selecting the right subpopulations for patient-centered interventions aiming at lowering expensive healthcare utilization such as hospitalizations (4).

Risk stratification in Dutch Primary Care

Data-driven approaches using risk stratification are not currently commonly used in the Netherlands. Hospitals are trying to introduce “data-driven healthcare” and “value based healthcare” principles into their internal organization. However, despite the availability of data and the great possibilities of providing proactive care in primary care (which is due to the gatekeeper function of General Practitioners (GPs) in the Netherlands), routine primary care data are not being used systematically for Population Health Management purposes. Regional attempts have been made to establish proactive care interventions based on data, in the primary care context, such as the U-care program in Utrecht. This program was aiming to test the cost-efficacy of early detection of frail elderly, followed by personalized proactive care interventions. It is still used as a means to prioritize care in many practice centers. The early detection in this program concerned a frailty assessment based on patients’ electronic medical record data (mainly physical deficiencies), followed by a more detailed evaluation of cognitive, social and psychological domains when the Frailty Index score was above a certain threshold (5). Although this is a fair attempt to use data to assess the risk of being frail and thus performing risk stratification in Dutch primary care, it required the additional collection of information through interviews and questionnaires rather than fully relying on systematically usable routinely collected registry data. Other approaches are mostly targeted on specific subpopulations or specific diseases. Risk stratification analyses on complete primary care populations using registry data in a systematic way, are lacking.

Built on the issues discussed above, the studies reported in this thesis aim at finding a suitable risk stratification method that can be used on general populations in Dutch primary care.

Risk stratification in the context of Population Health Management

Risk stratification is an important element of Population Health Management (PHM), a revitalized new concept in healthcare. Although many different definitions for PHM

exist, the Triple Aim value perspective seems important in most definitions, ranking patients' value and quality of care as equally important elements as lowering of costs (6). With the patient's value in mind, providing personalized care is one of the main pillars of PHM. An efficient way to analyze risks and needs of patients and thus enabling personalized care, is to use data-driven approaches.

Data-driven approaches in the form of risk stratification, also support efficiency and proactive care provision, other important pillars of PHM: performing risk stratification in PHM approaches, enables us to allocate resources to those who will benefit most from intervention. Assigning specific risks to individuals gives opportunities to identify the need for targeted proactive care. With aging populations, the view of the burden of disease is changing from that of single chronic diseases to more complex patterns of diseases, recognizing that multimorbidity is the norm (7). This change in epidemiology is causing the already diminishing healthcare resources to run out at an even faster rate. The use of innovative technology within healthcare and the increasing demands of patients about the way their healthcare should be organized, are adding to this problem. With reduced budgets available for healthcare and a decreasing workforce due to the aging population, our healthcare is becoming too expensive to afford. The effective and proactive nature of PHM, which can be supported by risk stratification, can offer solutions.

Even though risk stratification is possibly one of the strengths of PHM approaches, PHM goes beyond the allocation of resources to the identification of appropriate subpopulations and the provision of proactive care. PHM highlights the importance of the coordination of care delivery across a specified population. In PHM, improvement of both clinical and financial outcomes is gained through a set of not only individual, but also organizational and cultural interventions. (8, 9). This requires multidisciplinary, collaboration of different stakeholders and consideration of the governance structures on different levels. Most healthcare systems are organized in fragmented non-integrated silos, which are built up according to single organization, medical or social conditions. Separate educational programs, payment systems and pressure groups in parliament show the fragmentation of our healthcare systems. The organizational interventions of PHM approaches, which are striving towards interdisciplinarity and collaboration across disciplines, are therefore becoming a necessity rather than a luxury.

PHM provides solutions to renew and improve our healthcare systems, with risk stratifying data-driven approaches as important tools towards more efficient and sustainable healthcare systems. To enable cultural interventions and to provide holistic profiles of patients when performing risk stratification, it is important to also include social and cultural determinants of health rather than sticking to just biomedical determinants. This thesis while less focused on social and cultural elements, concentrated on routinely available data in Dutch GP practices.

Objective of this thesis

The objective of this thesis was to identify a risk stratification tool which can be used in Dutch primary care covering overall general practice populations. Different risk stratification tools are used internationally. However, the suitability for the use in primary care varies between the different tools. In addition, the appropriateness of any tool is dependent on the goal that needs to be achieved. Specifically in primary care, the goal should be to improve the general health and wellbeing of the population. Consequently, a risk stratification tool fit for primary care should be based on complete patients' profiles rather than on specific disease outcomes.

The research question to be answered with this thesis is 'What risk stratification tool is most suitable for Dutch primary care and how can this tool be used with Dutch routine primary care data?'

Different sub-questions can be derived:

- What risk stratification tool is most appropriate for use in primary care?
- Is this risk stratification tool applicable to the Dutch primary care data?
- How do we select the right data for proper application of the risk stratification tool in primary care?
- How well does this risk stratification tool perform in Dutch primary care?
- How can we adjust the risk stratification tool to appropriately fit the Dutch primary care setting?

Outline of this thesis

The second chapter of this thesis was aimed at answering the following question 'What risk stratification tool is most appropriate for use in primary care?' In order

to answer this question, a systematic review was performed to identify and assess different risk stratification models used internationally in primary care. Calibration and discrimination properties of the models were employed to evaluate the performance.

Chapter 3 reported results of a pilot study in which a risk stratification tool known to be appropriate for the use in primary care, is applied to a Dutch primary care setting. Results show the applicability of the tool using Dutch primary care data.

The fourth chapter discussed the results of the main study within this thesis. In this study, the performance of the risk stratification model in terms of calibration and discrimination properties, used in Dutch primary care, was statistically assessed. In addition, the model was adjusted in order to best fit the Dutch primary care situation.

To visualize the effects and benefits of using a risk stratification model in primary care, a model which identifies a specific subgroup within the population, that would benefit most from certain interventions, was estimated. This is discussed in chapter 5. The subgroup to be identified was a group of complex patients with problems on multiple health domains and with above average acute care utilization. Identifying this type of subgroup for intensive care management interventions, can allocate healthcare resources efficiently yielding to proper intervention programs and eventually lowering overall healthcare costs.

This thesis ends with recommendations for further research, especially regarding societal and practical impact.

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