Risk stratification in Dutch primary care: a promising approach to manage population health
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CHAPTER 6

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GENERAL DISCUSSION

The objective of this thesis was to find a risk stratification tool that can be used in Dutch primary care covering total primary care populations and answering the research question *'What risk stratification tool is most suitable for Dutch primary care and how can this tool be used appropriately using Dutch routine primary care data?'* In our studies we identified a risk stratification tool to be used in Dutch primary care. In addition, we added recommendations to improve the tool according to the Dutch primary care setting.

From our systematic literature review, the ACG had proven to be not only the most frequently used risk stratification model in primary care, but also the most accurate model to predict different types of both current and future healthcare utilization. Our findings have confirmed these results in the Dutch primary care context. With our pilot study, the ACG has shown great promise to identify different levels of multimorbidity and burden of healthcare in the Dutch primary care (general practice) setting. Models using the ACG's diagnosis and multimorbidity categories, the ADGs and ACGs respectively, perform well in predicting the amount of GP visits. In addition, the ACG models for predicting future hospitalization and high costs showed good performances in terms of discrimination and calibration properties. When adapting the models to fit the Dutch primary care data by adjusting the coefficients of the underlying predictors, model performances even improved. The ACG is also an appropriate tool to identify complex patients with problems in multiple health domains. With these results, the ACG has proven to be a well performing risk stratification tool that can be effectively used in Dutch primary care, predicting healthcare utilization in the form of GP visits, future hospitalization and future high healthcare costs.

Methodological improvements of the models

Focusing on specific aspects to improve the models for use in Dutch primary care, we can enhance to the already highly performing models. Two important methodological aspects need to be considered for further optimizing the models for risk stratification purposes. Firstly, the clinical validity of the predictors underlying the models, needs to be investigated. Although the statistical validity of the models has been assessed with this research, the predictors are based on US data. The predictor 'pregnancy' for example is a contributing factor for both hospitalization and the high costs risk, with ORs greater than four. However, the inclusion of pregnancy within the models

is based on the US context where pregnancy may pose much greater risk than in the Netherlands. Therefor the clinical significance of the underlying predictors needs to be validated for the Dutch setting, as clinical characteristics may have different importance in various countries. We recommend the use of focus groups and Delphi studies which include local clinicians to dive deeper into the clinical validity of the underlying predictors of the risk stratification models.

Secondly, enriching the data by adding diagnostic measurements such as laboratory values, may be interesting to include in the models and further research to investigate the added value is needed. The ACG software has recently been updated to include diagnostic measurements, which were not included in this study. This could be considered for further optimization of the Dutch version of the models. However, a balance should be struck between putting more effort into predicting more precisely based on more biomedical data and focusing on improving predictions based on contextual data, broadening the holistic profile of patients.

Why risk stratification in primary care?

The focus of this study is on risk stratification specifically performed in the primary care setting. My assertation is that performing risk stratification in primary care is beneficial to the whole healthcare continuum and can improve the health of the total population, because it can be used as the basis for further targeting interventions. By using primary care data to identify patients at risk for high healthcare utilization, such as high numbers of GP visits, hospitalization and high healthcare costs, high risk patients can be detected at an early stage and appropriate interventions can be provided proactively. Using risk stratification in primary care is therefore beneficial for the total population, especially in countries where primary care functions as the gatekeeper for specialty care. The fact that in such countries, the majority of the population is registered with a GP, makes it even more promising to use risk stratification in primary care. With almost complete profiles of patients available in primary care registries, which cover nearly the total population, these data are very valuable for PHM purposes. When moving risk stratification to secondary care, the chance exists of providing care too late in the care continuum with the risk of providing care in a reactive rather than proactive manner.

Another reason why risk stratification in primary care gives excellent opportunities for improvement of healthcare, is the enormous pressure currently put on

primary care especially in Western countries. Due to the diminishing workforce and increasing complexity of patients, GPs find themselves overloaded with work, overwhelmed and even burned out, resulting in degradation of healthcare quality (1-4). Broadening the tasks of GPs (4), for example with increased policies to move more care from specialists towards primary care, is increasing this burden. With efficient use of available resources and time, approaches to ease the rising pressure on GPs are possible. The ACG algorithm has a large numbers of predictors, that can be applied for management of care provision and planning. In addition, with the use of risk stratification, referrals to specialty care can be coordinated and managed in a more efficient and effective manner. A clear distinction between patients that can be treated in primary care and patients that need referrals to specialty care can be made using patients' profiles based on registered data.

First steps to be taken: creating a 'fertile' environment

However, to effectively take advantage of the benefits of risk stratification in primary care, healthcare professionals need to collaborate and be aware of the direct and indirect benefits of risk stratification. In the Netherlands, the typical GP is not yet been convinced of these benefits. This has also been encountered within this study: participating GPs were not ready to continue with the risk stratification-based project that was part of this dissertation, since they were not yet convinced of how this form of risk stratification would benefit their personal caregiving.

Awareness and trust in the models need to be created amongst healthcare professionals. A study by Wagner et al. showed that for healthcare professionals to feel at ease using risk stratification algorithms, considerations such as trust in the algorithms play a strong role (5). Healthcare professionals need to be convinced that the already established algorithm is specific enough to the practice's patient population in order to feel at ease using such a model (5). During our study, we have tried to create trust amongst healthcare professionals, in particular GPs, by statistically validating specific risk stratification algorithms. However, during the project, we have observed that the participating GPs are not convinced of the added value of the algorithms to benefit their specific patient populations. Adjusting the algorithms with input of healthcare professionals can create more trust. Wagner and colleagues showed that healthcare professionals that didn't trust existing risk stratification algorithms enough to benefit their patient population, were still positive

towards performing risk stratification by using their own criteria for risk stratification (5). Another way to create trust amongst healthcare professionals towards already existing risk stratification algorithms is to prove the added value of the algorithms for their patient populations and show the benefits of interventions using risk stratification tools in Dutch primary care. Selecting the right patients for specific interventions by using risk stratification strategies in primary care and proving the effects on GPs' workload and the health of their patient populations, can show the benefits for healthcare professionals and their practices as a whole, creating a solid support base for risk stratification based-approaches. An example of the benefits of using risk stratification is shown by a study by Hewner et al., where risk stratification was used to appoint cohorts of patients with high risk of hospitalization (6). With targeted case management these patients received appropriate care in order to avoid unnecessary hospitalizations (6), resulting in increased health of the population. A first attempt to investigate the benefits of risk stratification by selecting specific patients for interventions, has already been set into action in Dutch primary care. One of the algorithms resulting from this study, the algorithm to identify complex patients with the use of the ACG software, will be used to select patients for an intervention study. Complex patients, the so called 'hotspotters', will be selected for a proactive integrated care approach in different general practices in the Netherlands. The effects of the intervention on the health and care needs of the participating patients as well as the cost-effectiveness of the approach will be measured.

Next to trust in the algorithms, Wagner and colleagues found that practical implementation of risk stratification models is another key consideration to determine practices' attitudes towards risk stratification. Practical implementation requires the availability of technical skills and consistent information systems, but also the assistance to generate user friendly reports that healthcare professionals can use during their consultations. (5) Within our study, we have successfully implemented risk stratification algorithms using the available information systems. However, we observed differences in available technical skills between practices. We also encountered the disadvantages of practices not getting the right assistance in generating user friendly information and the algorithm software not then aligning with their workflow. These are aspects that result in hesitation and skepticism of GPs towards the use of these risk stratification algorithms. Attention needs to be paid to these considerations regarding practical implementation alongside the creation of trust among healthcare professionals.

As it is important to generate holistic patient profiles, integration of information systems would be beneficial. This requires the addition of stakeholders other than GPs, either within or outside the health sector. However, persuasion of other stakeholders is of immense importance for other reasons too. Once stakeholders such as insurance companies, health policy makers and municipal authorities, realize the benefits of risk stratification in primary care, support for implementation can be reached on national, regional, and local governance level, promoting integration between these different parties. In the UK where the National Health Service functions as the overarching government-funded institute that organizes healthcare nationally, this integration of care is a key policy at national level. In the United States, different stakeholders are bundled into Accountable Care Organizations (ACOs) in order to coordinate care for patients in a more efficient way, and in Germany the integrated care provision in the Gesundes Kinzigtal approach yields great results (7). The use of data for risk stratification purposes resulting in efficient provision of care is made much easier when care is more integrated for example in situations such as the UK, Gesundes Kinzigtal and the ACOs in the US. It goes without saying that GPs need to stay included. With the responsibility of the health of their own population, trust and awareness amongst GPs is needed in order for them to engage with other stakeholders towards more integration of care.

As financial benefits are most appealing for the different stakeholders, the beneficial financial implications of risk stratification should also be considered in above mentioned intervention studies in order to convince payers of a return on investment. Although decreases in expensive healthcare utilization, such as hospitalizations, as a result of risk stratification approaches have already been proven internationally (6, 8), evidence within Dutch primary care is still needed. A great example of a successful effort that has been made in the Netherlands is the Lung care program that has been set up in Nijkerk (9). Using the available data, patients with Chronic pulmonary obstructive disease (COPD) are risk stratified in order to provide efficient care. This was done in a collaborative setting, including healthcare professionals such as GPs and respiratory specialists, social care and voluntary organizations and one of the leading insurance companies in the region of Nijkerk, the Netherlands. Special financial arrangements between healthcare professionals and the insurance company were made and reported in the Health Affairs article, a million dollars saving was accomplished within three years. With the savings, expansion to diabetes

and cardiac care is being implemented. With more evidence of programs such as the Lung care program in Nijkerk, the right stakeholders can be attracted to participate in risk stratification approaches used in integrated programs on regional and even national level.

Future improvements

Although primary care seems an appropriate place within the care continuum to implement risk stratification approaches, benefits can be strengthened by linking primary care data with data from the social domain. Including social determinants in risk stratification strategies enriches the data, posing the opportunity to make predictions even more accurate, and enables to provide care following the specific risks in various subpopulations. Literature has shown associations of social determinants such as educational level (10) and income (11, 12) with level of healthcare utilization. Despite current privacy challenges regarding linkage of different data sources, cooperation between different healthcare and wellbeing sectors should still be pursued. Collaboration and integration on different levels, including information systems, can maximize the benefits of risk stratification approaches in primary care. Including the social sector in risk stratification approaches provides opportunities for more holistic approaches, where patient profiles extend beyond biomedical characteristics. Including cultural and ethnical components for risk stratification can also be of added value as ethnicity has been proven to be associated with healthcare utilization (13) and health outcomes (14). Agyemang *et al.* and Uitewaal *et al.* found that although there is no difference in treatment between indigenous Dutch and ethnic minorities in the Netherlands, health outcomes are worse for ethnic minorities (14, 15). This indicates that ethnicity has great potential to be recognized in the implementation of risk stratification algorithms. However, using ethnicity in risk stratification algorithms can be controversial, as this can be seen as evidence of institutional racism. With our current healthcare system we often strive for equality in the care provided, which means that every person receives the same care and is treated the same no matter the situation. Within healthcare systems fairness is often translated as providing everyone with equal care, excluding every form of discrimination. However, with the realization that fairness is not merely the provision of equal care, but providing equity in care, discriminating between different risk groups, which may include ethnic minorities, should be adopted in the provision of

6

improved care. However, these discussions are being complicated in the Netherlands when institutions such as the Dutch tax authorities are suspected of institutional racism in a series of cases where multiple beneficiaries for child allowance were disadvantaged based on ethnical profiling algorithms. Despite these controversies, it is my belief that including ethnic background amongst other social determinants, can be of great added value to risk stratification approaches. There is a need for more investigation of this added value as well as the correct use of those determinants without harming privacy and dignity of individuals within the population. Using determinants underlying to ethnicity, such as cultural behaviour and socio-economic status, should also be taken into account, which might soften the controversy.

On the other side, a majority of research has been undertaken with data originating from white populations, not taking into account the determinants for ethnic minorities. This study, has not included the multicultural setting of the Netherlands and thus the risk stratification algorithms are mostly based on native Dutch inhabitants. The exclusion of ethnic minorities in research can also be considered as institutional racism, as cultural determinants are not taken into account. An important recommendation is therefore to validate the risk stratification algorithms resulting from this thesis in more multicultural settings of the Netherlands, such as Amsterdam and the Hague.

Conclusion

In my opinion, to gain the best effects for healthcare, risk stratification approaches can best be performed in primary care, since this is the setting closest to real life in which most health issues of most citizens, at least administratively, come together. In our research, several risk stratification models using the ACG tool, have shown good performance in the Dutch primary care setting. Methodological improvements can be achieved by optimizing the models, especially with regards to the clinical validity of the predictors. However, next to the methodological improvements, practical implementation needs to be taken into account. Both an increase in confidence in reliability and applicability among healthcare professionals, as well as improvement of technical implementation tools for risk stratification, need to be considered. Inclusion of sectors outside healthcare, for example the enrichment of data as input for the models with social domain data, can add great value to risk stratification approaches in primary care.

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6