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## Studies on improvement of efficiency in ambulatory care

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## Summary and concluding remarks

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### Part one

Given the ageing population, increasing burden of chronic diseases and rising healthcare costs, it is of great interest to continue to search for innovative ways to restructure the existing healthcare system. The objective is to increase efficiency and thereby save costs, without diminishing the quality of the care delivered. In this thesis we focused on several strategies to improve efficiency in the ambulatory setting including the emergency department (ED) and outpatient department. Although the total number of patients presenting to the EDs has declined slightly during the past few years, the complexity of the patients care needs has increased leading to overcrowding and long waiting times. Previous literature has already addressed the problem of stagnation and long waiting times on the EDs.<sup>1</sup> In the past, a 4-hour target was set in United Kingdom in which time patients should be seen and treated in the ED.<sup>2</sup> This target was set to avoid congestion and reduce negative health outcomes known to be associated with long waiting times on the ED. In chapter two, we assessed the factors that contribute to a long stay in the ED at the VUmc, also referred to as 'completion time'. We used the 4-hour target as a cutoff point in our data-analysis. In this study we found that 13% of patients had a completion time of longer than 4 hours in the ED. Treatment by multiple specialties, waiting for radiology tests, older age and categorization as Emergency Severity Index (ESI) category 3 were associated with a long stay in the ED. In particular, consulting different specialties is slowing down the process in ED, because these consultations are performed one after the other. These results emphasize that mainly older and sicker patients with comorbidities are at risk by staying longer in the ED, and are also the most vulnerable group in terms of deterioration. It is well-known that older patients tend to present themselves with atypical complaints leading to greater delays in the ED.<sup>3</sup> In order to shorten the length of stay for this group of vulnerable patients, we advised the creation of assessment teams consisting of multiple specialties to formulate a diagnostic plan together instead of consecutively. Interestingly, in the group of patients who exceeded the 4-hour target, we noticed that there was a significant period of time elapsed between the results of all diagnostic tests being known and when the patient left the ED. One reason for this delay was the lack of space on the wards leading to a time-consuming search for a bed or transfer to another hospital. Another important reason for a prolonged stay after finishing all diagnostics, was a delay in decision making. Most

patients were seen by residents who were relatively inexperienced and who had to multitask in a busy ED and wards. In some cases, we noticed long delays before the residents consulted their supervisors. Especially in cases where the supervisors are not present in the hospital, residents tend to collect patients before they call their supervisor because they do not want to disturb their supervisor too often during the night. After the results of our study were known, the shifts of the supervising physicians of the Internal Medicine Department was adjusted to cover the busiest moments on the ED namely until 23:00. This way the supervisors were more accessible to the residents for consultation and co-assessment of the sicker patients.

In 2012, we again measured the completion times on the ED and all the steps between presentation and discharge. We performed these measurements to get more insight into the current situation and to investigate whether the improvements we made after the first study had any effect on ED congestion. In addition, we also included a large peripheral centre, the St. Antonius Hospital in the Nieuwegein to compare the processes and bottlenecks between the hospitals. Patients categorized as ESI 2/3 were followed more closely because we already knew that this group was prone to stay longer on the ED. In the St. Antonius Hospital, the Boston triage system was used. In this system, patients triaged as orange and yellow were comparable to ESI 2/3 patients and therefore closely followed by the researchers. We noticed that the average stay on the ED in the VUmc had decreased from 2:23 hours to 2:10 hours and a smaller percentage exceeded the four hour target, namely 11% compared to 13% in 2010. During the new measurements, the senior doctors of the Internal Medicine Department were physically present in the hospital until 23:00 instead of 18:00 and the shifts of the qualified emergency physicians were extended. In both hospitals, the VUmc and St. Antonius Hospital, similar factors were found that contributed to a long stay on the ED, namely older age, involvement of multiple specialties, and undergoing radiological tests. Earlier we described that assessment teams could be a solution for this older vulnerable group of patients triaged as ESI 2/3 or orange/yellow. However, until now we found it difficult to introduce this concept due to logistical reasons. Time that elapsed after results of all the diagnostics were known still had a significant influence on exceeding the four hour target in both hospitals. The main reason for this finding was a lack of direct supervision, which should be addressed soon. Another reason could still be a lack of beds in the hospital. Since 2013 an Acute Medical Unit was created in the VUmc. This has already led to a significant

increase in available beds for acute admissions and a reduction in ED congestion.

Timely diagnostics and treatment are important for patient safety and satisfaction. However, patients can still deteriorate during their stay in the ED. This can remain undetected, particularly in patients who stay longer in the ED. On the wards, we already used a scoring system to detect patients with a worsening clinical condition and in need of acute medical attention. This score is the so-called National Early Warning Score (NEWS) that has been validated prospectively in the hospital wards.<sup>4</sup> In the ED, the triage systems are used at presentation to assess the priority of patients for clinical intervention. These scores provide prognostic information as a predictor of admission and mortality. However, no scoring systems are used to monitor patients longitudinally during their stay in ED. In chapter four, we measured the NEWS at different time points in the ED. The scores correlated with patient outcomes including 30-day mortality, hospital admission and length of stay in the hospital. Therefore, the NEWS can be of additional value to longitudinally monitor patients during their stay in the ED. Especially in patients with moderate triage categories (ESI 2 and 3), the NEWS can better identify patients in need of urgent attention and potentially expedite admissions to the medical wards and intensive care.

## Part two

In the second part of this thesis, we emphasized the chronic care in the outpatient department. The Internet and related technologies, also referred to as eHealth, have been used more frequently to monitor or deliver care from home in patients with chronic diseases. Cardiovascular diseases are one of the main causes of death in Western countries and unhealthy lifestyles often lie at the root of the development of these illnesses. eHealth has been used frequently to address lifestyle behaviours and monitor vital parameters in the treatment of cardiovascular diseases. Chapter five contains a review describing the effect of multiple lifestyle interventions on a cardiovascular risk profile. We found that the addition of a multiple lifestyle intervention eHealth program to usual care, did not lead to significant improvements of outcome measures such as weight, blood pressure and cholesterol levels. However due to large variations in the study design, intensity of the delivered care and patient engagement to the programs, it was difficult to make definite conclusions on the effects of eHealth. We believe that with correct implementation and with enough patient involvement, Internet programs can decrease hospital visits and be of value in chronic

and preventive care. Chapter six is a prospective randomized controlled trial in order to investigate the effect of a web-based interactive program combined with home blood pressure monitoring on office blood pressure and 24-hour blood pressure and other health outcomes including weight, lifestyle behaviours and medication use. During this trial of one year, we followed patients with hypertension from the outpatient clinic of the Internal Medicine Department. Patients were randomized into two groups: one group received usual care and the other group interactive monitoring. After one year we saw a slightly greater decrease in systolic and diastolic office blood pressure of respectively 2.68 (95% CI, -4,71 to 10) mmHg and 1.04 (95% CI, -3,58 to 5,65) mmHg in the treatment group compared to the placebo group. Unfortunately, probably due to lack of power, no significant differences were found in outcome measures between the groups. It was noticed that patients in the intervention group completed almost all home blood pressure measurements throughout the study period and that they were overall very positive about the intervention. Unfortunately, we did not integrate this web-based system properly into the structure of our outpatient department which may have led to an insufficient effect. As mentioned in the introduction, eHealth has shown to be effective in blood pressure control in the primary care setting.<sup>5</sup> We believe this can be of additional value in the hospital setting as well. Therefore it is important to integrate an eHealth program properly into the existing workflow, which showed to be difficult during our study in a hospital setting. Due to advancing technology, we think this should become more achievable in the future.

## Part three

In the third and final part of this thesis, we focused on cost savings on unnecessary diagnostic testing. In chapter seven we describe how we created awareness about the magnitude of unnecessary diagnostics we perform in day-to-day practice in the Internal Medicine Department of the VUmc. With simple measures such as intensive counseling of the junior doctors, pocket cards detailing costs of laboratory tests, frequent feedback about the amount/ the nature of the tests performed, unbundling panel tests and increasing protocol adherence, we achieved a 13% reduction in costs spend on diagnostics in 2009 compared to 2008. The largest reduction was achieved due to the decline in laboratory tests. After this study, we extended these multi-faceted interventions to many other departments in the hospital with success.

## Future plans

As mentioned before the flow of relatively complex patients has increased in the last few years leading to stagnation at the ED. We believe that better co-ordination of complex and older patients who are seen by multiple specialists can reduce length of stay in the ED. Outflow problems can be reduced by acute medical units which has been introduced in the VUmc already. Many initiatives are underway to improve the patient flow on the ED and the results of our studies have been used to formulate and initiate these interventions.

In the meantime the early warning score has successfully been re-introduced in the hospital wards and the ED of the VUmc and we have been busy validating the value of EWS in the hospital setting prospectively.

At last, we recently started a 'Reduction in unnecessary diagnostics through attitude change of the caregivers (RODEO project)' in five large hospitals in the Netherlands, extending this multifaceted intervention to a national level.

Although we have come a long way during these studies, the journey is far from over.

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