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CHAPTER 1

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INTRODUCTION AND OUTLINE OF THIS THESIS
INTRODUCTION

Although consistently ranked number one in the European Health Consumer Index since 2008\(^1\), the Dutch Health Care System is seen as one of the most expensive healthcare systems in Europe\(^2,3\). In the past, countless attempts to reduce healthcare costs have been tried, like enforcing practices guidelines, capitation of hospital’s budgets or making patients consumers. So far, none had much impact. Perhaps one of the reasons for the lack of success of these earlier fixes is the failure to define the overall goal: improving value for patients\(^4\). As defined by Michael Porter, value means the health outcomes achieved that matter to patients relative to the cost of achieving those outcomes. Moving from volume and profitability of services provided, to a high-value health care delivery system might be accomplished by following the six components of Michael Porters value agenda. First, health care providers should organize into Integrated Practice Units (IPUs). In an IPU, a dedicated team made up of both clinical and nonclinical personnel provides the full care cycle for the patient’s condition. Second, clinical outcomes and costs should be measured at patient level. Third, health care providers and payers should move from ‘fee for services’ systems to ‘bundled payments for care cycles’. Fourth, services should be provided at the right location for each service line and therefore hospitals should work together to integrate care delivery across separate facilities. Fifth, superior health care providers for particular medical conditions need to serve more patients and extend their reach through strategic expansion. Six, the preceding five components are powerfully enabled by a supporting information technology platform (Figure 1)\(^4\).
Measuring clinical outcomes for every patient

Despite the important societal and economic role the health care system fulfills, it still lags behind when it comes to standardized reporting processes. In the past, data to compare the performance of different health care providers were scarce. With Sweden as a pioneer, several nation-wide clinical registries (audits) have been initiated in the Western world, like the English Lothian and Borders large bowel cancer project and the United States National Surgical Quality Improvement Program, all leading to demonstrable improvement in clinical outcomes and smaller variation between providers \(^5\)-\(^7\). With the introduction of the Dutch Surgical Colorectal Audit (DSCA) in 2009, robust quality information became available, enabling monitoring, evaluation, and improvement of surgical colorectal cancer care in the Netherlands.
The DSCA dataset covers 3 aspects: case-mix variables (e.g., age, sex, and comorbidity) necessary for hospital comparison; process variables (e.g., wait times, multidisciplinary team meetings, complete colonoscopy); and outcomes of care (e.g., mortality, length of hospital stay, number of lymph nodes, and complications like anastomotic leakage, pneumonia, or reinterventions) all measured at patient level. Since the introduction of the DSCA, guideline compliance for diagnostics, preoperative multidisciplinary meetings and standardized reporting increased and post-operative morbidity and mortality declined.\textsuperscript{8,9} Besides from facilitating the improvement in outcomes, population-based databases provide important clinical data for research as well, especially from patients often not eligible for RCTs\textsuperscript{10}.

**Colorectal cancer**

Colorectal cancer is among the top three leading cancers in terms of new cases as well as cancer related mortality in Europe and the United States of America\textsuperscript{11,12}. Most colorectal carcinomas develop through an adenoma - carcinoma sequence, therefore underlining the need for early detection of adenomatous polyps, e.g. by national screening programs or colonoscopy in high-risk patients. In the Netherlands between 8000-10000 procedures for primary colorectal cancer are performed each year. The cancer and nearby tissue is removed and either an anastomosis (Figure 2 or a stoma is constructed (or both, which can be more likely in the case of rectal cancer). The two major approaches for colorectal cancer surgery are open abdominal surgery, usually performed through a midline incision, or laparoscopic surgery. Between 2009 and 2015, laparoscopic approach in the Netherlands increased from 35% to 70% for colon cancer resections and from 35% to 85% for rectal cancers resections\textsuperscript{13}. Although colorectal cancer resections are commonly performed, they are still associated with a disproportional share of complications in general surgery\textsuperscript{14}, with mortality and morbidity rates ranging up to 1.2-4.8% and 15-25% respectively\textsuperscript{13}.
OUTLINE OF THIS THESIS

The Dutch Value Based Health Care study
In 2012 a pilot study combined the detailed clinical data of the DSCA with cost-price information for six hospitals. Results of this pilot study led to the initiation of the Dutch Value Based Health Care (DVBHC)-study. The purpose of the DVBHC-study was to investigate possible relations between quality and costs of colorectal cancer surgery. Twenty-nine hospitals were approached for participation and analyses were performed from a scientific perspective. Translation of patient level resource utilization into costs for each hospital was provided by Performation (Bilthoven, The Netherlands), a healthcare consultancy firm providing patient level costing (using time-driving activity-based costing). The dataset of the Dutch Value Based Health Care study was used for chapters 3, 4, 5, 7, 8 and 9.

Surgical auditing and hospital costs
Recent literature suggests that focus in health care should shift from reducing costs to improving quality; where quality of health care improves, cost reduction will follow. Surgical auditing could facilitate this process, since availability of key data on processes and outcomes is one of the cornerstones for quality improvement. However quality improvement by surgical auditing had been described earlier, it’s relation to cost reduction is poorly investigated. A systematic review of the
relationship between surgical auditing and cost-evaluation is reported in chapter 2 of this thesis. The DSCA identified significant reduction in mortality and severe complications after its initiation in 2009. To explore the effect of a nation-wide quality improvement initiative on healthcare costs, the DVBHC-database was analyzed to investigate whether the quality improvement between 2010 and 2012 for the participating 29 hospitals was accompanied by cost-reduction as well. Moreover, identification of ‘best performing hospitals’ was explored by looking at quality and costs at hospital level. The results are reported in chapter 3.

Colorectal cancer surgery is commonly performed however it is associated with a disproportionate share of adverse events in general surgery. Since adverse events are associated with extra hospital costs it seems important to explicitly discuss the costs of complications and the risk factors for high-costs after colorectal surgery. Obviously, a decline in complication rates after colorectal surgery will be of most benefit to the patients, however one might argue that a business case for quality improvement can be made as well. Both items are reported in chapter 4.

Laparoscopic techniques and hospital costs
During the last two decades, laparoscopic resection has developed as a commonly accepted surgical procedure for colorectal cancer. However, there have been questions regarding the cost-efficacy, mostly because of prolonged operation time and higher costs of operation materials (e.g. disposables). The DVBHC-database was used to compare actual 90-day hospital costs between elective open and laparoscopic colon and rectal cancer resection. Analyses were performed by using sub-group analyses based on operative risk and reported in chapter 5.

The Jeroen Bosch Hospital (Den Bosch, The Netherlands) is one of the Dutch pioneers in performing single port laparoscopy (SPL) for colorectal cancer and Jeroen Bosch Hospital’s surgeons started using SPL in 2011. Since SPL is a relatively new technique, little is known about is effect on hospital costs. In chapter 6 we describe clinical and financial outcomes between SPL and conventional laparoscopy for colorectal cancer performed at the Jeroen Bosch Hospital.
High-risk patients and hospital costs
Frail patients are at high risk for developing complications after major surgery and therefore detailed performance information of those patients is of interest for healthcare providers. Moreover, due to increasing health care costs, discussion regarding increased hospital costs when operating high-risk and/or frail patients is rising. To facilitate this discussion, we analyzed hospital costs of two specific sub-groups suffering from high complication rates. Firstly, the impact of obesity on hospital costs is reported in chapter 7. Since evidence from general surgery suggest that there seems to be a so-called “obesity paradox” (lower mortality rates after surgery for pre-obese and mildly obese patients as compared to normal weight patients), this was also investigated in this study. Secondly, hospital costs of the oldest old colorectal cancer patients (age 85 and older) were analyzed and the results are reported in chapter 8.

Reimbursement and quality improvement
The current reimbursement system in the Netherlands is not contributing to any improvement in value of care. At the moment, colorectal cancer reimbursement is partly based on length of hospital stay (with a cut-off at day 28). Although not very likely because of the integrity of healthcare providers, it might even provide a perverse stimulant (e.g., complications will result in longer hospital stay and therefore result in a higher reimbursement). As suggested by Michael Porter, reimbursement in healthcare should be tied to overall care for the patient and should include severity adjustments and (long-term) care guarantees that hold the provider responsible for avoidable complications. Based on the subgroup analyses showed in chapter 5, an alternative reimbursement system for colorectal cancer surgery in the Netherlands is suggested in chapter 9.
REFERENCES


3. ‘De zorg: hoeveel extra is het ons waard?’. The Dutch Ministry of Health Welfare and Sport; 2012-12-06 2012.


