Systematic quality improvement in healthcare: clinical performance measurement and registry-based feedback
van der Veer, S.N.

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Chapter 1

General introduction and outline
This thesis addresses the subject of systematic quality improvement in healthcare. Specifically, we investigated the following three research topics: quality improvement strategies, patient experience as a clinical performance indicator, and the impact of registry-based feedback on the quality of care. The first two topics were explored within the clinical domain of renal replacement therapy; the Dutch National Intensive Care Evaluation (NICE) registry was used as a practical context to examine the impact of registry-based feedback.

This chapter introduces the three research topics, and then briefly describes the contexts in which they were explored. We conclude Chapter 1 with formulating the research questions and outlining the remaining chapters.

**Introducing the research topics**

**Quality improvement strategies**

There is persistent room for improvement in healthcare.\(^1\)\(^-\)\(^3\) This may partly be explained by the complexity of the healthcare system, which hampers the achievement of change.\(^4\)\(^-\)\(^6\) One approach to changing complex systems is systematic quality improvement (QI).\(^7\)\(^-\)\(^11\) This approach is characterized by its focus on solving problems in the system’s underlying processes rather than focusing on correcting the mistakes of individuals. It relies on data from healthcare professionals’ own setting to guide practice improvement, and it encourages working in multidisciplinary QI teams. The task of a QI team is to identify QI strategies. In this thesis we defined a *QI strategy* as a systematic attempt to improve the way care delivery is organized. It concerns interventions that need adaptation to the local setting by means of an iterative development process. This process is known as the Plan-Do-Study-Act (PDSA) cycle, and includes small-scale evaluations of the impact of a proposed strategy.\(^7\)\(^-\)\(^11\) QI strategies can be distinguished from *best practices*, which we defined as (a set of) clinical actions that are considered to improve outcomes in patients, regardless of where they are treated. For example, to increase the uptake of the best practice of prescribing prophylactic aspirin to patients hospitalized after acute myocardial infarction, implementing a computerized reminder system is a potentially effective QI strategy.\(^12\) Alternatively, in settings without a robust information technology infrastructure in place, providing comparative feedback reports on adherence rates combined with educational elements might be considered.\(^13\)

Many systematic reviews have evaluated the impact of QI strategies on the quality of healthcare across medical domains.\(^14\)\(^-\)\(^19\) However, even though different clinical contexts may require different strategies to achieve change,\(^20\) reviews focusing on a specific clinical domain are sparse. Healthcare professionals may not be familiar with the concepts underlying systematic quality improvement,\(^21\) or may be unaware of which QI strategies apply to their particular setting. This may explain part of the existing opportunity for improvement in healthcare.

**Clinical performance measurement – patient experience as an indicator**

Measurement has traditionally been a part of quality improvement in healthcare. The pivotal role of clinical performance data was already acknowledged by Ernst Codman one hundred years ago, when he started to record medical errors and to link these errors to patient outcome in order to improve the care delivered in his “End Result Hospital”.\(^22\) Since then, continuous measurement of clinical performance is being more and more integrated into healthcare systems worldwide.\(^23\)\(^-\)\(^25\)

Before introducing the topic of patient experience as an indicator of clinical performance, this section describes two types of performance measurement systems, and some general background on clinical performance indicators.
FORMATIVE VERSUS SUMMATIVE SYSTEMS

In the literature, two main performance measurement systems are distinguished: formative systems focusing on internal quality control, and summative systems focusing on external accountability. In formative systems, performance measurement is primarily a tool for healthcare providers to monitor and improve their care processes without external interference or direct negative consequences for payment and reputation. The National Intensive Care Evaluation (NICE) foundation—aiming to improve the quality of intensive care—is an example of a formative initiative from the Netherlands. Pay-for-performance and public reporting programs are typical summative systems, mostly used by governments, payers, and patient organizations. They link low performance to reduced financial resources or reputation harm; once low performance has been established, care providers have limited opportunity to change their practice in order to prevent this. Examples from the Netherlands are the public reporting of hospital care quality using the Healthcare Inspectorate’s performance indicator set or the hospital standardized mortality ratio.

CLINICAL PERFORMANCE INDICATORS

Regardless of the formative or summative nature of the system, clinical performance indicators form the core of any performance measurement initiative. Indicators are proxies of performance that indicate potential opportunities for improvement. Three classic categories can be distinguished: structure, process, and outcome indicators. Structure indicators refer to factors associated with the healthcare setting, e.g., the availability of equipment. They are linked to performance by the assumption that the proper settings will result in high quality care. Process indicators refer to the care that is actually being delivered, and the extent to which this is in line with established clinical standards; for instance, the percentage of eligible patients that receive β blockers after an acute myocardial infarction. Outcome indicators involve the ultimate status of the patient after having received treatment, such as the mortality rate among coronary artery bypass surgery patients, or quality of life after kidney transplantation.

When composing an indicator set one should strike a balance between covering all the important aspects of performance, and keeping data collection robust and feasible. This includes identifying reliable indicator data that are readily electronically available as byproducts of routine processes, or easily made available with minimal extra resources. Once reliable performance data are collected, they need to be translated into interpretable and actionable information; for example, by adjusting for case-mix factors, and developing a feedback strategy that matches stakeholders’ needs and preferences.

PATIENT EXPERIENCE AS A CLINICAL PERFORMANCE INDICATOR

Patient experience is considered an important and relevant patient outcome by many stakeholders involved in the care delivery process, and, therefore, is an outcome indicator with high face validity. Several public reporting initiatives have incorporated the patient perspective as a part of clinical performance, such as the Consumer Assessment of Healthcare Providers and Systems (CAHPS) in the USA, and the Consumer Quality (CQ) Index initiative in the Netherlands.

However, whereas the outcome indicator ‘death’ is objective, unmistakable and, therefore, relatively easy to measure, patient experience is not. Moreover, patient experience was shown to also be influenced by factors that are not attributable to healthcare. Hence, to use patient experience as an accurate indicator of clinical performance and facilitate its use for quality
improvement, a validated measurement instrument and knowledge on its determinants are warranted.

**Impact of registry-based feedback on clinical performance**

Clinical performance measurement and feedback have always been closely knit: besides collecting medical error data, Ernest Codman also made them publicly available to patients and other hospitals by publishing an annual report. Nowadays, performance feedback is considered a common QI strategy to change clinical practice. Providing performance feedback reports is a standard service offered by medical quality registries. A medical quality registry is a systematic and continuous collection of a standardized set of health and demographic data for a specific patient population, submitted by multiple users, held in a central database, and subjected to a data quality assurance protocol. Registry-based feedback often comprises data on a broad range of performance indicators, benchmarked against external standards or peer performance. The underlying assumption is that reports of inferior or inconsistent care are an incentive for healthcare providers to change their routine practice. Yet, in general, the impact of feedback on the quality of care was shown to be small to moderate, and it remains unclear how this impact can be further optimized.

**Introducing the research contexts**

The topics of systematic quality improvement strategies, and of patient experience as a clinical performance indicator were explored within the clinical domain of renal replacement therapy. We used the feedback as provided by the Dutch NICE registry as a practical example to address the topic of registry-based feedback effectiveness. Both contexts are briefly described below.

**Renal replacement therapy**

End-Stage Renal Disease (ESRD) is a chronic condition in which the kidney function can no longer sustain life; ESRD patients require renal replacement therapy (RRT). RRT care comprises chronic dialysis and kidney transplantation. The essence of dialysis is removing toxins and excess water from the body, which can be done by a machine holding an artificial filtering device (hemodialysis), or via a dialysis solution (dialysate) that is infused into the patient’s abdominal cavity (peritoneal dialysis). Most hemodialysis patients receive their treatment at a dedicated outpatient dialysis center, which they visit three to four times a week; one dialysis session takes three to eight hours. Peritoneal dialysis requires renewal of the dialysate in the abdomen either manually four to five times during the day, by a machine at night, or by a combination of both; these procedures can be performed at home. ESRD patients that have received a kidney transplant no longer need dialysis. Although this (eventually) results in a lower treatment intensity, transplanted patients must take immunosuppressive drugs, and frequently visit the transplant clinic and other caregivers for the rest of their life. The long-term character of treatment of ESRD, and the intensive interaction between patient and healthcare provider make patient experience an important outcome indicator of the quality of RRT care. It also causes the delivery of RRT care to be complex, especially when considering that patients have frequent co-morbidity, and treatment involves healthcare professionals from multiple disciplines. Like stated earlier, this complexity hampers the achievement of change, which may partly explain the persisting room for improvement in the delivery of RRT care.
The National Intensive Care Evaluation (NICE) registry

The NICE registry is entrusted with collecting and reporting data on the quality of care delivered at Dutch intensive care units (ICUs). ICUs are complex organizational units within hospitals providing multidisciplinary and expensive care to a heterogeneous population; patients admitted to the ICU are usually in need of intensive monitoring and some form of mechanical or pharmacological support, and have a relatively high mortality and morbidity risk. In the intensive care domain, systematic QI and clinical performance measurement are ubiquitous, which is reflected by the many performance indicator sets and numerous ICU quality registries. In the Netherlands, the intensive care profession founded the NICE registry in 1996 with the aim to systematically and continuously monitor, compare, and improve the quality of ICU care. Data collection started with the outcome indicators case-mix adjusted hospital mortality and length of ICU stay. In 2006, the Netherlands Society for intensive care (NVIC) extended the indicator set to a total of eleven structure, process, and outcome measures, adding items such as nurse-to-patient ratio, proportion of out-of-range glucose measurement, and unplanned extubation rate. Currently, almost 90% of all Dutch ICUs voluntarily submit their data to the registry. Until recently, they received –as a regular NICE service– quarterly and annual benchmark reports on the indicators.

Research questions and outline of the thesis

We formulated one research question per topic, and explored the answer in one of the two research contexts.

Quality improvement strategies in RRT care

Despite the many literature reviews evaluating the impact of QI strategies, there had been no attempts to create an overview of the systematic QI strategies reported within the domain of RRT care. Still, we anticipated that many initiatives had been undertaken aiming to change the delivery of care to ESRD patients. Sharing the experiences from these initiatives was expected to accelerate the improvement of RRT care. This triggered our first research question.

Research question 1 – Which quality improvement strategies have been reported within the domain of RRT care, and what was their impact on the quality of care?

We address this research question in Chapter 2. This chapter describes the results of a systematic review of the literature on initiatives that aimed to increase the uptake of best RRT practice in daily care. We present a categorized overview of the identified QI strategies, and report on their impact on the quality of RRT care.

Patient experience as an indicator of the clinical performance of dialysis centers

The Consumer Quality (CQ) index initiative in the Netherlands publicizes data on the experience patients have with a broad range of healthcare services. This initiative provides a standardized method comprising criteria for developing the measurement instruments, and for subsequent analysis and reporting of patient experience data. Until now there was no CQ index instrument for chronic dialysis care. In 2002, the Dutch Kidney-patient federation (NVN) developed a survey to measure patient satisfaction with dialysis care, which was employed as part of the certification scheme for Dutch dialysis centers. In 2006, the NVN decided to revise the survey according to the CQ index criteria. This formed the basis for our second research question.
Research question 2 – How to use patient experience as an indicator of the clinical performance of dialysis centers?

This question is addressed in Chapter 3. This chapter regards the development and validation of two CQ index instruments to measure the patient experience with in-center hemodialysis, and peritoneal dialysis and home-hemodialysis care respectively. In Chapter 4 we explore the relationship between characteristics of dialysis patients and the experience they have with their care.

The impact of the NICE registry feedback reports on ICU performance

To investigate the potential of the NICE registry reports to prompt healthcare providers to change their daily care, and to explore how the impact of feedback could be further optimized, we formulated the third research question.

Research question 3 – How can the impact of the NICE registry feedback reports on the quality of intensive care be increased?

To answer this research question, we first systematically reviewed the literature on how medical quality registries in general provide performance feedback to healthcare professionals in Chapter 5. In this chapter, we additionally investigated the effect of registry-based feedback on the quality of care, and identified the factors that were suggested as moderators of the effect. Chapter 6 describes the development of a new multifaceted feedback strategy within the context of the NICE registry, and the study protocol for the quantitative and qualitative evaluation of the strategy’s effectiveness. The results of the quantitative evaluation are presented in Chapter 7, where we conducted a cluster randomized controlled trial to assess the impact of the feedback strategy on ICU patient outcomes compared to standard NICE feedback reports. In Chapter 8 we report on the results of the qualitative study, in which we explored potential explanations for why the intervention was effective or not.

Finally, in Chapter 9 we synthesize and discuss the main findings presented in this thesis, and provide suggestions for future research.
## Reference List


