The value of external peer review in oncology

Evaluating the impact on cancer services in Dutch hospitals

Melvin J. Kilsdonk

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This thesis is part of the Health Sciences Series, HS 16-011, department Health Technology and Services Research, University of Twente, Enschede, the Netherlands. ISSN 1878-4968.

Cover design: 'Measuring clinical excellence' by Miguel Montaner.

Printed by: Ipskamp Drukkers, Enschede.

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ISBN: 978-90-365-4079-7

DOI: 10.3990/1.9789036540797

THE VALUE OF EXTERNAL PEER REVIEW IN ONCOLOGY

EVALUATING THE IMPACT ON CANCER SERVICES IN DUTCH HOSPITALS

PROEFSCHRIFT

ter verkrijging van
de graad van doctor aan de Universiteit Twente,
op gezag van de rector magnificus,
prof. dr. H. Brinksma,
volgens besluit van het College voor Promoties
in het openbaar te verdedigen
op vrijdag 18 maart 2016 om 16.45 uur

door

Melvin Jorrit Kilsdonk

Geboren op 3 september 1985
te Zwolle

Dit proefschrift is goedgekeurd door de promotoren:

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Prof. dr. S. Siesling

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Introduction

Quality improvement in healthcare

Quality of healthcare is difficult to define and multi-interpretable. A commonly used definition is from the Institute of Medicine (IoM):"Quality of care is the degree to which health services for individuals and populations increase the likelihood of desired outcomes and are consistent with current professional knowledge" (1). This definition shows that quality of care does not only concern direct patient care but also depends on conditions that are needed to provide care. A practical interpretation was given by Donabedian by describing quality in relation to structure, process and outcomes (2). Structure measures include the availability of resources, management systems and policy guidelines. It is regarded as the basis of a hospital organization. Process measures represent the processes necessary for day-to-day healthcare delivery. Outcomes are the 'end-results' and can contain medical indicators (e.g. mortality, complication rates) as well as patient satisfaction data. Donabedian's model assumes a dynamic relationship between the three components based on the logical assumption that good outcomes rely on good processes, which rely on good structure.

Improving the quality of care is frequently described by the concept of continuous quality improvement (CQI). CQI is originally an industrial model of quality improvement that has proven its value in several manufacturing situations and organizations especially in Japan. It entails enlisting an entire organization to work towards a goal of continuous improvement in quality as defined by the needs and wants of the customer. This model gained popularity on its appliance in hospitals in the early 1990's. Measurement of quality plays an important role in CQI and the Deming cycle, or Plan-Do-Check-Act cycle, is often incorporated in the bigger concept of CQI. It consists of a cyclic four-stage learning approach; in the 'plan' stage the aims of improvement are identified, the 'do' stage is the actual execution of change, the 'check' stage examines the success of the change and the 'act' stage identifies adaptations and next steps to inform a new cycle. In later years the 'check' stage has been referred to as 'study' stage because 'check' emphasizes inspection over analysis. The combination of the Deming cycle and the concept of continuous quality improvement results in an ideal situation in which the quality-level gets higher and higher over time as can be seen in Figure 1.

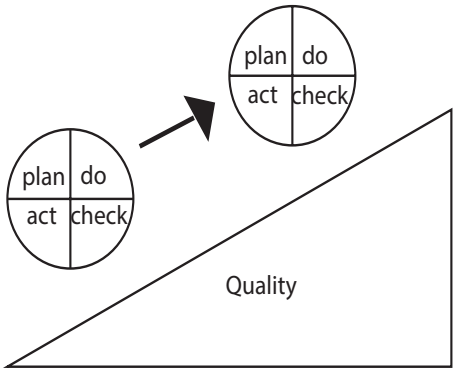

Figure 1. The Deming cycle in relation to continuous quality improvement.

External peer review

The success of quality improvement programmes relies for an important part on (social) context (3). Effective interventions need to be complex and multifaceted and developed iteratively to adapt to the local context and respond to unforeseen obstacles and unintended effects (4). In the Netherlands, external peer review (in Dutch: visitatie) is a cornerstone in evaluating and improving the quality of healthcare. It has been identified by The External Peer Review Techniques (ExPErT) programme as one of four main methods used in Europe in this field together with accreditation, International Standardisation Organization (ISO) certification, and the European Foundation of Quality Management (EFQM) excellence model (5, 6). In general, external peer review and accreditation are the closest to the actual delivery of healthcare, whereas ISO certification and the EFQM excellence model focus primarily on the managerial and organizational conditions under which care processes are executed (7). Common grounds are shared between accreditation and external peer review; the most important differences are the collegial approach in external peer review, confidentiality of reports and often the absence of an award or certificate in external peer review. The incentives for both methods can be similar but accreditation mostly has a more regulatory compulsive character while external peer review is often improvement driven and voluntary. Internationally, accreditation is the most frequently used method for quality evaluation. Table 1 highlights the main features and differences of accreditation and external peer review.

	External peer review	Accreditation
Origins	The Netherlands, as part of quality assurance of specialist training programmes	USA, 1917 Hospital Standardization programme set up by American College of Surgeons
Surveyors	Peers being practicing professionals	Healthcare professionals
Preparations	Self-review addressing the organisational and procedural aspects of professional performance	Self-review stating the compliance to a set of explicit standards
Evaluation	Visit by external peer review committee addressing key issues of the self-review On-site observation On-site interviews	Grading compliance to standards using self-review On-site observation On-site interviews
Report	Description of the organization, positive and negative findings, recommendations for improvement and comparisons with standards	Compliance and non-compliance with standards of the accreditation programme
Certification	None	Yes, accreditation
Disclosure	Confidential	Public

Table 1. Key features and differences of external peer review and accreditation (6, 8).

There is limited evidence on the effectiveness of external peer review in the Netherlands. Lombarts and Klazinga published an extensive paper on the introduction and development of external peer review. They state that many stakeholders perceived it as a credible instrument for assuring the quality of care. Besides, it plays an important role in the positioning of the medical profession as a reliable partner in delivering healthcare (9). Another study by these authors showed that external peer review seems to enforce the development of management of medical care (10). A study on peer review amongst general practitioners found significant improvements on many aspects of practice management, such as equipment, record keeping, organization of information and delegation (11). Descriptive studies were published on external peer review of paediatric care in the Netherlands and on the legal perspectives (12, 13).

Few international studies have been published on the effects on clinical outcomes. Roberts et al report on the one- and three-year evaluation of peer review for chronic obstructive pulmonary disease in the United Kingdom (14, 15). Their findings after three years indicated an association with improved quality of care, service delivery and changes that promote (and are precursors to) quality improvement. Their one-year evaluation showed no significant differences leading to the conclusion that changes can take a prolonged period to occur. In lung cancer care, peer review was successful in stimulating quality improvement activities but improvements in treatment rates and patient experiences were small (16). More research has been done on the impact of accreditation programmes on the quality of care. Two recent systematic reviews on accreditation revealed complicated relationships and the authors were hesitant to make strong claims about the effects due to limitations of the studies (17, 18).

External peer review for multidisciplinary cancer care in the Netherlands

During the 1980s and 90s, cancer treatment became increasingly multidisciplinary. Adjuvant chemotherapy and radiotherapy transferred cancer treatment from a monodisciplinary responsibility to the responsibility of multiple medical specialties. Multidisciplinary care was promoted by the Comprehensive Cancer Organizations. Before their fusion into one national organization in 2011 there were eight regional Comprehensive Cancer Organizations. They formed networks of healthcare professionals and cancer institutes aiming to improve cancer care through cancer registry, research, guideline development, knowledge exchange and organizational improvement without having a treatment function themselves. Anticipating the increasing multidisciplinary treatment of cancer patients, the Comprehensive Cancer Organization in the North of the Netherlands introduced an external peer review programme in 1994 to review the multidisciplinary organization of cancer care in hospitals. The programme gradually spread over the country and was eventually used nationwide. A majority of Dutch hospitals has gone through the procedure at least once and in some regions already thrice.

The programme initially focussed on organizational requirements for multidisciplinary care. Over time, it evolved and also paid attention to important (inter)national trends such as centralization. However, the primary focus remained on the organization of cancer care as a whole (not specific tumour types). Participation is voluntary and there is no certification afterwards. Findings are documented in a confidential report.

The programme relies on a pre-established quality framework and hospital organizations and processes are compared to the standards of this framework. The quality framework evolves around nine focus areas of which there are five organizational areas and four result areas. The framework is based on the INK (Instituut Nederlandse Kwaliteit) management model (Figure 2). For each focus area, standards and requirements are defined by medical specialists and healthcare professionals.

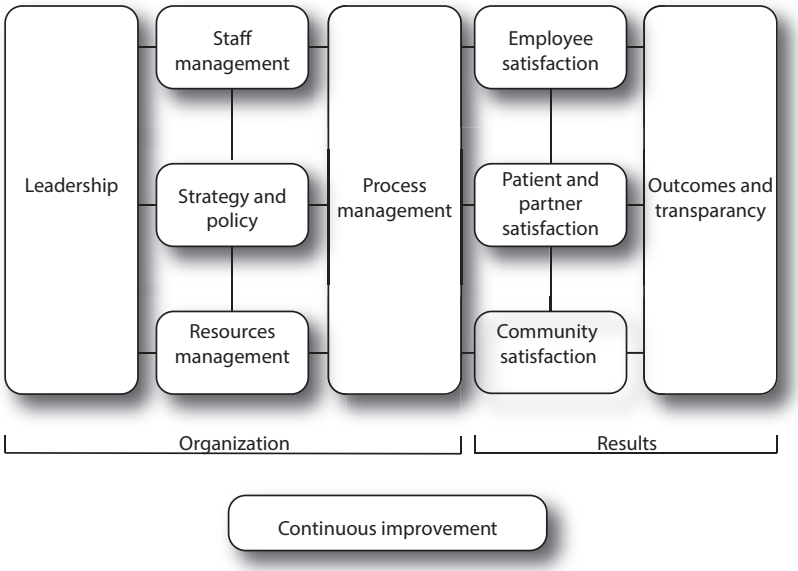

Figure 2. Focus areas of the quality framework of the external peer review programme for multidisciplinary cancer care.

When a hospital applies to participate in the programme they start with an extensive self-review. The actual site-visit combined with the self-review serves as a mirror, reflecting the weak and strong points of the organization. Participation in the programme gives insight in which areas improvement is needed and recommendations for improvement are given. Major topics of recommendations were the organization of weekly multidisciplinary patient care meetings, shared decision making between specialists, oncological specialization of medical specialists, dedication of oncology committees to policy making, introduction of integrated

care pathways, referral policies for low volume tumours and highly complicated interventions and working according to evidence based guidelines. Figure 3 presents a flow chart of the entire peer review process.

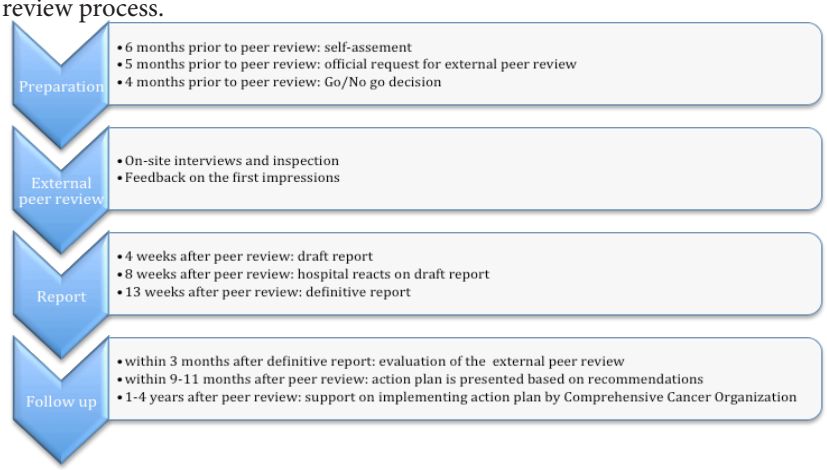

Figure 3. Flow-chart of the external peer review process, hospitals are advised to participate every 4-5 years.

Objectives and thesis outline

Even though there is almost 20 years of experience with the external peer review programme for multidisciplinary cancer care there is no structured evidence of its effectiveness on quality improvement. This is a more general problem for external peer review and accreditation programmes. The lack of conclusive evidence has led to many calls for research in the fields of external peer review and accreditation (19, 20). As Ovretveit stated: "Many countries are embarking on accreditation programmes without any evidence that they are the best use of resources for improving quality and no evidence about the effectiveness of different systems and ways to implement them" (21).

This thesis aims to investigate the impact of the external peer review programme for multidisciplinary cancer care on clinical outcomes and organization. The following research questions will be investigated:

- How can the impact of external peer review on quality of care be studied methodologically?
- What is the impact of the programme on the clinical quality of cancer care?
- What are the experiences of stakeholders and what is the perceived value of the programme?
- What drives quality related organizational change in cancer care?

Chapter 2 reports on the results of a literature review on research methods used in previous studies on the impact of external peer review and accreditation in order to create a general research model. As previous research has showed, research in the field of quality improvement through external peer review and accreditation is challenging and difficult. This is partly because the programmes are difficult to evaluate: they change over time, are applied to changing organizations and need to be assessed from different perspectives (21, 22). Other factors such as guidelines and other quality programmes influence patient outcomes as well. Most programmes do not directly focus on patient outcomes but on organizations as a whole. Therefore, a relationship between patient outcomes and peer review programmes is difficult (if not impossible) to prove. Based on the literature in the review a general research model is proposed to optimize research designs of studies on external peer review and accreditation.

The impact of the external peer review programme for multidisciplinary care on clinical outcomes is studied by evaluating specific multidisciplinary treatment characteristics. **Chapter 3** reports on the impact of implementing the recommendations from the programme on colorectal cancer treatment and survival in the Netherlands. Specifically, the paper investigates whether (1) the participation in the external peer review programme and (2) the extent of the implementation of recommendations impacted multidisciplinary treatment patterns (such as combined treatment modalities) and survival of colorectal cancer patients. Colorectal cancer was amongst the first types of cancer requiring multidisciplinary treatment. Previous studies showed treatment variation that can not be explained by medical factors alone. It is suggested that hospital characteristics play a role in explaining this treatment variation (23, 24). **Chapter 4** analyses treatment patterns in breast cancer patients who were treated in hospitals from two different regions in the Netherlands and a control group. Comparing different regions creates the opportunity to analyse the influence of regional factors as well as the possible external peer review influence. Breast cancer is the commonest type of cancer in women in the Netherlands and its treatment is marked by a multidisciplinary approach and specialization of the involved physicians and nursing staff.

In **Chapter 5** a qualitative study is presented where physicians, nurses and managers reflect on their experiences with the programme, the perceived impact and the role of external peer review in the future. Telephonic interviews were conducted with 31 stakeholders from 15 different hospitals.

Chapter 6 studies the centralization patterns of surgical treatment for pancreas, oesophagus and bladder cancer. This provides a more general insight in what drives quality related organizational change in cancer care. Centralization of low-volume tumours and highly-complex surgical

interventions is the best studied form of quality improvement through organizational change. As there are many factors that may have been of influence, we identified whether and which professional, organizational and regulatory stimuli were effective in stimulating centralization of cancer care.

In the general discussion (**Chapter 7**) the future of external peer review in cancer care is discussed, incorporating the research results from the previous chapters.

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2

Evaluating the impact of accreditation and external peer review

International Journal of Health Care Quality Assurance (2015)
Vol.28 Iss 8 pp. 757-777

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Abstract

Purpose

Accreditation and external peer review play important roles in assessing and improving healthcare quality worldwide. Evidence on the impact on the quality of care remains indecisive because of programme features and methodological research challenges. The purpose of this paper is to create a general methodological research framework to design future studies in this field.

Design

A literature search on effects of external peer review and accreditation was conducted using Pubmed/Medline, Embase and Web of Science. Three researchers independently screened the studies. Only original research papers that studied the impact on the quality of care were included. Studies were evaluated by their objectives and outcomes, study size and analysis entity (hospitals vs patients), theoretical framework, focus of the studied programme, heterogeneity of the study population and presence of a control group.

Findings

After careful selection 50 articles were included out of an initial 2,025 retrieved references. Analysis showed a wide variation in methodological characteristics. Most studies are performed cross-sectionally and results are not linked to the programme by a theoretical framework.

Originality/value

Based on the methodological characteristics of previous studies the authors propose a general research framework. This framework is intended to support the design of future research to evaluate the effects of accreditation and external peer review on the quality of care.

Introduction

External quality assessment programmes play an important role in assessing and improving health care quality. The External Peer Review Techniques (ExPErT) programme identified four main methods used in Europe in this field: accreditation, International Standardisation Organisation (ISO) certification, visitatie/external peer review and the European Foundation of Quality Management (EFQM) excellence model (Heaton, 2000). ISO certification and the EFQM excellence model focus primarily on the managerial and organisational conditions under which care processes are executed. External peer review and accreditation are the closest to the actual deliverance of healthcare (Klazinga *et al*, 2000). Therefore, in this study we focus on the last two methods. Important differences between external peer review and accreditation are the collegial approach, confidential reports and the absence of an award or certificate in external peer review. Incentives for both methods can be similar but accreditation often has a regulatory character while external peer review often is improvement driven and voluntary (Table 1) (Heaton, 2000; Klazinga *et al*, 2000). Programme standards are based on evidence-based guidelines, theoretical organisational models and expert consensus. Adherence to the standards is seen as proxy of how well care is organised.

	External peer review	Accreditation
Origins	The Netherlands, as part of quality assurance of specialist training programmes	USA, 1917 Hospital Standardization programme set up by American College of Surgeons
Surveyors	Peers being practicing professionals	Healthcare professionals
Preparations	Self-review addressing the organisational and procedural aspects of professional performance	Self-review stating the compliance to a set of explicit standards
Evaluation	Visit by external peer review committee addressing key issues of self-review On site observation On site interviews	Grading compliance to standards using self-review On site observation On site interviews
Report	Description of the organization, positive and negative findings, recommendations for improvement and comparisons with standards	Compliance and non-compliance with standards of the accreditation programme
Certification	None	Yes, accreditation
Disclosure	Confidential	Public

Table 1. Key features and differences of external peer review and accreditation (Heaton 2000; Klazinga *et al*. 2011)

While designed to assess and improve the organisation and quality of care, the actual impact on clinical and organisational outcomes such as guideline adherence or adverse effects remains unclear (Shaw, 2001; Greenfield and Braithwaite, 2008; Greenfield and Braithwaite, 2009; Hinchcliff *et al*., 2012). Recent literature reviews on accreditation revealed complicated relationships and the authors were hesitant to make strong claims about the effects due to limitations of the studies (Greenfield and Braithwaite, 2008; Hinchcliff *et al*., 2012).

Despite inconsistent evidence, the programmes are adopted worldwide, requiring significant amounts of labour and money. Given these investments and the lack of evidence on the impact of these programmes, the call for evidence grew (Shaw, 2001; Greenfield and Braithwaite, 2009).

There are several reasons for the lack of consistent evidence, depending on programme features, methodological research challenges and difficulties in relating the outcomes to the programmes (van Harten *et al*, 2000; Ovretveit and Gustafson, 2002; Ovretveit, 2002; Ovretveit and Gustafson, 2003). In general, it is not totally understood how quality of care can be defined and measured, nor which factors are responsible for quality improvement. The most solid method to prove the impact of any intervention is a 'traditional' randomised clinical trial, but this is not always possible. In our study we therefore did not attempt to perform a review on the outcomes of previous studies. We focussed on why the evidence is inconclusive and what can be done to improve future research in this field. The purpose of this review is to assess the methodological characteristics of international studies on the impact of accreditation and external peer review on the quality of care in order to create a general research framework. This framework could support researchers in determining the most appropriate research approach to study the effect of these programmes and facilitate comparisons between studies.

Methods

A literature search on the impact of external peer review (visitatie) and accreditation programmes in healthcare was conducted in November 2012. These two methods of external quality assessment share common grounds and are the closest to the actual delivery of healthcare and were therefore included in the search. Programmes such as ISO and EFQM were not included as these primarily target managerial and process-related conditions. We focused on clinical literature and searched the Pubmed/Medline, Embase and Web of Science databases. We looked for studies that examined the impact of accreditation or external peer review programmes on healthcare quality-related outcomes. In our search strategy, no differentiation was made in organisational vs speciality programmes or voluntary vs mandatory programmes. Outcomes nor the content of the programmes were specified, which makes it difficult to narrow down results of a search strategy. We tested different MeSH and Emtree terms (Pubmed/Medline and Embase) and used accreditation, Joint Commission on Accreditation of Healthcare, peer review and benchmarking to search the Pubmed database. Embase and Web of Science were searched using the terms: accreditation, peer review, visitatie and joint commission. Visitatie is a word originating in the Netherlands (and sometimes used in English publication), external peer review is used more frequently internationally. Therefore, both visitatie and peer review were included in our search strategy. The results were narrowed down by using terms such as 'quality of healthcare', 'quality assurance' and 'outcome and process assessment'. To obtain our final selection we selected only the references with keywords in their titles such as impact, outcome(s), difference(s) and effect(s). This was done to filter studies on the impact of the

programmes. In addition the search was limited to articles written in English or Dutch (see Table 2 for the full search strategy).

Literature database	Search entry		*N*
Pubmed/Emtree	(accreditation[majr] OR Joint Commission on Accreditation of Healthcare Organizations[majr] OR Benchmarking[majr] OR Peer Review[majr]) AND (Quality of Health Care[majr] OR Organizational Culture[majr] OR Quality Assurance, Health Care[majr] OR Quality Indicators, Health Care[majr] OR Total Quality Management[majr] OR Safety Management[majr]) AND ((Efficiency, Organizational[majr] OR "Outcome and Process Assessment (Health Care)"[majr] OR "Outcome Assessment (Health Care)"[majr] OR "Medical Errors/prevention and control"[majr]) OR ((Health Services[majr] OR Health facilities[majr]) AND (standards[sh] OR ut[sh] OR sn[sh]))) AND (review[ti] OR accredit*[ti] OR impact[ti] OR improv*[ti] OR effect[ti] OR effectiv*[ti] OR audit[ti] OR audit*[ti]) NOT laboratory		1501
Embase	1.	'accreditation"/mj	101
	2.	'visitatie'	
	3.	'peer review"/mj	
	4.	'joint commission'	
	5.	1 or 2 or 3 or 4 -->18637	
	6.	'health care quality'/mj	
	7.	'health services research'/mj	
	8.	'quality control'/mj	
	9.	'outcome assesment'/mj	
	10.	'error'/mj	
	11.	'health care facilities and services'/mj	
	12.	'health services research'/mj	
	13.	'safety'/mj	
	14.	'organization and management'/mj	
	15.	#6 OR #7 OR #8 OR #9 OR #10 OR #11 OR #12 OR #13 OR #14 --> 269162	
	16.	#5 AND #15 --> 667	
	17.	Outcome*:ti OR compar*:ti OR difference*:ti OR error*:ti OR performance:ti -->2679383	
	18.	#16 AND #17	
Web of Science	1.	Topic=(accreditation) OR Topic=(visitatie) OR Topic=("peer review") 13816	499
	2.	Title=(compar*) OR Title=(difference*) OR Title=(error*) Title=(outcome*) OR Title=(effect*) OR Title=(impact) OR Title=(performance) 4310912	
	3.	Topic=(health) OR Topic=(care) 1352312	
	4.	1 AND 2 1368	
	5.	#4 refined by document type (article or review) and (language English/Dutch) 1157	
	6.	5 AND 3	
		Total number of references	**2101**
		After deleting double references	**2025**

Table 2. Literature search strategy and number of retrieved references (*N*)

We used an extensive search strategy because we could not filter references based on type of accreditation programme or type of outcome variables. Using keywords and title words to narrow down our results was needed to reach an acceptable amount of references. The risk of losing relevant references by this strategy was acknowledged and an intensive search of the reference lists of our retrieved studies was done to find studies that were not identified by the initial search effort. We felt comfortable doing this because we also studied the reference lists of two previous well-known studies on accreditation (Greenfield and Braithwaite, 2008; Hinchcliff *et al.*, 2012).

The abstracts were independently analysed by three researchers (MK, WVH, SS). Disagreements were solved by consensus. The inclusion criterion was: original research on the impact of accreditation or external peer review on quality related outcome measures (incorporating structural, procedural and outcome related quality indicators). We did not specify specific outcomes because accreditation programmes can focus on different process, structure, and outcome variables (including quality of life of patients). Therefore, all structure, process or outcome related measures were included in our review. Exclusion criteria were: settings that do not deliver direct patient care (e. g. laboratories), evaluations of (singled out) accreditation standards instead of the entire programmes, evaluations of substance abuse programmes, programme assessments and the absence of quality related measures such as financial impact and costs-effectiveness.

Qualitative evaluation

No existing hierarchy of evidence framework was used to rank the quality of the studies. Common hierarchy of evidence frameworks are suited for experimental situations but lack differentiating criteria for studies on quality improvement programmes. In order to evaluate the studies we assessed several methodological characteristics. The following items were extracted from each paper: the objectives, study approach, focus of the studied programme, heterogeneity of the study population and theoretical frameworks, analysis entity and the presence of a control group. The focus of the studied programme was categorised as either the healthcare organisation as a whole (organisation) or a specific medical specialism or disease (service). Multiple hospitals including different subspecialties were rated as a highly heterogeneous study population and multiple hospitals only focussing on one or two specialties as low.

Results

Search results

A total of 2,101 references were identified, after deleting the double references 2,025 publications remained. After careful screening of the titles and abstracts, 52 articles were selected. The full texts were studied and 40 articles qualified. By examining the reference lists another ten references were retrieved. In total, 50 articles were included in our review (Figure 1 for a flowchart of the literature search). Their characteristics are presented in Table 3.

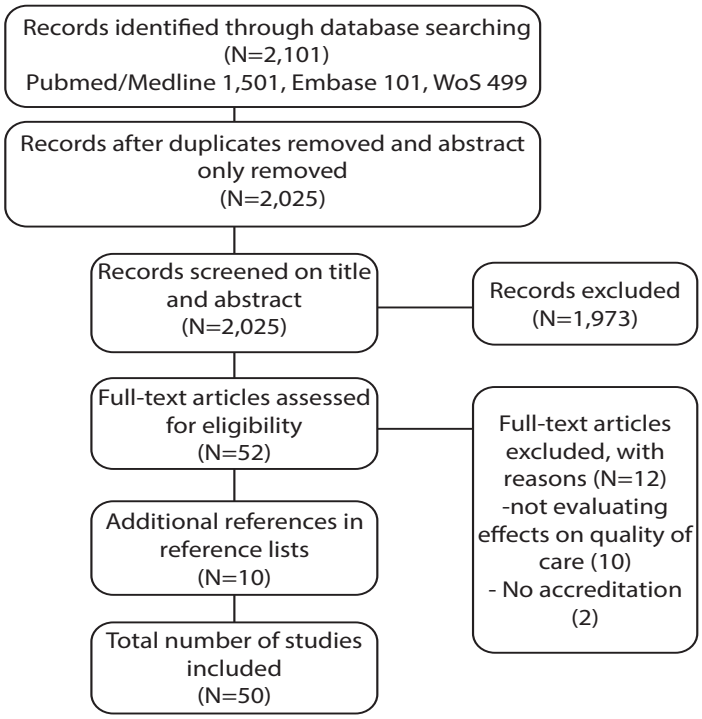

Figure 1: Study selection

Table 3: Study characteristics

Author(s), year	Objectives and outcomes	Study approach	Focus of the programme and outcome category	Heterogeneity of the studied organisations	Theoretical framework explaining results	*N*, analysis entity	Control group?
Wagner, McDonald, Castle, 2012a	To assess the impact of accreditation on nursing home safety culture perception	Cross-sectional, qualitative	Organisation; Safety	Low	No	4008 respondents	Yes
Wagner, McDonald, Castle, 2012b	Examine the association between nursing home accreditation and quality measures	Longitudinal, quantitative	Organisation; Clinical	Low	Yes	16267 nursing homes	Yes
Rivas *et al.*, 2012	Examine perceptions of service change among participants of nationwide peer review project for COPD	Cross sectional, qualitative	Service; Provider perception	Low	No, theory building research	43 respondents in 35 hospitals	Yes
Kwon *et al.*, 2012	Evaluate the impact of COE accreditation on clinical outcomes in bariatric surgery	Longitudinal, quantitative	Service; Clinical	Low	No	30755 patients	Yes
Roberts *et al.*, 2012	Evaluate whether peer review of respiratory units improves services and quality for COPD care	Longitudinal, mixed methods	Service; Clinical	Low	No	82 units	Yes
Schmaltz *et al.*, 2011	Examine the association between Joint Commission accreditation and performance on national quality measures for common diseases.	Longitudinal, quantitative	Organisation; Clinical	High	No	3891 hospitals	Yes
Gratwohl *et al.*, 2011	Test if JACIE accreditation improves patient survival after stem cell transplantation	Longitudinal, quantitative	Service; Clinical	Low	No	107904 patients	Yes
al Awa *et al.*, 2011a	Determine if accreditation process has a positive impact on patient safety and quality of care	Longitudinal, quantitative	Organisation; Safety/Clinical	N/a, one hospital	No	1 hospital (some analyses with total numbers of patients)	No
al Awa *et al.*, 2011b	Compare perceived patient safety and quality of care indicators pre and post accreditation	Longitudinal, qualitative	Organisation; Safety/Clinical	N/a, one hospital	No	870 respondents	No
El-Jardali *et al.*, 2011	Explore the association between patient safety culture predictors (accreditation) and several safety outcome variables.	Cross-sectional, mixed method	Organisation; Safety	High	No	68 hospitals and 6807 respondents	Yes
Edwards, 2011	Investigate whether peer review programme factors are associated with better objective clinical performance (morbidity/mortality)	Cross-sectional, quantitative	Organisation; Clinical	High	No	296 hospitals	No

Table 3: Study characteristics

Szecsenyi *et al.*, 2011	Assess the effectiveness of the European practice assessment programme in improving management in primary care practices focussing on the domain of quality and safety	Longitudinal, quantitative	Organisation; Safety	Low	Yes	204 primary care practices	Yes
Sack *et al.*, 2011	Assess the relationship between patient satisfaction and accreditation status	Cross-sectional, qualitative	Organisation; Patient perception	High	No	36777 patients from 73 hospitals (analyses mostly on hospital level)	Yes
Lichtman *et al.*, 2011	Assess differences in mortality and readmission rates between accredited and non-accredited stroke centers.	Cross-sectional, quantitative	Service; Clinical	Low	No	4512 centers	Yes
Shaw *et al.*, 2010	Identify systematic differences in quality management, organisation and practice between hospitals that were accredited, or certificated, or neither	Cross-sectional, mixed methods	Organisation; Safety Organisation	High	No	89 hospitals in 6 countries	Yes
Braithwaite *et al.*, 2010	Determine whether accreditation is associated with self-reported clinical performance and independent ratings of organisational performance	Longitudinal, mixed methods	Organisation; Clinical/ Organisational	High	Yes	19 hospitals	No
Pomey *et al.*, 2010	Evaluate how the accreditation process helps to introduce organisational changes that enhance the quality and safety of care.	Longitudinal, qualitative	Organisation; Organisational	High	Yes	5 hospitals	No
Kim *et al.*, 2010	Evaluate if improvement occurs in the image quality of CT-scans after accreditation	Longitudinal, qualitative	Service; Clinical	Low	No	5 hospitals	No
Sack *et al.*, 2010	Assess relationship between patient satisfaction and accreditation status in cardiology	Cross-sectional, qualitative	Organisation; Patient perception	Low	No	3037 respondents	Yes
Roberts *et al.*, 2010	Study impact of peer review on COPD quality measures	Longitudinal, mixed methods	Service; Clinical	Low	No	100 hospital COPD units	Yes
Awa *et al.*, 2010	Perceived impact (by nurses) of accreditation on patient safety and quality of care	Longitudinal, qualitative	Organisation; Safety	N/a, one hospital	No	870 respondents	No
Lutfiyya *et al.*, 2009	To determine whether quality measures differed for critical access hospitals based on JCAHO accreditation status	Cross sectional, quantitative	Organisation; Clinical	Low	No	730 hospitals	Yes
Thornlow and Merwin, 2009	Examine the relationship between patient safety practices (as mentioned by accreditation standards) and patient safety outcomes	Cross-sectional, quantitative	Organisation; Safety	High	Yes	115 hospitals	yes

Al Tehewy *et al.*, 2009	Determine the effect of accreditation on patient and provider satisfaction in NGO's for primary care.	Cross-sectional, qualitative	Organisation; Patient/provider perception	High	No	60 NGO's for primary care	Yes
Sunol *et al.*, 2009	Explore association between implementation of quality improvement strategies in hospitals and success in meeting defined quality requirements	Cross-sectional, mixed methods	Organisation; Organisational	High	No	89 hospitals in 6 countries	Yes
Chandra *et al.*, 2009	Evaluate association between accreditation and guideline adherence and clinical outcomes for myocardial infarction.	Cross-sectional, quantitative	Service; Clinical	Low	No	33328 patients from 344 hospitals	Yes
Braun *et al.*, 2008	Examine the impact of organisational characteristics (accreditation) on quality-related services.	Cross-sectional, qualitative	Organisation; Organisational	High	No	290 health centres	Yes
Paccioni, Sicotte, Champagne, 2008	Understand the effects of the accreditation process on organisational control and quality management in two primary care health organisations.	Longitudinal, mixed methods	Organisation; Organisational	Low	Yes	2 primary care centres	No
Ross *et al.*, 2008	Determine whether accredited hospitals have better performance on acute myocardial infarction measures than non-accredited hospitals.	Cross-sectional, quantitative	Service; Clinical	Low	No	395250 patients	Yes
Menachemi *et al.*, 2008	Compare the quality of care of ambulatory surgery in accredited vs. non-accredited ambulatory surgery centers measured in hospital admissions..	Cross-sectional, quantitative	Organisation; Clinical/Safety	High	No	364 Ambulatory surgery centres	Yes
Sekimoto *et al.*, 2008	Evaluate the impact of hospital accreditation on infection control programmes	Longitudinal quantitative	Organisation; Clinical	High	No	335 hospitals	Yes
El-Jardali *et al.*, 2008	Assess perceived impact (by nurses) on several variables of quality of care	Cross-sectional qualitative	Organisation; Organisational	High	No, theory building research	1048 respondents	No
Hosford, 2008	Investigate the impact of quality improvement efforts on reducing medical errors.	Cross-sectional qualitative	Organisation; Safety	High	Yes	155 hospitals	Yes
Stradling *et al.*, 2007	Examine the effect of accreditation delivery of stroke care.	Longitudinal, quantitative	Service; Clinical	N/a, one hospital	No	1 hospital	No
Juul *et al.*, 2005	Examine availability and quality of clinical guidelines on perioperative diabetes care before and after a RCT and international accreditation	Longitudinal, mixed methods	Service; Clinical	Low	Yes	51 units in 9 hospitals	Yes

Table 3: Study characteristics

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Parthasarathy *et al.*, 2006	Study the effect of American Academy of Sleep Medicine accreditation of sleep centers and sleep-medicine certification of physicians on therapy adherence and discontinuation.	Cross-sectional, qualitative	Service; Patient behaviour	Low	No	632 patients	Yes
Miller *et al.*, 2005	Examine the association between JCAHO accreditation scores and quality indicators and patient safety indicators.	Cross-sectional, quantitative	Organisation; Clinical/Safety	High	No	2116 hospitals	No
Heuer, 2004	examines the relationship accreditation scores and patient-satisfaction ratings.	Cross-sectional, qualitative	Organisation; Patient perception	Low	No	41 hospitals	No
Pomey *et al.*, 2004	Examine the organisational changes following preparation for accreditation and accreditation.	Longitudinal, qualitative	Organisation; Organisational	N/a, one hospital	Yes	1 university hospital	No
Salmon J: Heavens J: Lombard C: Tavrow P, 2003	To assess the effects of an accreditation programmeme on the processes and (clinical) outcomes of public hospitals in a developing country setting.	Longitudinal, mixed methods	Organisation; Organisational/ Clinical	High	No	53 hospitals	Yes
Chen *et al.*, 2003	Examine the association between JCAHO accreditation and quality of care and survival rates of myocardial infarction.	Cross-sectional, quantitative	Service; Clinical	Low	No	134579 patients In 4221 hospitals	Yes
Griffith, Knutzen, Alexander, 2002	Examine the relationship of outcome measures generated from Medicare data to Joint Commission accreditation measures for hospitals.	Cross-sectional, quantitative	Organisation; Clinical	High	No	742 hospitals	No
Barker *et al.*, 2002	Identify the prevalence of medication errors and compare different settings (accredited vs. non-accredited)	Cross-sectional quantitative	Organisation; Safety	High	No	36 healthcare facilities	Yes
Simons *et al.*, 2002	Measure morbidity and mortality outcomes within a single regional trauma system after designation of trauma centers and compare outcomes in one accredited center vs. non-accredited centers.	Longitudinal, quantitative	Service; Clinical	Low	No	3 trauma centers	Yes
Dean Beaulieu and Epstein, 2002	Determine performance of accredited health plans on quality indicators and impact of accreditation on enrolment.	Cross-sectional, quantitative	Organisation; Clinical	High	No	Varies in different analyses	Yes
Pasquale *et al.*, 2001	Evaluate impact of trauma center characteristics (including accreditation) on survival outcome	Cross-sectional, quantitative	Service; Clinical	Low	No	13942 patients	Yes

Table 3: Study characteristics

van den Hombergh *et al.*, 1999	Evaluate and compare the effects of external assessment on practice management (mutual visits and feedback by peers compared with visits and feedback by non-physician observers)	Longitudinal, qualitative	Organisation; Organisational	Low	No	68 GP practices	No
Bickell *et al.*, 1996	Assess impact of external peer review programme on the reduction of caesarean rates	Longitudinal, quantitative	Service; Clinical	Low	No	165 hospitals	Yes
Hadley and McGurrin, 1988	Evaluate the relationship between JCAHO accreditation and seven hospital characteristics related to the quality of care.	Cross-sectional, quantitative	Organisation; Organisational	High	No	216 hospitals	Yes
Duckett, 1983	To discern the role of the ACHS's accreditation programme in changing hospitals in New South Wales.	Longitudinal, qualitative	Organisation; Organisational	High	No	23 hospitals	Yes

Methodological characteristics

Objectives

The studies can be divided into two categories. First there are studies on 'the differences between hospitals after accreditation'. Their objectives are characterised by the question whether there is an association or relationship between accreditation status or scores and performance on quality indicators. These objectives implicate a static comparison on a certain moment in time and are tested by comparing performance measures to accreditation scores or measures from accredited hospitals to non-accredited hospitals. Second, we found studies with the objective to evaluate the impact or effect of a programme (on the quality of care). Key difference of an impact study is the evaluation of the added value of the programme. Instead of testing whether organisations differ the focus is on the achievements of the programme, mostly through a longitudinal design.

Study approach

In total, 27 of the 50 studies used a cross-sectional study design. Studies that aggregated data that was gathered over several years (e.g. survival data) were categorised under cross-sectional research. A cross-sectional, quantitative approach was the most prevalent as 52 per cent of the cross-sectional studies used this approach. A great benefit proves to be the large sample sizes that can be attained, as the high numbers of included hospitals and patients in cross-sectional studies show (Table 3). Most of these studies used large administrative databases such as the annual survey data of the American Hospital Association (AHA). A cross-sectional study-design is generally favoured for its low costs, absence of follow-up time and easy accessibility of mostly administrative data. The main shortcoming of cross-sectional studies is that they only address the question whether there are differences between hospitals; these can be explained by the accreditation status but other external and internal factors cannot be excluded. Therefore, results from a cross-sectional study have to be put in perspective and other possible causal or interfering factors need to be considered.

To evaluate the impact of accreditation the added value needs to be studied. This was done by analysing changes by using a longitudinal approach, the simplest one being a before-after study. In total, 23 studies were performed longitudinally. Longitudinal studies had smaller study populations. In nine studies a small population was studied more extensively (Simons *et al.*, 2002; Pomey *et al.*, 2004; Stradling *et al.*, 2007; Paccioni *et al*, 2008; Awa *et al.*, 2010; Kim *et al.*, 2010; Sack *et al.*, 2010; al Awa *et al.*, 2011a; al Awa *et al.*, 2011b). These studies were done to gain more insights in how accreditation is perceived and what subsystems and cultural variables are affected. This strategy does create problems with respect to the external validity. Pomey *et al.* (2004) published one study on the accreditation of a single university hospital and more recently one on the accreditation of five healthcare organisations (Pomey *et al.*, 2004; Pomey *et al.*, 2010). In the latter study they stated not to aim for the best internal and external validity but

to study a small number of cases in detail. Instead of focussing on outcomes, they evaluated how the accreditation process helped to introduce organisational changes. Similarily, Paccioni *et al.* used a study population of two primary care centres to gain understanding of the dynamics and impact of accreditation from a cultural control point of view (Paccioni *et al*, 2008).

Another approach we encountered to study added value was the examination of a dose-response relationship between hospitals in different phases of accreditation. Gratwohl *et al.* (2011) managed to include 421 bone-marrow transplantation centres. Centres were divided in those who were not accredited, preparing for accreditation, applied for accreditation, in the process of accreditation and accredited. A dose-response relationship was found with systematically better outcomes in the centres that were at a more advanced phase of accreditation.

Programme focus

Organisation-focussed programmes consist of multiple components and impact can be expected in multiple outcome categories. Research on programmes with an organisational focus tends to use groups of outcome variables rather than single outcome variables. Looking at the objectives, this is shown by the aim to evaluate the impact on broad outcome categories such as 'organisation', 'quality management' or 'safety measures'. These categories include several variables such as: availability of guidelines and protocols, number of readmissions and number of complications. Braithwaite and Greenfield (2010) state that all the components of a (complex) hospital system are interdependent and that there is interaction between all the different components. They plead that complex programmes like accreditation need a multi-method evaluation combining quantitative and qualitative data to explore all the different components. We found eight other studies that used a mixed method evaluation (Salmon *et al*, 2003; Juul *et al*., 2005; Paccioni *et al*, 2008; Sunol *et al*., 2009; Roberts *et al*., 2010; Shaw *et al*., 2010; El-Jardali *et al*., 2011; Roberts *et al*., 2012).

Studies on service-focussed programme primarily use clinical process and outcome variables such as therapeutic guideline adherence, morbidity and mortality (Pasquale *et al*., 2001; Simons *et al*., 2002; Chen *et al*., 2003; Juul *et al*., 2005; Stradling *et al*., 2007; Ross *et al*., 2008; Chandra *et al*., 2009; Gratwohl *et al*., 2011; Lichtman *et al*., 2011). It seems that it is easier to select specific care-related outcome variables when the programme is directly targeting one specific service or disease.

Study population and theoretical frameworks

A logical theoretical framework can be used to create structure and hypothesise on how outcomes can be related to the programme. It is suggested that the need of a theoretical framework increases when the studied programme is more heterogeneous (e.g. organisational focus) and when there is a wider variation in the organisations studied (Walshe *et al*., 2001).

Studies on service-focussed programmes applied to homogeneous organisations are closer to an experimental situation which justifies the use of more experimental methods (and care-related outcomes). We considered a theoretical framework to be present if there was an explicit description in manuscript of how the authors expected the programme to affect the outcome variables. In total, 34 papers concern studies that focus on the accreditation of whole organisations, seven of them use a theoretical framework. Other studies gave arguments for the impact of accreditation programmes such as the standardisation of processes and better guideline adherence but did not explicitly rely on a theoretical framework.

Thornlow and Merwin (2009) refer to the Quality Health Outcomes Model to structure the relationships between system, intervention and outcomes (based on Donabedian's structure, process and outcomes model). System variables were hospital characteristics, intervention variables were defined as utilisation of patient safety practices and outcomes were defined by the Agency for Healthcare Research and Quality. A fourth construct 'client' was added and defined as risk-adjusted variables including diagnosis, age and gender. A study on the impact of accreditation in U.S. nursing homes used Donabedian's original model (Wagner *et al*, 2012a). Braithwaite *et al*. (2010) research programme identified five major variables: organisational performance, clinical performance indicators, organisation culture, consumer participation and accreditation performance. A simplified model was made of the inter-relationships between these variables. Causal relationships could not be established due to potentially confounding variables. Instead qualitative and quantitative methods were combined to examine associations between the five major variables. Pomey *et al*. (2004;2010) used a self-designed model in both studies that evolves around the dimensions of change. This consists of conditions favouring emergence and diffusion of change and the characteristics of change. Accreditation is regarded to be an agent of change. Paccioni *et al*. (2008) describe a culture-approach, in which accreditation is a method to influence culture in a hospital.

Analysis entity

Outcomes can be analysed on a macro-level (healthcare systems), meso-level (healthcare organisations) and micro-level (patients). There is no consistent usage of these levels. Gratwohl *et al*. (2011) studied the effects of JACIE accreditation on patient survival after stem cell transplantation. Patients were grouped according to the accreditation status of the centre where they were treated. This micro-level evaluation allowed them to measure the accreditation effect instead of a centre effect and created the possibility to put the programme impact in perspective to other (possible) influencing variables. Most other studies used entire organisations as analysis entity, aggregating clinical data per hospital and categorising the hospitals according to their accreditation status. Aggregation of data may lead to problems. When data is aggregated from micro-level to meso-level, information might be lost and the analysis can lose power (aggregation bias). Another problem is the interpretation of results; conclusions are being

made on aggregated data from heterogeneous populations as if they came from a homogeneous population. Outcome categories were primarily clinical (e.g. survival), organisational or safety (e.g. medication errors). Some studies investigated the impact on patient perception (e.g. patient satisfaction) or provider perception.

Control group

Most studies (N=35) used a control group of non-accredited hospitals. Adding a control group creates a quasi-experimental situation, as it is often not possible to randomly assign hospitals to the control group. Not all the studies had the possibility to include a control group. In order to create different groups, some studies used the accreditation scores to investigate a dose-response relationship.

Implications for future research

This review provided insight in important methodological challenges in studying the impact on quality of care. It also revealed how some studies were able to overcome these challenges by the choice of their study design and use of a theoretical framework such as the structure, process, outcome model. We summarised our findings in a framework (Figure 2). Following the methodological aspects we studied, it graphically shows what steps should be taken to evaluate an external quality assessment programme. In eight simple steps this framework can help to choose a research approach for future studies:

1. There are two categories of research objectives: research on differences between organisations based on their accreditation status/scores and research on the impact of a programme, which evaluates the added value.

2. Study approach depends on the objective of the study. A cross-sectional study can serve to analyse the association between accreditation status or scores and performance measures. A longitudinal approach has more explanatory power and is more suited to study the impact of accreditation by assessing changes in organisations. Studying a quasi-experimental dose-response relationship can also provide information on the added value of accreditation

3. Describe the programme and study population as the choice for outcome measures depends on the organisational or service focus of the studied programme.

4 and 5. In an evaluation of an organisation focussed programme the different components of the healthcare system can be explored by a mixed-method evaluation. Use of more care-related outcome variables seems to be justified in studies on service focussed programmes.

6. The need for a theoretical framework increases when studying an organisation focussed programme or when there is a heterogeneous study population. Complicated relationships exist between variables such as structure, processes, culture and clinical performance. A theoretical

framework can be used to describe the direct influence of the programme on these variables and the expected indirect effects.

7. A control group creates a quasi-experimental situation as randomization to the programme is often not possible. In the absence of a control group a dose-response relationship based on accreditation scores can be investigated.

8. The choice of outcome entity decides on which level conclusions can be drawn. When studying the effects on a micro-level, non-aggregated data is favoured.

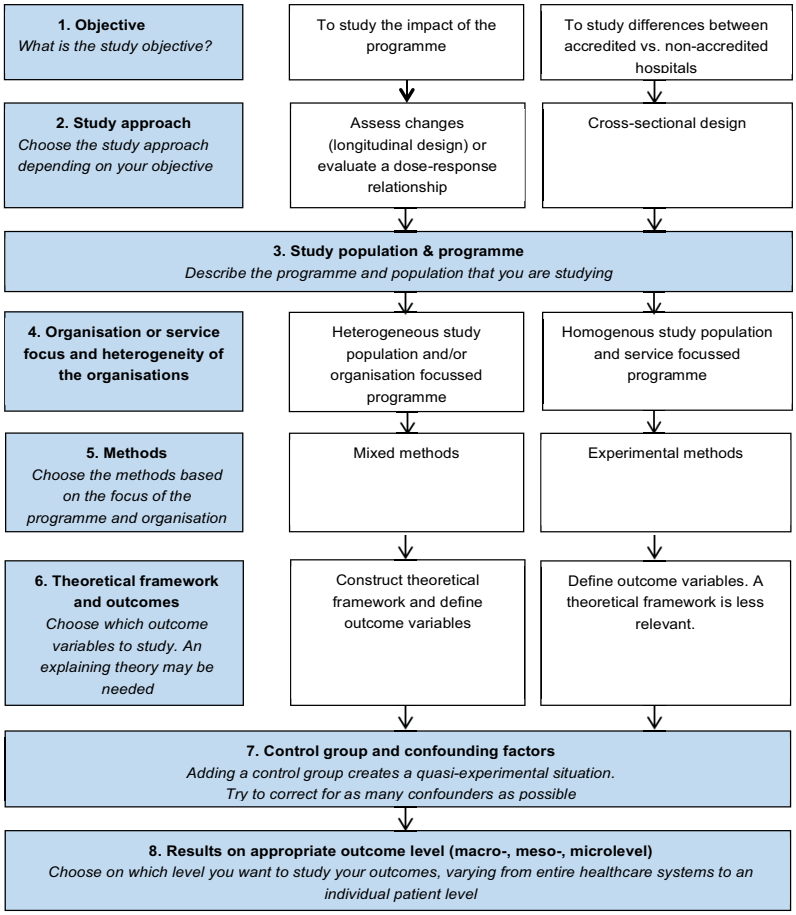

Figure 2. General research framework for external quality assessment programmes. The methodological aspects correspond with the review items

Discussion and conclusion

The evidence for the impact of accreditation and external peer review on the quality of care is still inconclusive. Although multiple studies have been performed internationally, previous reviews struggled to draw hard conclusions (Greenfield and Braithwaite, 2008; Hinchcliff *et al.*, 2012). Because of the difficulties in studying complex interventions we reviewed international research by their methodological characteristics to develop a general research framework. More uniformity in research methods and avoiding the pitfalls of research on complex interventions can create a stronger evidence base for accreditation and external peer review.

We deliberately kept the framework simple. By using the framework, researchers can decide if their study design will benefit from a theoretical framework to explain their results. Also, the need for mixed methods or a more experimental design can be assessed. As the call for evidence grows (particularly on clinical outcomes), we advice that future studies include specific clinical process and outcome indicators such as guideline adherence or patient safety. This might also improve acceptance for the programmes amongst professionals. Future studies should avoid a cross-sectional design. Longitudinal studies, or at least the evaluation of a dose-response relationship is needed to study the added value of the programmes.

A critical research obstacle that remains is that many of the studied programmes do not primarily intent to improve outcomes but rather focus on organisation and processes. We believe that in the current era of evidence-based medicine, quality improvement programmes need to step up to become effective tools with an impact on care processes and outcomes. This is also the reason why we focussed on accreditation and external peer review and did not include programmes like ISO-certification. Omitting these programmes will not have a major impact on our developed framework, since this framework is intended for studies on clinical outcomes.

We specifically restricted our study selection to publications on the impact of the programmes on quality-related outcomes. Because of our selection criteria we ended up with fewer articles than previous reviews on the impact of accreditation (Greenfield and Braithwaite, 2008; Hinchcliff *et al.*, 2012). This strategy holds the risk of missing key literature. We used the reference lists of the articles to find studies that were not captured by the initial literature search. We believe that we have retrieved a sufficient amount of relevant papers to study a variety of different methodologies in order to create our general research framework. There was a large variation in programmes and outcomes varying from organisation-related outcomes to patient-related outcomes. The study by Kim *et al.* (2010) reports on a more 'technical outcome'. This study was included in our definite selection because it concerns an accreditation programme that targets quality improvement in an important process related outcome variable: CT image quality. Image quality is directly related to the quality of the diagnosis, subsequent staging and thus treatment (Kim *et al.*, 2010). As we experienced, a literature review on a complex intervention like accreditation is difficult because of the large variety of programmes and outcomes. Future

studies on how evidence from studies on complex interventions can be used to create a body of evidence might appeal to researchers and programme makers worldwide.

Overall, our framework could be used to structure further research in this field and improve our knowledge on the impact of accreditation and external peer review. Future studies can also benefit if programme makers establish clear and measurable goals for their programmes. Outcome variables to evaluate the programmes need to be defined in advance to increase the possibilities for evaluation. More and better research can be used to improve quality assessment all over the world and generate more understanding and acceptance for the burden that accreditation and external peer review inevitably brings along.

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3

The impact of organisational external peer review on colorectal cancer treatment and survival in the Netherlands

British Journal of Cancer (2014) 110, 850-858

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Abstract

Background

Organisational external peer review was introduced in 1994 in the Netherlands to improve multidisciplinary cancer care. We examined the clinical impact of this programme on colorectal cancer care.

Methods

Patients with primary colorectal cancer were included from 23 participating hospitals and 7 controls. Hospitals from the intervention group were dichotomised by their implementation proportion (IP) of the recommendations from each peer review (high IP vs. low IP). Outcome measures were the introduction of new multidisciplinary therapies and survival.

Results

In total, 45705 patients were included (1990-2010). Patients from intervention hospitals more frequently received adjuvant chemotherapy for stage III colon cancer. T2-3/M0 rectal cancer patients from hospitals with a high IP had a higher chance of receiving preoperative radiotherapy (OR 1.31, 95% CI 1.11-1.55) compared with the controls and low IP group (OR 0.75, 95% CI 0.63-0.88). There were no differences in the use of preoperative chemoradiation for T4/M0 rectal cancer. Survival was slightly higher in colon cancer patients from intervention hospitals but unrelated to the phase of the programme in which the hospital was at time of diagnosis.

Conclusion

Some positive effects of external peer review on cancer care were found, but the results need to be interpreted cautiously due to the ambiguity of the outcomes and possible confounding factors.

Introduction

Delivering high quality care is key to any modern healthcare system. External quality assessment programmes are more and more considered as a cornerstone in the assessment and improvement of quality. Internationally, accreditation is the most commonly used method. In the Netherlands, external peer review (visitatie in Dutch, meaning "to visit") is the dominant external quality assessment method and this approach is slowly gaining popularity in Europe [Heaton, 2000, van Weert, 2000]. Organisational external peer review for cancer care was introduced in the Netherlands in 1994. In England, National Cancer Peer Review (NCPR) was introduced as part of the National Cancer Programme in 2004, after a first round of peer review was conducted at a regional level in 2001 [National Cancer Peer Review Programme, 2012]. The English programme focusses on performance for specific tumour groups, whereas the Dutch programme targets the multidisciplinary cancer care organisation in hospitals as a whole.

When the external peer review programme was introduced in the Netherlands in 1994, treatment of cancer patients was predominantly monodisciplinary. Since then, multidisciplinary cancer care has become the standard. The programme was introduced by the Comprehensive Cancer Centre North Netherlands. The nine Comprehensive Cancer Centres, covering the whole Netherlands, are regional network organisations of health care professionals and institutes for cancer and palliative care aiming at improving cancer care through research, guideline development, knowledge exchange and organisational improvement without having a treatment function themselves. The peer review programme was first introduced in the Northern Netherlands and gradually spread over the country. Surveyors are all specially trained medical and nursing specialists, which results in a natural understanding of the daily challenges faced in the treatment of cancer patients; in this way the system is supposed to generate recognition and involvement of professionals. Participation is voluntary and hospitals are advised to participate every 4-5 years. A majority of Dutch hospitals has gone through the procedure at least once and in some regions already thrice. Using self-assessment, on-site observation and interviews, the state of cancer care in a hospital is evaluated and recommendations for improvement are given. Major topics of recommendations were the organisation of weekly multidisciplinary patient care meetings, shared decision making between specialists, oncological specialisation of medical specialists, dedication of oncology committees to policy making, introduction of integrated care pathways, referral policies for low volume tumours and highly complicated interventions and working according to evidence-based guidelines.

Few studies have been published on the clinical impact of external peer review. Roberts *et al*. report on the 1- and 3-year evaluation of peer review for chronic obstructive pulmonary disease in the UK [Roberts *et al*, 2010, Roberts *et al*, 2012]. Findings after 3 years indicated an association with improved quality of care, service delivery and changes that promote quality

improvement [Roberts *et al*, 2012]. The 1-year evaluation revealed no differences showing that changes need a longer period to occur [Roberts *et al*, 2010]. More studies have been done on the effects of accreditation but the evidence remains uncertain [Greenfield and Braithwaite, 2008, Hinchcliff *et al*, 2012]. Due to high financial and labour investments, calls have been made for more research concerning the clinical impact of these programmes [Greenfield and Braithwaite, 2009, Shaw, 2001].

The purpose of our study is to investigate whether (1) the participation in the external peer review programme focussing on multidisciplinary cancer care and (2) the extent of the implementation of the peer review recommendations impacted multidisciplinary treatment patterns (such as combined treatment modalities) and survival of colorectal cancer patients. Colorectal cancer was amongst the first types of cancer requiring multidisciplinary treatment. Due to new treatments, the quality of care has improved significantly in the last 20-30 years. [Elferink *et al*, 2010a, van Steenbergen *et al*, 2010a]. Studies have proven that regional and inter-hospital treatment variation exists that cannot be explained by medical factors only. It is suggested that hospital characteristics have a role in this variation [Elferink *et al*, 2010b, Elferink *et al*, 2010c]. Three major therapy changes requiring multidisciplinary cooperation have been introduced in the period under study: (1) the introduction of adjuvant chemotherapy in stage III colon cancer, (2) the introduction of preoperative radiotherapy in T2-T3 rectal cancer and (3) the introduction of preoperative chemoradiation in T4/M0 rectal cancer and tumours with an expected positive circumferential margin (CRM).[Dutch national working group on gastrointestinal cancer, 2012] We hypothesised that the willingness of a hospital to have external peer review and to follow the recommendations from it is correlated to the hospital giving higher quality of colorectal cancer treatment measured by the introduction of new multidisciplinary therapies and better survival of the colorectal cancer patients.

Material and Methods

Design and patients

We selected all patients diagnosed with primary invasive epithelial colorectal cancer (ICD-O3, codes: colon C18.0-18.9, rectum C20.9) between 1 January 1990 and 31 December 2010 from the population-based Netherlands Cancer Registry. Patients diagnosed at autopsy, during an emergency operation or with previous malignancies were excluded. Patients from hospitals from the two regions where the programme was introduced first (Northern Netherlands and Rotterdam/South-west regions) form the intervention group. All hospitals in these regions voluntarily participated in the programme. The control group consists of patients from seven hospitals with otherwise comparable characteristics that did not participate before 2009, because the programme as such was not yet available in all regions.

Within the Netherlands Cancer Registry clinical administrative data of every newly diagnosed cancer patient in the Netherlands are collected. Topography and morphology are coded according to the International Classification of Diseases for Oncology and staging according to the TNM classification. Follow-up of vital status is achieved by linking the registry to municipal records. Quality of the data is high [Schouten *et al*, 1993a] and data completeness is estimated to be at least 95% [Schouten *et al*, 1993b].

The treatment and survival analyses are based on the hospital were the patient was diagnosed. Some patients may have been referred for treatment but this is considered as a good standard of care of the referring hospital. Furthermore, referral policies for low-volume tumours were an important topic of the external peer review programme. We used the implementation proportion (IP) of all the recommendations given in the final reports of each peer review as a measure for the willingness of a hospital to implement the recommendations and the quality of colorectal cancer care. Data on the IP were obtained by studying the peer review reports, follow-up correspondence, hospital documents and interviews with stakeholders. Implementation was ranked per recommendation on a scale from 0 to 4 in which 4 represents total implementation and 0 a not implemented recommendation (Appendix 1). Scores per hospital were expressed as a percentage of the total score that could be achieved. When implementation of a recommendation could not be assessed (no data), the recommendation was subtracted from the total possible score. We used the average IP of all peer reviews per hospital because the time period in which changes can occur is unknown and quality improvement is a continuous process. Data from three cycles of peer review (1994-2009) were used from the Northern Netherlands and data from two cycles (1996-2006) from the Rotterdam region. A third cycle was completed in the Rotterdam region between 2009 and 2011 but follow-up time was too short to monitor the IP. We did not make assumptions on what a high or a low IP is and therefore dichotomised the hospitals in the intervention group into two categories: (1) hospitals with the highest IP and (2) with the lowest IP.

Hospitals were asked for permission to use their data from the Netherlands Cancer Registry and programme reports. We excluded university hospitals and hospitals that merged during our study period since it was impossible to determine the IP.

Multidisciplinary treatment patterns

We studied the impact of the programme on the introduction of three major changes in multidisciplinary treatment: (1) adjuvant chemotherapy in stage III colon cancer, (2) preoperative radiotherapy in T2-T3/M0 rectal cancer and (3) preoperative chemoradiation in T4/M0 rectal cancer. Preoperative chemoradiation is also recommended in rectal cancer patients

with tumours with an expected positive circumferential margin (other than T4 tumours) but the Netherlands Cancer Registry does not provide data on the expected margin. We therefore focussed on the T4/M0 patients for the implementation of the preoperative chemoradiation. All patients with T2-3/M0 tumours, irrespective of their circumferential margin, are therefore included in the analyses for preoperative radiotherapy as this is the minimal treatment they should have received.

Survival

The association between the programme and survival was evaluated for the complete cohort subdivided in colon and rectal cancer patients. To examine the impact of the different programme phases on survival, we compared the 5-year survival of patients with the phase in which the hospital was at time of diagnosis.

Statistical Analyses

Clinical stage was used in our analyses for preoperative radiotherapy for T2-3/M0 rectal cancer patients and preoperative chemoradiation for T4/M0 rectal cancer patients. In case clinical stage was unknown it was substituted by pathological stage. Pathological stage was used for analysing the use of adjuvant chemotherapy in stage III colon cancer and survival, clinical stage was used when pathological stage was unknown. We excluded patients aged ≥75 years for the analyses of the introduction of chemotherapy in stage III colon cancer and chemoradiation in T4/M0 rectal cancer to prevent a bias as elderly patients are known to receive systemic therapy less frequently [Elferink *et al*, 2010b, Elferink *et al*, 2010c].

Multivariate logistic analysis was used to analyse the variation in treatment and the influence of participating in the programme and the IP, corrected for gender, age at diagnosis, year of diagnosis, average hospital volume of diagnoses and presence of an in-hospital radiotherapy department. Because all analyses concern adjuvant therapy, only operated patients are included in the treatment analyses.

Using Cox's proportional hazards model we examined differences in hazard of dying adjusted for gender, age at diagnosis, year of diagnosis and average annual hospital volume of diagnoses. Survival time was defined as the period from incidence to date of death (all causes) or censuring (31-12-2011 or emigration date). For all analyses STATA version 12.0 (StataCorp, College Station, TX, USA) was used.

Results

Population

We requested permission of 26 hospitals from the Northern Netherlands and Rotterdam region to use the data from their peer reviews and the Netherlands Cancer Registry, 23 hospitals gave their permission. Seven out of twelve hospitals without experience with the programme agreed to be included in the control group. In total, 45 705 patients were diagnosed with colorectal cancer in these 30 hospitals (about 1 out of 3 of all hospitals in the Netherlands) between 1990 and 2010, 31890 patients with colon cancer and 13815 patients with rectal cancer. A schematic overview of the study population at each phase of our study is presented in Appendix 2.

Implementation of programme recommendations

In the three cycles of peer review in the Northern Netherlands and two cycles in the Rotterdam region 727 recommendations were given to the hospitals. This is an average of 12 recommendations per peer review per hospital. The intervention group was dichotomised in 12 hospitals with a high IP (average 62.6%) and 11 hospitals with a low IP (average 44.8%). Table 1 shows the patient characteristics of the population of colon and rectal cancer patients for the intervention and control groups.

Variable	Intervention group High IP (12 hospitals)	Intervention group Low IP (11 hospitals)	Controls (7 hospitals)
Colon cancer			
Sex			
Male	5555 (48.4)	5211 (48.8)	4835 (49.7)
Female	5924 (51.6)	5463 (51.2)	4902 (50.3)
Mean age at diagnosis			
<60	2071 (18.0)	1939 (18.2)	1907 (19.6)
60-74	4694 (40.9)	4520 (42.4)	4309 (44.3)
>74	4714 (41.1)	4215 (39.5)	3521 (36.2)
Period of diagnosis			
1990-1995	2710 (23.6)	2381 (22.3)	2100 (21.6)
1996-2001	3080 (26.8)	2867 (26.9)	2559 (26.3)
2002-2007	3535 (30.8)	3472 (32.5)	3051 (31.3)
2008-2010	2154 (18.8)	1954 (18.3)	2027 (20.8)
Stage			
1	1761 (13.5)	1683 (15.8)	1317 (13.5)
2	4026 (35.1)	3823 (35.8)	3626 (37.2)
3	2945 (25.7)	2694 (25.2)	2421 (24.9)
4	2392 (20.8)	2174 (20.4)	2055 (21.1)
Carcinoid	36 (0.3)	30 (0.3)	29 (0.3)
Unknown	319 (2.8)	270 (2.5)	289 (3.0)
Average annual volume of hospital of diagnoses			
<50	6070 (52.9)	6856 (64.2)	2437 (25.0)
50 or more	5409 (47.1)	3818 (35.8)	7300 (75.0)

Table 1 (part 1). Characteristics of the cohort of colon (*N*= 31890) cancer patients per hospital category, 1990-2010, data are no(%). IP= Implementation Proportion

Rectal Cancer			
Sex			
Male	2804 (57.2)	2696 (58.8)	2597 (60.0)
Female	2100 (42.8)	1888 (41.2)	1730 (40.0)
Mean age at diagnosis			
<60	1192 (24.3)	1087 (23.7)	1153 (26.7)
60-74	2099 (42.8)	2050 (44.7)	1975 (45.6)
>74	1613 (32.9)	1447 (31.6)	1199 (27.7)
Period of diagnosis			
1990-1995	1045 (21.3)	977 (21.3)	896 (20.7)
1996-2001	1274 (26.0)	1183 (25.8)	1077 (24.9)
2002-2007	1628 (33.2)	1511 (33.0)	1372 (31.7)
2008-2010	957 (19.5)	913 (19.9)	982 (22.7)
Stage			
1	1352 (27.6)	1324 (28.9)	1135 (26.2)
2	1139 (23.3)	1089 (23.8)	1058 (24.5
3	1262 (25.7)	1127 (24.6)	998 (23.0)
4	808 (16.5)	762 (16.6)	756 (17.5)
Carcinoid	13 (0.3)	18 (0.4)	18 (0.4)
Unknown	330 (6.7)	264 (5.8)	362 (8.4)
Average annual volume of hospital of diagnoses			
<25	3039 (62.0)	3829 (83.5)	1572 (36.3)
>25	1865 (38.0)	755 (16.5)	2755 (63.7)

Table 1 (part 2). Characteristics of the cohort rectal cancer patients (*N*= 13815) per hospital category, 1990-2010, data are no(%). IP= Implementation Proportion

Multidisciplinary treatment patterns

Out of the colon cancer patients, 4969 surgically treated patients under 75 years of age patients had stage III. Patients with stage III colon cancer who were diagnosed in hospitals in the intervention group received adjuvant chemotherapy more frequently compared to the control group (Table 2). This was seen in both the high IP and the low IP intervention hospitals (OR 1.48, 95% CI 1.25-1.75 and OR 1.19, 95% CI 1.00-1.41).

	Hospital category	**OR**	**95% CI**
Adjuvant chemotherapy stage III colon carcinoma	Control group	1.00	Reference
	Intervention group	1.33*	1.15-1.55
	- high IP	1.48*	1.25-1.74
	- low IP	1.19*	1.00-1.41
Preoperative radiotherapy T2-T3/ M0 rectal cancer	Control group	1.00	Reference
	Intervention group	0.98	0.96-1.14
	- high IP	1.31*	1.11-1.55
	- low IP	0.75*	0.63-0.88
Preoperative chemoradiation T4/ M0 rectal cancer	Control group	1.00	Reference
	Intervention group	1.27	0.81-2.01
	- high IP	1.11	0.89-2.46
	- low IP	1.48	0.67-1.83

Table 2. Odd's ratio's (OR) for receiving new multidisciplinary treatment per hospital category, adjusted for age, gender, year of diagnosis, average annual hospital of diagnoses. CI= Confidence Interval, IP= Implementation Proportions. Adjustment for the presence of in-hospital radiotherapy department has been made for preoperative radiotherapy and chemoradiation. *P<0.05.

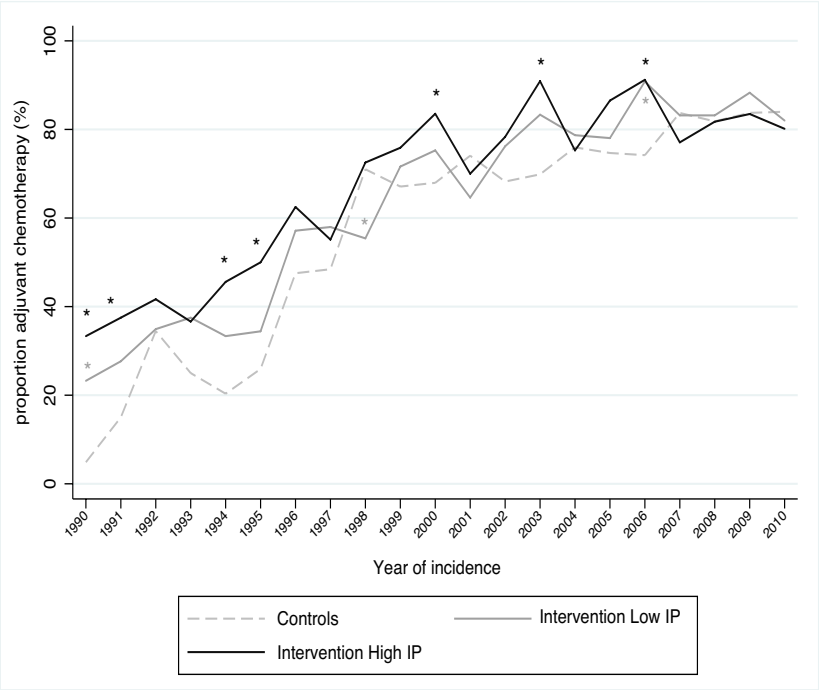

Figure 1. Introduction of adjuvant chemotherapy for stage III colon cancer (standard since 1990) per hospital category based on the implementation proportion (IP) of recommendations given in the programme. * Represents statistical significance per year ($P<0.05$).

An early adopter effect is seen in Figure 1 between 1990 and 2000, but the effect is also seen in the later years.

Concerning the rectal cancer patients, 7804 patients were included in our treatment analyses with stage T2-T3/M0 cancer and 689 with T4/M0 rectal cancer. The analyses of the use of preoperative radiotherapy for T2-T3/M0 rectal cancer initially showed no difference between the control group and the intervention group (table 2). Here the IP mattered as can be seen in Figure 2; patients who were diagnosed in the intervention hospitals with a high IP received preoperative radiotherapy more often (OR 1.31, 95% CI 1.11-1.55) while patients of intervention hospitals with a low IP had a lower chance (OR 0.75, 95% CI 0.63-0.88) compared with the control group.
No differences were seen in the use of preoperative chemoradiation for T4/M0 rectal cancer patients (Table 2). Figure 3 shows that after the year 2000 the proportion of patients receiving preoperative chemoradiation rose but no statistically significant differences were seen between the intervention and control groups (Table 2).

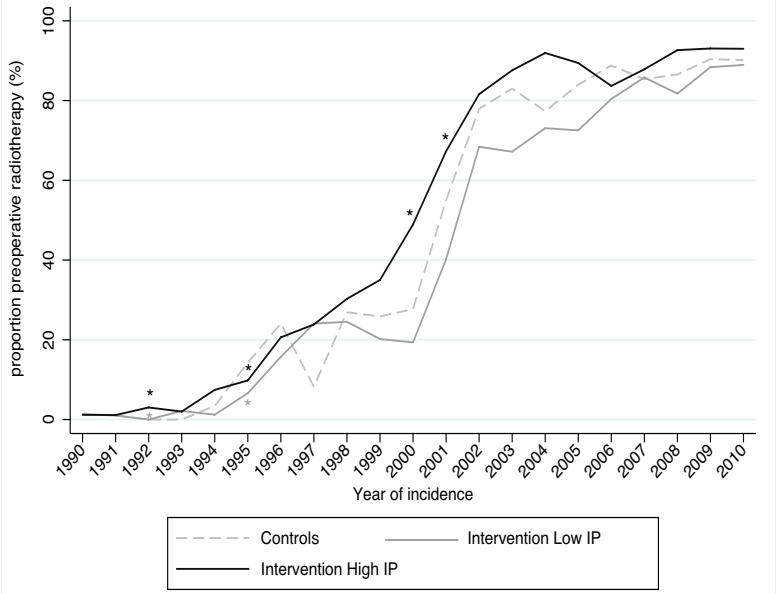

Figure 2. Introduction of preoperative radiotherapy in T2-T3/M0 rectal cancer per hospital category based on the implementation proportion (IP) of recommendations given in the programme. Official guideline introduction was in 2003. * Represents statistical significance per year ($P<0.05$).

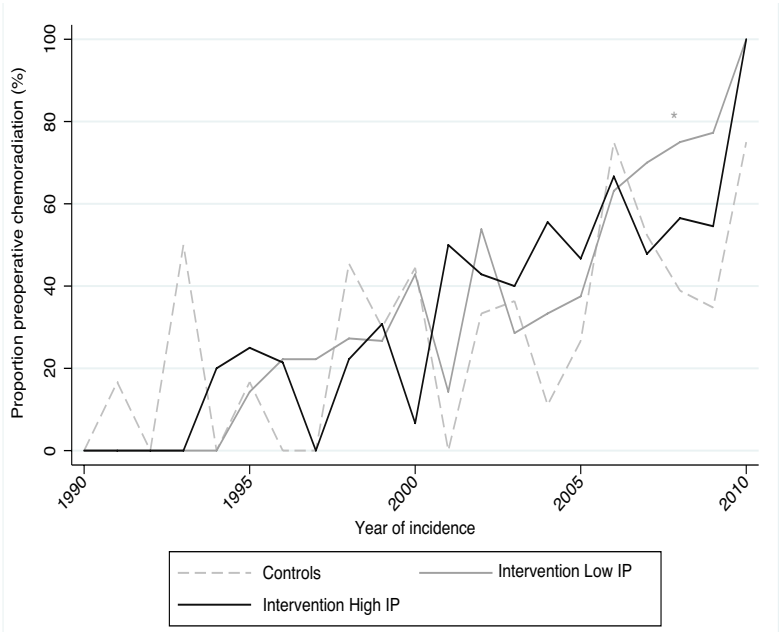

Figure 3. Introduction of preoperative chemoradiation in T4/M0 rectal cancer (recommended since 2005) per hospital category based on the implementation proportion (IP) of recommendations given in the programme. * Represents statistical significance per 5-year period ($P<0.05$).

Survival

The hazard of dying for patients with colon cancer was slightly lower in the intervention group compared to the control group (HR 0.97, 95% CI 0.94-0.99; Table 3). No statistical significant differences were found in the hazard of dying of rectal cancer between the intervention and the control group (Table 3). Furthermore, there was no correlation seen between the average 5-year survival and the programme phases for both colon and rectal cancer (Figures 4 and 5).

	Hospital category	HR	95% CI
Colon cancer	Control group	1.00	Reference
	Intervention group	0.97*	0.94-1.00
	- high IP	0.97	0.93-1.00
	- low IP	0.96*	0.93-1.00
Rectal cancer	Control group	1.00	Reference
	Intervention group	0.96	0.92-1.01
	- high IP	0.98	0.93-1.03
	- low IP	0.96	0.91-1.01

Table 3. Hazard ratio's (HR) for colon and rectal cancer patients per hospital category, adjusted for age, gender, year of diagnosis, average annual hospital of diagnoses. CI= Confidence Interval, IP= Implementation Proportions. *P<0.05

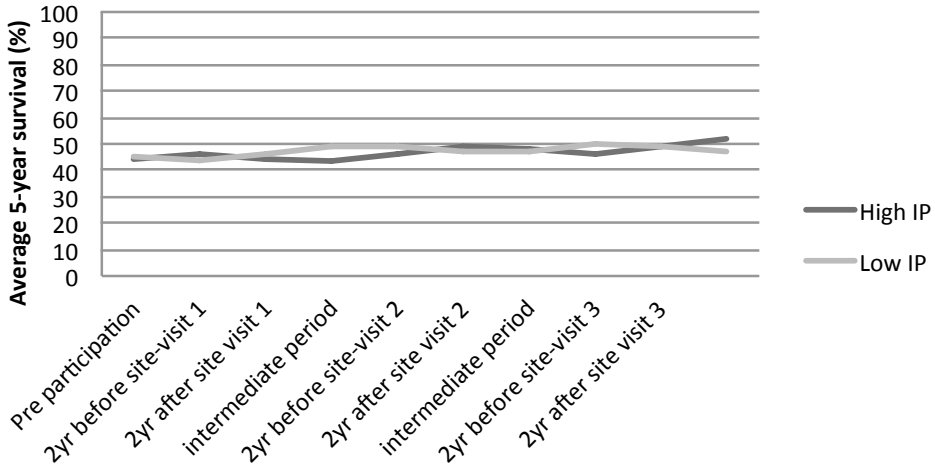

Figure 4. Average 5-year survival of colon cancer patients per hospital category and phase of the programme at the time of diagnosis. IP= Implementation Proportion.

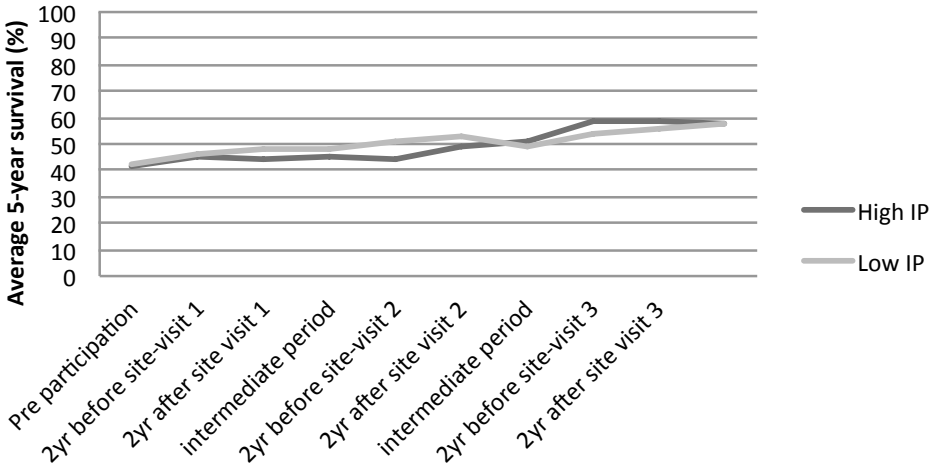

Figure 5. Average 5-year survival of rectal cancer patients per hospital category and phase of the programme at the time of diagnosis. IP= Implementation Proportion.

Discussion

To our knowledge, we present a unique long-term evaluation of the relationship between external peer review and treatment and survival of cancer patients based on the population-based data. There are some indications that the peer review increased process related quality of care. Participation in the peer-review programme and the proportion of implementation of recommendations were associated with a higher proportion of stage III colon cancer patients that received adjuvant chemotherapy, whereas for rectal cancer the implementation of recommendations seems more relevant as patients diagnosed in hospitals with a high IP received preoperative radiotherapy more often. On the other hand, we did not find a difference in the percentage of patients receiving preoperative chemoradiation for T4/M0 rectal cancer related to participation or IP. Furthermore, a survival difference could only be shown for colon cancer, but not for rectal cancer and this did not seem to correlate with the phase of the programme.

A complicated association exists between external peer review, multidisciplinary care patterns and survival outcomes as many internal and external factors may be influential. Some differences in stage III colon cancer treatment for instance were already apparent before the introduction of the programme in 1994 (Figure 1). Does the programme as such have added value or do quality oriented hospitals also act as early adopters and simply implement recommendations better? Absence of a baseline measurement of organisational quality and innovative behaviour makes it impossible to answer this question. Based on our findings either relation is possible, but we tend to conclude that quality focussed hospitals are more likely to work on continuous quality improvement and to behave as early adopters.

Inter-hospital and regional variation in the treatment of colorectal cancer patients was shown in previous national studies [Elferink *et al*, 2010b, Elferink *et al*, 2010c]. Before 2000 there was both regional variation in guidelines and in their implementation in the Netherlands. This might partly explain differences in the results for adjuvant chemotherapy for stage III colon cancer as these are most prominent before the year 2000. The results in our study may also have been influenced by clinical trials conducted before official guideline recommendation. However, despite possible guideline and trial influences, recent studies still stress the patient- and hospital-dependant variation in adjuvant therapy, even after official guideline introduction of new therapies in the Netherlands and it is unlikely that this is different in other countries [Berrino *et al*, 2007, Elferink *et al*, 2010b, Elferink *et al*, 2010c, Lemmens *et al*, 2005, van Steenbergen *et al*, 2010b]. Although it is unlikely that guideline and trial influences alone can explain the treatment variation, it is very difficult to correct for these factors in studying the impact of peer review.

The average 5-year survival of colon and rectal cancer patients did not appear to be related to the phase of the peer review programme in which the hospital was at the time of diagnosis. Hazard ratio comparisons showed a significant difference in the risk of dying from colon cancer, favouring patients diagnosed in the intervention group. In rectal cancer, hazard ratio's were comparable but not statistically different between the intervention and control group. These differences are small and promising but need to be considered with caution. We analysed the risk of dying in the complete cohorts of colon or rectal cancer patients in stead of the subgroups in which we studied the introduction of new multidisciplinary therapies. Reason for this is that especially in rectal cancer these new therapies predominantly have an effect on local control. Adjuvant chemotherapy is associated with improved survival in stage III colon cancer [Moertel *et al*, 1990]. For rectal cancer the benefit of preoperative radiotherapy and chemoradiation is mainly local control, the impact on survival is smaller and the evidence is more ambiguous [Bosset *et al*, 2006, Colorectal Cancer Collaborative Group, 2001, Folkesson *et al*, 2005, Kapiteijn *et al*, 2001].

The main weakness of our study (and most studies in this field) is that the impact of other, and possibly many, confounding factors could not be assessed. Survival and mortality are generally used as the ultimate indicators of quality of care in cancer studies, but are influenced by a complex set of internal and external factors and it is difficult to single out the programme impact. Hospitals in the control group are likely to have introduced changes in their organisation as well, but we are not aware of similar programmes that have been executed. Five hospitals from the approached control group and three from the approached intervention group did not give permission to use data from the Netherlands Cancer Registry which might influenced our results, though the participating set seemed sufficiently representative for the Dutch situation.

Our research had several characteristics adding to a better understanding of the added value of the programme. It was possible to include patients from hospitals without experience in

participating in the programme, creating a quasi-experimental situation. Because all hospitals in the intervention region participated in the programme (even though three did not give permission to use their data in this study), there was no programme participation bias. The Netherlands Cancer Registry provided us with reliable data over a long time period making it possible to analyse our results on a 'patient-level'. We did not single out recommendations and neither did we address a 'rank' of importance to them to assess the programme impact instead of the impact of single recommendations.

Conclusion

Organisation focused external quality assessment programmes have difficulties in demonstrating their added value on clinical care. All hospitals are willing to participate in external peer review but the proportion of implementation of recommendations of the programme differs. Our data shows that some positive effects on cancer care can be expected but the results need to be interpreted cautiously. Future research on different types of cancer should assess whether our results can be generalised. A qualitative study can examine the perceived impact and influence on the sense of ownership amongst cancer specialists.

Improved organisation may be a value per se, especially in complex multidisciplinary treatment. However, if external quality assessment should provide measurable benefits for individual cancer patients, programmes probably need to focus more on specific aspects of the delivery of care and clinical outcomes. This will increase the possibilities to quantitatively evaluate the impact on the quality of care. Links with clinical audit systems and national cancer registries may lead to the reduction in administrative workload of these programmes and improved acceptance for continued external peer review for cancer care in the future.

Acknowledgements

We would like to thank M. Wouters MD PhD, surgeon in the Netherlands Cancer Institute (NKI AVL) for his valuable research advice. Moreover we would like to thank all participating hospitals for their participation in this project. We would like to thank all physicians, nurses and management representatives from both intervention regions that cooperated in interviews for the valuable discussions on the perceived (clinical) impact of the programme (results will be published separately). The authors thank the registration team of the Netherlands Comprehensive Cancer Organization (IKNL) for the collection of data for the NCR.

Consent

The hospitals were asked for their written consent for using the data from their external peer reviews and from the NCR. The Privacy Committee of the NCR approved the study and all data was used anonymous for the analyses. Hospitals were not reported in which category they were ranked.

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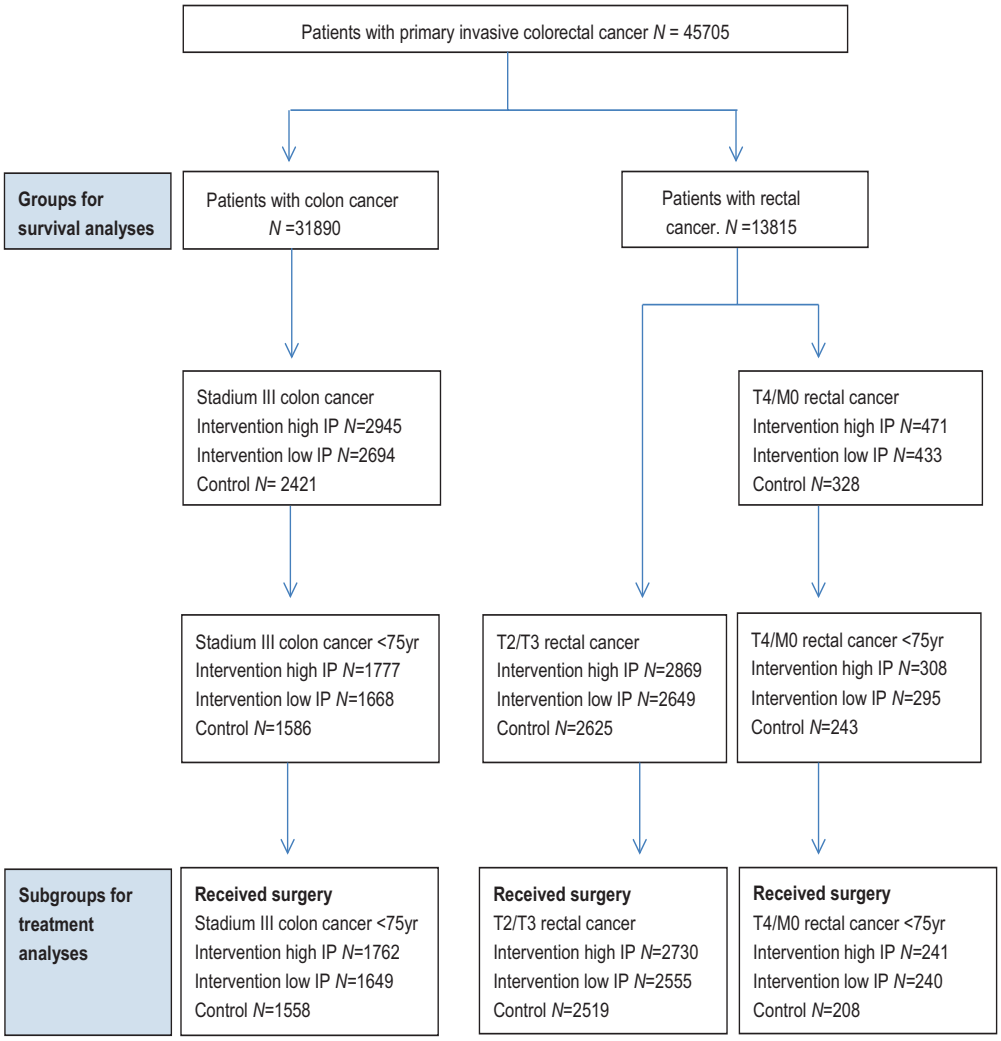
Appendix 1: Ranking implementation of recommendations

Implementation score of recommendation	Criterium
0	Not implemented at all
1	Hospital only started working on implementing
2	A recommendation consists of two parts and one is implemented
3	Recommendation is implemented but not yet in the entire organisation
4	Complete implementation

Appendix 2: Schematic overview of the study population at each phase of the study



4

Regional variation in breast cancer treatment in the Netherlands and the role of external peer review: a cohort comprising 63 516 women

BMC Cancer (2014) 14:596

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Abstract

Background

Treatment variation is an important issue in health care provision. An external peer review programme for multidisciplinary cancer care was introduced in 1994 in the Netherlands to improve the multidisciplinary organisation of cancer care in hospitals. So far the clinical impact of external quality assessment programmes such as external peer review and accreditation remains unclear. Our objective was to examine the degree of variation in treatment patterns and the possible effect of external peer review for multidisciplinary cancer care for breast cancer patients.

Methods

Patients with breast cancer were included from 23 hospitals from two 'intervention regions' with the longest experience with the programme and 7 hospitals that never participated (control group). Data on tumour and treatment characteristics were retrieved from the Netherlands Cancer Registry. Treatment modalities investigated were: the completeness of breast conserving therapy, introduction of the sentinel node biopsy, radiotherapy after BCS for ductal carcinoma in situ (DCIS), adjuvant radiotherapy for locally advanced breast cancer (T3/M0 or any T,N2-3/M0), adjuvant chemotherapy for early stage breast cancer (T1-2/N+/M0) and neo-adjuvant chemotherapy for T4/M0 breast cancer. Hospitals from the two intervention regions were dichotomised based on their implementation proportion (IP) of recommendations from the final reports of each peer review (high IP vs. low IP). This was regarded as a measure of how well a hospital participated in the programme.

Results

63516 female breast cancer patients were included (1990-2010). Variation in treatment patterns was observed between the intervention regions and control group. Multidisciplinary treatment patterns were not consistently better for patients from hospitals with a high IP.

Conclusions

There is no relationship between the external peer review programme for multidisciplinary cancer care and multidisciplinary treatment patterns for breast cancer patients. Regional factors seem to exert a stronger effect on treatment patterns than hospital participation in external peer review.

Background

Breast cancer is the commonest cancer in women in the Netherlands and its burden increased during the last decades due to a steady rise in incidence [1]. Survival rates have improved because of better imaging and detection techniques, screening programmes and the introduction of new therapies [2, 3]. Breast cancer treatment is marked by a multidisciplinary approach and specialisation of the involved medical and nursing specialists. A recent study in 13,722 women showed that improving multidisciplinary care was associated with improved survival and reduced variation in survival among hospitals [4]. Specialisation of physicians is an important component of multidisciplinary care and is associated with better outcomes for various cancers [5]. A study in the UK revealed an 11-17% reduction in risk of death in women treated for breast cancer as a result of specialisation of surgeons [6]. Similar results were seen in other types of cancer and during the 90's multidisciplinary care became the standard of cancer care. It is known that treatment variation exists between and within countries and it is unknown whether and how these differences interact with improvement efforts. This poses serious challenges in efforts to evaluate improvement programmes.

Several quality improvement methods are used to improve the multidisciplinary organisation of care and reduction of variation. In the Netherlands an external peer review programme was introduced in 1994. Designed and executed by medical and nursing cancer specialists, it was introduced in the Northern Netherlands and gradually spread over the entire country. The programme focuses on the organisational conditions to provide optimal cancer care. Participation is voluntary and hospitals are advised to participate in cycles of 4-5 years. After a self-assessment, on-site observation and interviews, the organisation of cancer care in a hospital is evaluated and recommendations for improvement are given. Major topics of recommendations were the organisation of weekly multidisciplinary patient care meetings, shared decision making between specialists, oncological specialisation of medical specialists, dedication of oncology committees (with representatives of all medical specialisms) to policy making, referral policies for rare tumours and highly complicated interventions, introduction of integrated care pathways and working to evidence based guidelines. More information on the programme can be found in Additional file 1.

In general, the clinical impact of external peer review remains underinvestigated. A study evaluating a peer review programme for chronic obstructive pulmonary disease in the United Kingdom found an association with improved quality of care, service delivery and changes that promote quality improvement after three years [7]. The evaluation after one year revealed no differences showing that changes in healthcare can take a prolonged period to occur [8]. Accreditation is the most frequently studied form of external quality assessment. Literature reviews on the effects of accreditation on the quality of care could not provide strong evidence

due to limitations of the studies [9, 10]. The programmes demand high financial and labour investments and therefore there is a need for more research on the clinical impact of these programmes [11, 12].

The purpose of our study was to investigate the multidisciplinary treatment patterns of breast cancer patients and the effect of the external peer review programme for multidisciplinary cancer care in general hospitals. In a previous study we found some positive effects on colorectal cancer treatment, but the results needed to be interpreted cautiously due to the ambiguity of the outcomes and possible confounding factors [13]. In the current study we examined whether our previous results are also evident in breast cancer treatment. More importantly, by analysing different regions separately we hope to gain more insights in possible regional confounders. We hypothesised that the willingness of a hospital to have external peer review and to follow the recommendations from it, is correlated to the hospital giving higher quality of breast cancer treatment measured by the introduction of new multidisciplinary therapies.

Methods

Design and patients

Only female patients diagnosed with primary epithelial breast cancer (ICD-O 10, International Classification of Diseases, codes: C50.0 to 50.9) between 1 January 1990 and 31 December 2010 were selected from the Netherlands Cancer Registry (NCR). This is a population based independent cancer registry containing clinical administrative data of every newly diagnosed cancer patient in the Netherlands. Data is collected directly from the hospitals' patient files by specially trained registration clerks. Topography and morphology is coded according to the International Classification of Diseases for Oncology (ICD-O) and staging according to the TNM-classification. Follow-up of vital status is achieved by linkage of the registry to municipal records. The quality of the data is high [14] and completeness is estimated to be at least 95% [15]. Patients were included from hospitals in the Northern Netherlands and the Rotterdam region. In these regions the external peer review programme was introduced first (intervention regions). Patients from hospitals from other regions that never participated before 2009 were included in the control group. We excluded patients that were diagnosed with neuroendocrine tumours, synchronous tumours, diagnosed at autopsy and that had any type of previous malignancy.

Hospital categories

Hospitals from the intervention group were categorised by the implementation proportion (IP) of recommendations that were given in the final reports of each peer review. We dichotomised

the intervention region hospitals by their IP (high IP vs. low IP, no threshold was used). We regarded the IP of the recommendations as a proxy of how well a hospital participated in the programme. Rating the implementation was performed by studying final reports from subsequent reviews, follow-up correspondence, hospital documents and interviews with stakeholders when necessary. Implementation of a recommendation was ranked on a scale from 0 to 4 (Table 1). The IP per hospital was expressed as a percentage of the total possible score. When implementation of a recommendation could not be determined (lost to follow-up), this recommendation was subtracted from the total possible score. The average IP of all peer reviews per hospital was used because it is not known what the time period is in which changes based on organisational change can occur and quality improvement is a continuous process. Ranking the implementation of recommendations was performed by the principal investigator. If e.g. the report from the next peer-review states that a recommendation was not implemented at all this was ranked as zero. Full implementation was ranked as 4, examples of recommendations and their ranking can be seen in Table 1. Due to the objective nature of the evidence the ranking was not considered to be arbitrary and we did not use an inter-rater approach.

Implementation score	Criteria	Recommendation	Follow up report
0	Not implemented at all		
1	Hospital only started working on implementing	The oncology committee should make oncological policy plans	An oncological policy plan is in preparation
2	A recommendation consists of two parts and one is implemented	An oncology committee needs to be formed consisting of physicians and a nursing staff representative	There is an oncology committee consisting of physicians but no nursing staff representative
3	Recommendation is implemented but not yet in the entire organisation	There should be oncological specialisation, especially amongst the surgeons, urologists and gynaecologists	Oncological specialisation was realised in surgery, gynaecology, internal and pulmonary medicine but not in urology
4	Complete implementation	The hospital should have a full-time pulmonary physician if lung surgery is performed for an optimal pre-, peri- and post-operative care	The hospital appointed a full-time pulmonary physician

Table 1. Criteria and (real) examples of the ranking of implementation of the recommendations on a scale from 0-4

From the hospitals in the two intervention regions we used data from two or three cycles of participation:

- North Netherlands: three cycles, 1994-2009.
- Rotterdam region: two cycles, 1996-2006. A third cycle was completed between 2009 and 2011 but follow-up time was too short to monitor the IP.

All hospitals in these regions voluntarily participated in the peer review programme. The university medical centres and hospitals that merged during our study period were excluded, because it was impossible to follow-up the recommendations. Hospitals were asked to participate in the study by giving permission to use their data from the NCR and final reports.

Analyses

We analysed the Northern Netherlands and Rotterdam region separately to gain more insights in possible regional confounders besides the external peer review programme. Patients were grouped according to the hospital in which the diagnosis was made. They may have been referred for treatment but this was regarded to be good clinical practice (and referral policy is a theme of the programme). Multivariate logistic analysis was used to analyse treatment variation and the influence of hospital category (based on IP), gender, age at diagnosis, year of diagnosis, average hospital volume of diagnoses and presence of an in-hospital radiotherapy department. We studied several multidisciplinary treatment modalities. First of all, we studied the *completeness of breast conserving therapy (BCT)*. From its introduction onwards, breast conserving therapy is a multidisciplinary procedure and one of the earliest examples of multidisciplinary cancer treatment. Breast conserving surgery (BCS) was initially complemented with axillary lymph node dissection (ALND) and radiotherapy. Omission of lymph node dissection is allowed after a negative sentinel node biopsy (SNB). In our analyses, BCT was considered complete if radiotherapy had been given and ALND was performed or when radiotherapy is given, SNB was performed and ALND was omitted. We separately analysed the *introduction of the sentinel node biopsy*. Other indicators for treatment variation were taken from the indicator list of defined by the NABON (National Breast cancer Network Netherlands) in 2009. This list is part of a national audit on the quality of breast cancer diagnostics and treatment (NBCA) and started in 2011 [16]. These indicators are: *radiotherapy after BCS for ductal carcinoma in situ (DCIS), adjuvant radiotherapy for locally advanced breast cancer (T3/M0 or any T,N2-3/M0), adjuvant chemotherapy for early stage breast cancer (T1-2/N+/M0) and neo-adjuvant chemotherapy for T4/M0 breast cancer*. Although the NBCA was established in 2011 information on the selected indicators were available since 1990. We could therefore look in retrospect at the period from 1990 onwards to evaluate how hospitals performed on these quality indicators that we now regard to be the standard of care for breast cancer patients.

For the analyses of completeness of breast conserving therapy and adjuvant chemotherapy for early stage breast cancer pathological stage was used and substituted with clinical stage if pathological stage was unknown. For the rest of the analyses clinical stage was used substituted by pathological stage if unknown. STATA version 12.0 was used for all analyses. Written syntaxes guarantee reproducibility of the results. P-values were considered significant if smaller than 0.05.

Results

Hospitals and recommendations

Twenty-six hospitals from the Northern Netherlands and Rotterdam region were asked to give permission to use the data from their peer reviews and the Netherlands Cancer Registry. Twenty-three gave permission: 13 hospitals from the Northern Netherlands and 10 from the Rotterdam region. Seven out of 12 hospitals without experience with the programme agreed

to be included in the control group. In total, our study includes patient data from 30 hospitals, approximately one-third of all hospitals in the Netherlands. In the three cycles of peer review in the Northern Netherlands and two cycles in the Rotterdam region 727 recommendations were given, averaging 12 recommendations per peer review per hospital. The intervention hospitals in both regions were dichotomised based on the IP of the recommendations. The Northern Netherlands region was divided in six hospitals with a high IP (average IP 63.2%) and seven hospitals with a low IP (average IP 48.9%). The Rotterdam region was dichotomised in five hospitals with a high IP (average IP 63.2%) and 5 with a low IP (average 41.4%).

Patients

Our total cohort consist of 63 516 women. Table 2 shows the characteristics of the population grouped by their hospital category. There were no large differences in mean age at diagnosis and the number of patients per period of diagnosis between patients diagnosed in the different hospital categories. The average annual case volume differs between the regions, as in the Rotterdam region no hospitals with less than 50 patients diagnosed annually existed in the period under study. For only two hospital categories hospitals with more than 100 diagnosis per year existed (Northern Netherlands high IP and control group, Table 2).

Variable	**North High IP** *N(%) 6 hospitals*	**North Low IP** *N(%) 7 hospitals*	**Rotterdam High IP** *N(%) 5 hospitals*	**Rotterdam Low IP** *N(%) 5 hospitals*	**Controls** *N(%) 7 hospitals*
Mean age at diagnosis	61.16 SD 14.16	61.48 SD 14.20	61.33 SD 14.34	61.40 SD 14.39	59.80 SD 13.67
Period of diagnosis					
1990-1995	3260 (23.21)	2095 (19.42)	2310 (23.16)	2249 (23.28)	4454 (23.38)
1996-2001	4079 (29.05)	3085 (28.60)	2717 (27.24)	2635 (27.28)	5131 (26.93)
2002-2007	4426 (31.52)	3558 (32.98)	3082 (30.90)	3044 (31.51)	5995 (31.47)
2008-2010	2278 (16.22)	2050 (19.00)	1866 (18.71)	1732 (17.93)	3470 (18.22)
Stage					
IS	1097 (7.81)	776 (7.19)	794 (7.96)	775 (8.02)	1577 (8.28)
1	4758 (33.88)	3660 (33.93)	3323 (33.31)	3249 (33.63)	6595 (34.62)
2	5881 (41.88)	4575 (42.41)	4243 (42.54)	4097 (42.41)	7898 (41.46)
3	1480 (10.54)	1123 (10.41)	1018 (10.21)	959 (9.93)	1835 (9.63)
4	718 (5.11)	547 (5.07)	513 (5.14)	487 (5.04)	877 (4.60)
X	109 (0.78)	107 (0.99)	84 (0.84)	93 (0.96)	268 (1.41)
Average annual volume of hospital of diagnoses					
<50	924 (6.58)	647 (6.00)	0 (0.00)	0 (0.00)	953 (5.00)
50-100	4226 (30.09)	10141 (94.00)	9975 (100)	9660 (100)	16.579 (87.03)
100 or more	8893 (63.33)	0 (0.00)	0 (0.00)	0 (0.00)	1518 (7.97)

Table 2. Characteristics of breast cancer patients according to the hospital category, 1990-2010, data are no (%), N=63,516. IP= Implementation Proportion of recommendations given in the programme.

Completeness of breast conserving therapy

Incomplete breast conserving therapy, omitting radiotherapy and/or ALND after breast conserving surgery rarely occurred (Table 3). Although the absolute risk is low, the odds ratio's show that the risk of receiving complete BCT were higher in both hospital categories in the Northern Netherlands.

Introduction of the SNB

Since 2003 guidelines recommend the SNB to be performed in T1-2/N0 breast cancer. Unfortunately, the SNB was not registered consistently in the NCR in some regions of the country. When an ALND was performed after SNB then only the ALND has been registered in these regions. This might give an underestimation of the group that had a BCT with SNB followed by ALND. In our study, this only concerns the control group. We excluded all patients from the control group that were diagnosed in regions with this deviating registration policy (N=1950). The control group remained the largest group. Patients in the control region were more likely to receive a sentinel node biopsy compared to both intervention regions. The differences were most prominent between 1996-2001 (Table 3).

Radiotherapy after BCS for DCIS

The total numbers of patients are low in the early periods. After the introduction of a nationwide screening programme the incidence of DCIS has gradually risen because of the increasing quality of diagnostics. In the latest time period the percentage of radiotherapy was over 79% in all hospital categories. No significant differences were seen between the odds for receiving radiotherapy in the different hospital categories (Table 3).

Adjuvant radiotherapy for locally advanced breast cancer

Official guideline introduction of adjuvant radiotherapy for locally advanced breast cancer (T3/M0 or any T,N2-3/M0), was in 2002 and a large variation existed before and afterwards (Table 3). The control and Northern region hospitals with the highest IP show the best implementation of this recommendation of the guideline while especially before 2008 patients in the other regions were less likely to receive adjuvant radiotherapy.

Adjuvant chemotherapy for early stage breast cancer

Patients diagnosed in hospitals in the Rotterdam region and Northern Netherlands with a low IP received adjuvant chemotherapy more often for early stage breast cancer than patients in the control hospitals (Table 3). Guideline follow-up in the later time-periods is high and differences between the different hospital categories are small.

Neoadjuvant chemotherapy for T4/M0 breast cancer

Neoadjuvant chemotherapy for T4/M0 cancer is administered to approximately half of the patients in the latest time period (Table 3). Because this concerns high stage disease, patient preferences may play an important role in this variation. Both hospital categories in the Rotterdam region as well as the Northern low IP hospitals perform better compared to the control group, with the highest chance of receiving neoadjuvant chemotherapy in the Rotterdam hospitals with high IP (OR 2.67, 95% CI 1.74-4.07, Table 3).

Treatment	Hospital category	% of patients treated according to guidelines				OR	95% CI
		'90-'95	'96-'01	'02-'07	'08-'10		
Complete breast conserving treatment. *N*=22453 *Inclusion criteria: Stage I-IIIA* *Exclusion criterium: Breast amputation after BCS*	Controls	95.6	92.3	93.4	95.8	1.00	Reference
	North High IP	97.8	97.1	97.8	98.3	2.68*	2.08-3.45
	North Low IP	95.4	96.3	96.7	97.1	1.77*	1.43-2.17
	Rotterdam High IP	93.0	88.9	91.9	96.7	0.77*	0.64-0.92
	Rotterdam Low IP	94.6	89.6	91.7	95.0	0.72*	0.60-0.85
Introduction of the SNB. *N=25612* *Inclusion criteria: cT1-2, cN0, cM0, BCS*	Controls	0	33.9	93.6	98.3	1.00	Reference
	North high IP	0	16.2	93.9	98.8	0.68*	0.55-0.84
	North low IP	0	20.9	93.2	98.2	0.59*	0.50-0.70
	Rotterdam high IP	0	19.1	89.0	98.8	0.46*	0.38-0.55
	Rotterdam low IP	0	14.8	92.1	96.9	0.48*	0.40-0.57
Radiotherapy after BCS for DCIS. *N*=2414 *Inclusion criteria: DCIS, BCS*	Controls	16.1	31.7	76.8	85.2	1.00	Reference
	North high IP	50.0	49.0	74.8	84.9	1.24	0.88-1.74
	North low IP	57.1	43.7	72.5	81.7	1.13	0.84-1.52
	Rotterdam high IP	33.3	48.9	72.0	79.8	1.08	0.79-1.49
	Rotterdam low IP	27.6	50.4	74.1	83.3	1.27	0.93-1.73
Adjuvant radiotherapy locally advanced breast cancer. *N*=1511 *Inclusion criteria: cT3, any N, M0 en any T, N2-3, M0 + amputation*	Controls	64.6	67.3	64.6	69.1	1.00	Reference
	North high IP	53.5	54.4	53.5	68.3	0.75	0.51-1.10
	North low IP	46.2	62.5	46.2	53.2	0.56*	0.39-0.80
	Rotterdam high IP	39.2	34.2	39.2	61.5	0.40*	0.29-0.55
	Rotterdam low IP	29.7	35.9	29.7	68.6	0.36*	0.25-0.52
Adjuvant chemotherapy early stage breast cancer. *N*=9511 *Inclusion criteria: pT1-2 M0/X, surgery age<60*	Controls	51.3	73.1	85.1	91.9	1.00	Reference
	North high IP	62.3	69.7	90.4	93.0	1.24	1.00-1.54
	North low IP	52.8	70.6	91.4	91.3	1.29*	1.07-1.54
	Rotterdam high IP	60.2	72.3	88.0	95.6	1.50*	1.26-1.81
	Rotterdam low IP	55.3	67.2	90.1	96.0	1.22*	1.01-1.46
Neoadjuvant chemotherapy T4/M0 breast cancer. *N*=1484 *Inclusion criteria: cT4NxM0, surgery*	Controls	5.1	27.4	34.5	61.9	1.00	Reference
	North high IP	11.2	25.0	56.0	65.3	1.24	0.73-2.09
	North low IP	4.8	22.8	57.8	44.0	1.57*	1.00-2.47
	Rotterdam high IP	6.7	28.0	55.0	51.9	2.67*	1.74-4.07
	Rotterdam low IP	5.3	29.2	54.8	61.5	2.02*	1.32-3.08

Table 3. Odds ratio's for receiving multidisciplinary therapy per hospital category. Adjusted for age, year of incidence, annual volume of diagnoses per hospital, stage (if necessary). 1990-2010 *P<0.05. IP= Implementation proportion of recommendations given in the programme.

Discussion

The results of our study show variation in the multidisciplinary treatment of breast cancer patients in the Netherlands. No relationship was evident between variation in multidisciplinary treatment for breast cancer patients and participating in the external peer review programme for multidisciplinary cancer care. In the Northern Netherlands, only the completeness of breast conserving therapy (stadium I-IIIA) was better in patients diagnosed in hospitals with a higher IP compared to the control group. Patients from hospitals with the lowest IP more often received adjuvant chemotherapy for early stage breast cancer, neoadjuvant chemotherapy for T4 breast cancer and complete breast conserving therapy. In the Rotterdam region, patients diagnosed in hospitals with the highest IP were more likely to receive neoadjuvant chemotherapy for T4 breast cancer and adjuvant chemotherapy for early stage breast cancer. The latter results also account for patients from hospitals with a low IP from the Rotterdam region when compared to the control group. Differences between the regions imply that there are regional factors that are responsible for the variation.

Before 2002, there was regional variation in guidelines. Table 3 shows that variation decreased in the periods from 2002-2007 and 2008-2010 but no early adopter effect was seen in patients from hospitals with a higher IP. A previous study by van Steenbergen *et al.* on early stage breast cancer also showed decreased variation after the introduction of national evidence-based guidelines in 2002 but variation still persisted. Differences could be partly explained by hospital characteristics but also by locoregional practices. Adjuvant systemic therapy was found to be mainly influenced by patient and tumour characteristics [17]. Another study on early stage breast cancer confirms the important role of the national evidence-based guidelines and identified age as the most important factor in the decision whether a patient receives systemic therapy. They also found the presence of early and late-adopters amongst hospitals but could not determine the role of physicians or hospital characteristics [18]. The programmes in the Northern Netherlands and Rotterdam region were similar in origin. During the second cycle in the Rotterdam region, the focus shifted from the evaluation of basic organisational topics to implementing plan-do-check-act cycles and the measurement of quality within hospitals. This shift also occurred in the North region but the basic organisational topics remained part of the programme.

The main weakness of our study was that we had to use a black box approach concerning the supposed mechanism through which external peer review on hospital level exerts its influence on tumour service levels. Moreover we did not have the possibility of correcting possible confounding factors such as co-morbidity and patient preference. The gradual spread of the programme over the country gave us the possibility to use a control group, creating a quasi-experimental situation. Hospitals in the control group are likely to have introduced changes

in their organisation too, but we are not aware of similar programmes that have been used. Hospitals from the high IP and low IP groups may have had different starting points concerning organisational quality, unfortunately we did not have a baseline measurement of organisational quality. Therefore, we can not answer the question if hospitals that already had a good multidisciplinary organisation also performed well on implementing the recommendations from the programme.

Research in this field is challenging. Besides the 'quasi-experimental' situation (due to the gradual introduction of the programme) our study had multiple characteristics that helped us to evaluate the impact of external peer review. In the intervention regions all hospitals participated in the programme (even though they did not all give permission to use their data in this study). Because of this, there was no programme participation bias. We did not rank the importance of recommendations to assess the programme impact instead of the impact of single recommendations. We were able to analyse results on a 'patient level' because of the reliable and complete data, including information on treatment, over a long period of time provided by the Netherlands Cancer Registry.

Conclusion

Our study showed regional differences and did not reveal benefits in the multidisciplinary treatment of breast cancer patients being treated in hospitals participating in the programme nor did the extent in which the hospitals implemented the recommendations seem to matter. Organisation focussed quality improvement programmes are generally not designed to directly improve clinical care and in methodological terms this can still be considered as a "black box intervention". Improving the organisation of care seems a justified goal, but it may be questioned whether the effort put into it is justified if no clinical benefits can be shown. If the objective is that external quality assessment programmes should have a measurable effect on clinical outcomes, the programmes should change their approach. A better focus on the actual delivery of clinical care and incorporating reliable outcome data (from cancer registries) can bridge the gap between quality improvement and patient outcomes. Variation in treatment, as shown in our study can be used as a starting point for quality improvement programmes for hospitals to work on their organisation and delivery of care.

Acknowledgments

We would like to thank G. Sonke MD PhD, oncologist in the Netherlands Cancer Institute (NKI-AvL) for his valuable research advice and critical reading of the manuscript. Moreover we would like to thank all participating hospitals for their participation in this project. We would like to thank all physicians, nurses and management representatives from both intervention regions that cooperated in interviews for the valuable discussions on the perceived (clinical) impact of the programme (results will be published separately).

The authors thank the registration team of the Netherlands Comprehensive Cancer Organization (IKNL) for the collection of data for the NCR.

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Additional file 1

The external peer review programme for multidisciplinary cancer care.

Organisation of cancer care requires agreements between physicians, nursing staff, patients and all others involved. The external peer review programme for multidisciplinary cancer care covers the aspects of care which can be agreed upon to guarantee a high quality of care. This does not concern the actual clinical care but prerequisites that apply to the cancer care organisation. The programme relies on a 'quality framework' which describes requirements of three main aspects of care:

- Policy and organisation: organisational aspects of the hospital itself: internal regulations, means and materials, external cooperation.

- Management of processes: matters concerning the process that a patient undergoes. For example: shared decision making and exchange of information between providers, referral policies, time till treatment, informational and educational materials.

- Quality control system: the evaluation and actualisation of the quality control system and measures for improvement.

Concerning clinical care: the quality framework describes the requirement of up-to-date guidelines for the treatment of cancer patients. During the external peer review there is no check on an individual patient level if patients received the appropriate treatment. However, cancer registry data is used to evaluate e.g. the use of adjuvant treatments on a hospital level (compared to national averages).

5

Two decades of external peer review of cancer care in general hospitals; the Dutch experience

Cancer Medicine (2015) doi: 10.1002/cam4.612

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Abstract

Background

External peer review was introduced in general hospitals in the Netherlands in 1994 to assess and improve the multidisciplinary team approach in cancer care. This paper aims to explore the value, perceived impact and (future) role of external peer review in cancer care.

Material and methods

Semistructured interviews were held with clinicians, oncology nurses and managers from fifteen general hospitals that participated in three rounds of peer review over a period of 16 years. Interviewees reflected on the goals and expectations, experiences, perceived impact and future role of external peer review. Transcriptions of the interviews were coded to discover recurrent themes.

Results

Improving clinical care and organization were the main motives for participation. Positive impact was perceived on multiple aspects of care such as shared responsibilities, internal prioritization of cancer care, improved communication and a clear structure and position of cancer care within general hospitals. Establishing a direct relationship between external peer review and organisational or clinical impact proved to be difficult. Criticism was raised on the content of the programme being too theoretical and organization-focussed after three rounds.

Conclusions

According to most stakeholders, external peer review can improve multidisciplinary team work in cancer care; however the acceptance is threatened by a perceived disbalance between effort and visible clinical impact. Leaner and more clinically focused programmes are needed to keep repeated peer reviews challenging and worthwhile.

Introduction

Multidisciplinary team (MDT) work has become the standard in cancer care in the last decades as diagnostic and treatment options for various cancers grew.[1] The importance of multidisciplinarity further increased due to a shift from disease-focused management to a patient-centered approach. The European Partnership for Action Against Cancer (EPAAC), launched by the European Commission in 2009, therefore identified multidisciplinary care as a key element in cancer care.[2] Evidence on the impact of MDT-work on clinical outcomes is sparse, partly due to difficulties in relating procedural and organizational changes to the various possible benefits.[3] A recent study in 13722 breast cancer patients showed that improved multidisciplinary care was associated with improved survival and reduced variation in survival.[4] While MDT-work may seem self-evident for specialized cancer centres or university hospitals, it is a more recent development and an organizational challenge for general hospitals.[5]

In the Netherlands, regional Comprehensive Cancer Organisations were established in the eighties to disseminate specialized knowledge on cancer diagnosis and treatment and to improve service provision without having a treatment function themselves. They formed networks of healthcare professionals with the aim to improve cancer care and outcomes through research, guideline development and implementation, knowledge exchange and organizational improvement, for instance by promoting multidisciplinary care. The Comprehensive Cancer Organisation in the North of the Netherlands introduced an external peer review programme in 1994 to review the multidisciplinary organization of cancer care in hospitals and provide relevant feedback for further improvement. The programme focussed on the organization of cancer care within the general hospital setting. Over time, it evolved and also paid attention to patient centeredness and important (inter)national trends such as centralization. The primary focus remained on the organization of cancer care and the functioning of the multidisciplinary teams. Policies were reviewed but not checked for individual cases, such as compliance with policies for adjuvant chemotherapy or psychosocial care. Through self-reviews, site-visits and on-site interviews the organization of cancer care in a hospital is evaluated and recommendations for improvement are given. Reviewers are specially trained clinicians and nurses from other hospitals. Hospitals participate voluntarily and are advised to participate in cycles of four to five years to ensure continuous cycles of quality improvement. Annex 1 gives more detailed information on the external peer review programme. Similar programmes have been introduced in other countries. In England, for example, National Cancer Peer Review (NCPR) was introduced as part of the National Cancer Programme in 2004, after a first round of peer review was conducted at a regional level in 2001.[6] The English programme focuses on performance for specific tumour groups, whereas the Dutch programme primarily targets the multidisciplinary cancer care organization in hospitals as a whole.

Until now, we have published two peer-reviewed studies on the effects of the Dutch peer review programme for multidisciplinary cancer care.[7,8] Some positive effects were found on multidisciplinary colorectal cancer treatment but the outcomes needed to be interpreted with care due to possible confounding factors such as patient casemix and regional differences.[7] No added value was found on multidisciplinary treatment of breast cancer, as regional factors seemed to exert a stronger effect on treatment patterns than hospital participation in external peer review.[8] In general, (international) evidence on the effects of peer review on cancer care is sparse. In lung cancer, peer review was successful in stimulating quality improvement activities but improvements in treatment rates and patient experiences were small.[9] Outside the field of cancer care, two studies report on the one- and three-year evaluation of peer review for chronic obstructive pulmonary disease in the UK.[10,11] Findings after three years indicated an association with improved quality of care, service delivery and changes that promote quality improvement.[11] The one-year evaluation revealed no differences showing that changes need a longer period to occur.[10]

While evidence on external peer review is sparse, physicians worldwide are increasingly confronted with programmes such as external peer review and accreditation. In this qualitative study we aim to explore the role and impact of external peer review for multidisciplinary cancer care in the general hospital setting. In interviews with stakeholders we evaluated the value, perceived impact and (future) role of external peer review in cancer care.

Material and Methods

Semistructured interviews were conducted with stakeholders from general hospitals from two regions in the Netherlands that participated three times between 1994-2010 (North and Rotterdam region). The hospitals in these two regions have the longest experience in the programme with three cycles of peer review in our study period. We excluded hospitals that merged in the study period, as this made it hard to reflect on recommendations and the impact of the programme. From the two regions, all 26 qualifying hospitals were invited to participate in our study. Per hospital we requested to interview a clinician involved in the treatment of cancer patients, an oncology nurse and a representative from the board of directors or management. We aimed to interview at least two stakeholders per hospital. The following inclusion criteria were applied: (1) the interviewee was required to have participated in at least one peer review visit (preferably also involved in preparations for the programme); (2) oncology nurses should have coordinating/organizational tasks; (3) the management representative had to be involved with cancer care management in the hospital. Participation in the interviews was voluntary and participants were not reimbursed.

The telephonic interviews were conducted in Dutch from May to October 2012 by the principal investigator (MK). Participants were informed about the purpose of the study and how the data would be used. The interviews followed a fixed scheme. First, the motivation for participation was discussed, followed by the experiences with the programme. This was discussed according to the chronological phases of the programme: self-review phase, the actual site-visit and the aftermath. Consequently, the impact was discussed and examples of programme effects were asked. To conclude, views on the role of the programme in the future and possible improvements were asked. A list of general questions covering these topics was used. An overview of the main interview topics, questions and the rationale behind the questions is presented in Table 1.

Interview topics	Main/Opening question(s)	Rationale
Goals	What are your goals for participation in this programme?	Explore if the incentive is organizational improvement, quality improvement or both.
Experiences (programme evaluation)	What are your experiences with the self-assessment phase of the programme and what was its value?	Experiences with the different programme phases gives information on what the most important parts of external peer review programmes are and when changes occur.
	What are your experiences with the actual site-visit, what was its value and what was the added value after the self-assessment?	
	What is your opinion about the end-rapport, did it reflect the state of cancer care in your hospital?	
Impact	In which areas did you experience a programme impact? Can you give examples of programme effects?	Answers give insights in how external peer review influences organization and care and which aspects of care are affected.
Future	If the programme would remain as it is now, would you participate again? How can the programme be improved?	Does a programme retain its value after three participations or does it need changes?

Table 1. Overview of interview themes with examples of questions and the rationale behind the themes and questions. In this table only the main 'opening questions' are presented.

All interviews were recorded and transcribed verbatim using word processing software by the principal investigator (MK). All data were anonymized and interviewees were guaranteed that data would not be shared with third parties, allowing them to speak freely. The transcripts were analysed by using ATLAS.ti software (version 7, www.atlasti.com). Using an inductive approach (organizing the data based upon common patterns or themes), the entire transcripts were coded. Answers were given a distinct code to get an overall impression of the results from the interviews. Relevant citations were selected as illustration per interview topic. The results and citations were discussed with other investigators (WVH, SS). Despite the qualitative nature of this study, answers on specific questions, such as what the goals were to participate could be quantitatively analysed. In these cases, frequencies of answers were used to determine their relative importance.

Results

Study population

Fifteen out of the twenty-six invited hospitals participated in our study. Two hospitals reacted that they were either not able or not willing to invest their time in the interviews, the rest did not reply to our invitation and gave no reason for not participating. In our study population of 15 hospitals, it was not possible to interview two stakeholders in two hospitals; in one hospital we could only interview a medical specialist and in another hospital we only interviewed an oncology nurse. Additionally, in one hospital there was not a nurse available with sufficient experience with the programme to participate. We could only interview four managers that met our criteria of being personally involved in at least one external peer review and involvement in cancer care (partly due to high management turnover). In total, data from 15 hospitals and 31 interviews were analysed: 14 physicians (eight medical oncologists, four surgeons, one pulmonary physician and one gynaecologist), 13 oncology nurses and four management representatives.

Interview Findings

Motivation

The motivation to participate could be coded into ten distinct codes or 'buckets' as can be seen in Table 2. We further categorized these codes into four main 'themes'. The most frequently mentioned goal for participating in the programme was to obtain feedback on the quality of organization and processes (coded 21 times). Clinical quality improvement is mentioned by a majority of interviewees (N=19) as a goal for participation, even though the programme foremost has an organizational focus. Differences between physicians and nurses are seen in the positioning of cancer care which is an important goal especially for physicians (physicians: eight, nursing staff: two). By the position of cancer care the interviewees mean that cancer care was given priority amongst a hospital wide range of services and became the joined responsibility for physicians, nursing staff and management. This is illustrated by the next quote:

"As a medical oncologist you are not the only one in the web of physicians surrounding a patient. In every single case, a lot of physicians should communicate and cooperate. Sometimes one physician thinks this is more important than another. By participating in the programme you hope that attention is raised for everyone to see this necessity." [Oncologist]

Goals/incentive for participation (themes)	Goals mentioned by interviewees	Physicians (*N* = 14)	Nurses (*N* = 13)	Management (*N* = 4)	Total (*N* = 31)
External motivation	Transparency	1	4	0	5
	Obligation	1	2	2	4
	See what external experts find important in cancer care	0	4	0	4
Organization of care	Quality test of organization and processes (see how well you are doing)	9	10	2	21
	Positioning of cancer care in the hospital (priority for management and/or physicians)	8	2	0	10
	Reveal organizational weaknesses (blind-spots)	0	4	0	4
	Receive recommendations for improvement	2	2	2	6
	Re-evaluate existing patterns in cooperation and communication	1	1	0	2
Clinical cancer care	Quality improvement of clinical cancer care	9	7	3	19
Future perspectives	Getting ready for changes in the future	1	0	1	2

Table 2. Number of times a goal for participating in the peer review programme was mentioned by different stakeholders. Interviewees could have had more than one goal.

Programme experiences

The first phase of the external peer review, the self-review phase, forced stakeholders to review the organization and cooperation within their own hospital. Nineteen respondents stated that self-review through stating compliance to lists of organizational standards is a good method to discover weak points in their organization. It was said that changes already occurred in this preparation phase as existing policies were revised and corrected if necessary. Interestingly, all of these nineteen interviewees claim that the weaknesses were not totally unknown beforehand. The self-review phase was also the most criticised part of the programme. All interviewees answered that the investments (time and effort) were high. The questionnaires were criticised for being too theoretical, insufficiently suited for their individual situation and containing too many irrelevant and 'obvious' questions. It was mentioned three times that difficulties in answering questions sometimes resulted in giving 'desired' answers.

The actual site visit by peers, is valued highly, 20 respondents mentioned that this is the most important part of the programme. Especially the dialogue and opportunity to explain how they work was appreciated instead of only stating their compliance to a theoretical framework. Also, misinterpretations of answers given in the self-review could be corrected. Almost all interviewees (N=29) stressed the importance of a committee consisting of peers because of the mutual understanding of problems that hospitals are faced with. Eighteen participants think that the composition of the review committee (three medical specialists and one oncology nurse) does not need to be altered. Suggested changes to the committee were to add an extra

oncology nurse (N=2), a manager (N=2) or a professional from the psychosocial field (N=6). The rest of the interviewees had no opinion on this matter.

The final phase of the programme starts with the end-report based on the self-assessment and findings of the site-visit. The recommendations in the reports are generally regarded as a good reflection of the weaknesses and improvement points of the organization. All respondents answered that the recommendations are used in the cancer policy plans of their hospitals for the upcoming years. The reports are used to strengthen the position of the oncology services in negotiations with the board of directors and medical staff.

Perceived impact and examples of programme effects

In order to gain more understanding of how the programme impacted cancer care in hospitals, every stakeholder was asked to give examples of important effects of the programme (if there were any). We coded the aspects of care that were influenced by the programme. We found ten aspects of cancer care on which the programme had a perceived impact. They are mentioned in Table 3 with the examples that were given by the interviewees. The frequencies of the answers give a sense of importance but because we asked for examples we did not use the frequencies to determine which aspect of care is most influenced by the programme. Not mentioning an example does not mean that the programme did not impact that aspect of care in their hospital.

A perceived impact on the position of cancer care within the hospital organization is expressed nine times. It was also mentioned ten times as goal for participation (Table 2). This seems to work two ways: as mentioned earlier, the participation itself creates attention and involvement. Secondly, the other examples of perceived impact also enforce prioritization of cancer care. For example, a perceived impact on the (role of the) oncology committee was expressed 21 times in total. Also, according to a total of nine interviewees the role of the committee within the hospital and policy making was formalized. The formation of multidisciplinary oncology committees with representatives from all disciplines that treat cancer patients was stimulated especially in the first review rounds (most of the committees were small and not all disciplines were represented). This created an official structure within hospitals to advocate the interests of medical personnel and cancer patients in structural meetings with the board of directors and medical staff. Because the oncology committee was required to consist of representatives from all specialisms that treat cancer patients, 'smaller specialisms' like gynaecologists and urologists became more involved which improved communication. There was also a more general perceived impact on the cooperation between physicians and between physicians and nursing staff (N=4). Concerning clinical care, most impact was experienced on the multidisciplinary patient care meetings. Fourteen interviewees mentioned an example of impact on these meetings. Due to the recommendations, multidisciplinary patient care meetings were professionalised, protocols were developed on which patients should be discussed in these meetings and reporting was standardized. The programme required weekly meetings where every newly diagnosed cancer

patient was discussed in the multidisciplinary team to improve shared decision-making. Less frequently mentioned examples of programme impact concern impact on structure, delivery of care, psychosocial care, nursing staff, referral policies and future perspectives. These include increased numbers of staff, better integration of psychosocial care and advice on the introduction of integrated care pathways (Table 3).

Theme	Examples of impact given by the interviewees
Position of cancer care in hospital	- cancer care became a priority (*N*=9)
Oncology committee	- large committees were formed with representatives from all disciplines treating cancer patients (*N*=9) - role of committee was officially established in hospital organization (*N*=2) - committee got responsibility for policy making (*N*=5) - functioning of committee improved (*N*=3) - structural meetings were organised with board of directors and medical staff (*N*=2)
Cooperation	- involvement of "smaller" disciplines such as gynaecologists and urologists (*N*=6) - improved communication between specialists and between specialists and nursing staff (*N*=4) - improved communication with general practitioners (*N*=1)
Multidisciplinary patient care meetings	- involvement smaller disciplines in the meetings (*N*=3) - protocols on which patients have to be discussed (*N*=14) - uniformity of reporting (*N*=1)
Structure	- increased number of nursing staff (*N*=6) - investments in ICT (*N*=1)
Delivery of care	- advice on the introduction of integrated care pathways (*N*=2) - concentration of chemotherapy administration within the hospital (*N*=1)
Referral policies	- referral policies were made for rare tumours (*N*=1) - official agreements were signed with other hospitals on which patients to treat and which to refer for further treatment (*N*=3)
Nursing staff	- introduction of specialized oncology nurses (*N*=6) - education (*N*=2)
Psychosocial care	- increased number of psychosocial staff (*N*=6) - clarity on the role and positioning of psychosocial staff (*N*=1) - introduction psychosocial protocols (*N*=1)
Readiness for change	- organization is better prepared to adapt to future changes (*N*=4)

Table 3. Examples of effects of the external peer review programme as mentioned by interviewees (*N*=31) grouped per theme

Interviewees found it difficult to single out the effects of the programme. Investments in extra oncology nurses can be contributed to clear recommendations in the final reports of the programme, but other (clinical) effects of the program do not stand on their own. This is illustrated in the next citation:

"Every patient has an individual case-manager now. That would probably have been established anyway, but because of the recommendation of the programme it might have been introduced earlier. Yes, I think that had an impact. Another example is the multidisciplinary patient care meeting. They needed to be held more often and larger groups of patients needed to be discussed. I think that this would have been realised anyway because of the national guidelines

and not only because of the programme, but it certainly influenced it."[Oncology nurse]

Future role and improvements of the programme

All hospitals in our study population participated in three review rounds. The programme started with a strong focus on basic organizational requirements and evolved from there with more emphasis on professional quality and care pathway organization. The organizational focus remained to be a source of frustration. Twenty interviewees expressed their concerns on having to repeat all the organizational items in the self-review and site-visit in a fourth participation round. As a result, only 12 persons would still find a fourth participation worthwhile without major changes in the programme. This suggests that a mismatch between the investments and experienced benefits is a potential pitfall for the programme.

Suggestions for improvement that were given are:

- move beyond the basic organizational conditions and focus on the actual delivery of care
- decrease the time investments needed for self-review
- more emphasis on current and future requirements in oncology
- focus on one or two specific types of cancer
- give hospitals the opportunity to indicate on which parts of the care process they would like to receive in-depth feedback
- strengthen the patients' perspective compared to the organizational perspective.

Opinions varied whether the focus of the programme should remain on the entire cancer care organization or on specific types of cancer. Advantages mentioned of a tumor-specific programme were a better focus on actual care, less time-consuming preparations and the possibility to assign clinical experts as reviewers.

Disadvantages of a tumor-specific programme were also mentioned. There are already multiple organizations that have developed registrations and clinical audits for specific diseases. Because of this, there is a risk of an overkill of external assessment programmes. Other interviewees mentioned that the necessity to look at the entire organization does not change; weak points in the organization mostly concern aspects of cooperation and communication, which can be easier tackled through an organization focussed programme.

Discussion

It can be carefully concluded that the external peer review programme for multidisciplinary care in the Netherlands had a perceived positive impact on several aspects of cancer care. Most frequently mentioned were the internal positioning of cancer care, formation and role of oncology committee and multidisciplinary team meetings. Part of the experienced impact could be attributed directly to the programme based on recommendations in the final reports. Interviewees were hesitant to attribute more clinically oriented effects to the programme alone, as many factors can be of influence. Although the programme has an organizational focus, improvement of clinical care is mentioned as a motivation to participate almost as often as organizational improvement. Criticism was also raised, particularly on the repeated organizational focus and missing links with clinical care (most outspokenly in the self-review phase). Nineteen interviewees mentioned that while the self-review uncovers organizational weak spots, they were not entirely unknown beforehand. It therefore seems that the value lies in directing attention to these weak spots. The actual site visits were regarded as the most important part of the programme because of the dialogue that occurs with their peers from the review committee.

It is difficult to prove a direct impact of external quality improvement programmes. A previous mixed-method study on accreditation also struggled to answer the question. Performance on accreditation was found to be an accurate reflection of contextual organizational factors believed to be important in enabling or inhibiting quality of care and continuous quality improvement.[12] A French study on the impact of accreditation used a hypothetical model in which accreditation is seen as an agent of change.[13] These studies complement our findings that external peer review is one of multiple factors that initiates change and contributes to a better organization that can lead to quality improvement.

The external peer review programme for multidisciplinary cancer care was introduced to strengthen and support the (introduction of) multidisciplinary team work. There are two main categories of barriers to effective cancer care coordination. Firstly, those barriers that are a result of an ineffective team (recognition of health professional roles and responsibilities, transition of care, inadequate communication) and secondly barriers that are the result of inadequate resources, including managing scarce resources and inequitable access to health services.[5] Our results especially show a perceived programme impact on those barriers resulting from ineffective team work. Examples of the perceived impact revealed a transferral of responsibilities from individual physicians to multidisciplinary teams consisting of physicians, nursing and supporting personnel. This lead to prioritization of cancer care, improved communication and a central position of cancer care within general hospitals.

Contrary to our finding that the site-visit is the most valued part of the programme, previous research identified the self-review as the most important.[13] This might be due to the fact that the review committee consists of peers which creates mutual understanding. It also implies that

stakeholders value an approach that is not overly focussed on standards. Touati and Pomey described this earlier and drew parallels between accreditation and a management model of "commitment based management" in stead of 'control based management'.[14] Leaving a philosophy of control and adapting a philosophy of commitment provides greater room for autonomy and creativity of the reviewed hospital and stakeholders. This approach to quality management requires a challenging balance of improvement dynamics with standardization and assurance, but can be used to prevent the perception of external quality assessment programmes as coercive tools of over-standardization.[15] The disbalance between effort and effect threatens the legitimacy of the programme. Possibilities for improvement of the programme are mainly to move away from basic organizational requirements after a first or second round and focus more on actual clinical care. This can be achieved by making better use of the information from previous peer reviews. When it has been established that the basic organizational requirements were met, new peer reviews can pay attention to other aspects of care. This might create leaner and more flexible programmes.

Our study has several limitations. There will always be a certain degree of interpretation when working with qualitative data. We tried to minimize this by coding the transcripts with specialized software. The frequencies are mentioned to give a sense of importance. We were cautious to use this to make statements on the impact of the programme. The frequency counts in Table 2 and 3 are unbalanced which makes it difficult to draw firm conclusions. It does give a general overview of motivation and perceived impact. Although we interviewed representatives from 15 different hospitals, a larger study population might have revealed more details (although we experienced a considerable degree of saturation). We could only interview four management representatives due to a high management turnover and because managers were not always involved in the process before the actual site-visit. Eleven hospitals that were invited did not participate which might have resulted in a selection bias. The hospitals were invited because their regions were the first to implement the programme. Therefore, our findings only represent hospitals with multiple participations in the programme. The interviews were not done after each peer review but retrospective after three cycles of review which might cause a fading of memories. Hospitals that participate for the first time might find it more useful to focus on more basic organizational conditions. However, our research is unique in investigating organisations with multiple participations and our results show a decreasing acceptance for external peer review if a programme keeps focussing on organizational standards.

Conclusion

Organizational external peer review can be an appropriate method for general hospitals to improve multidisciplinary team work in cancer care. In general hospitals, it can help in the internal positioning of cancer care and to improve structures and processes that encourage

multidisciplinary team work. Our findings suggest that, concerning actual clinical care, external peer review has an indirect impact by influencing the multidisciplinary patients meetings, numbers of staff etc. The acceptance of a programme that primarily focuses on organizational requirements decreases after multiple participations. As a majority of interviewees participate to improve both organizational and clinical care we argue that moving from an organizational focus to clinical cancer services in future participations can keep external peer review worthwhile and challenging.

Acknowledgements

We would like to thank all the interviewees for their contribution to this study.

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6

What drives centralization in cancer care?

Submitted

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Abstract

Background

To improve quality of care, centralization of cancer services in high-volume centres has been stimulated. Studies linking specialization and high (surgical) volumes to better outcomes already appeared in the 1990s. However, actual centralization was a difficult process in many countries. In this study, factors influencing the centralization of cancer services in the Netherlands were determined.

Material and methods

Centralization patterns were studied for three types of cancer that are known to benefit from high surgical caseloads: oesophagus-, pancreas- and bladder cancer. The Netherlands Cancer Registry provided data on tumour and treatment characteristics from 2000-2013 for respectively 8037, 4747 and 6362 patients receiving surgery. By plotting timelines of centralization of cancer surgery, relations with the appearance of (inter)national scientific evidence, actions of medical specialist societies, specific regulation and other important factors on the degree of centralization were ascertained.

Results

For oesophagus and pancreas cancer, a gradual increase in centralization of surgery is seen from 2005 and 2006 onwards following (inter)national scientific evidence. Centralization steps for bladder cancer surgery can be seen in 2010 and 2013 anticipating on the publication of norms by the professional society. The most influential stimulus seems to have been regulations on minimum volumes.

Conclusion

Scientific evidence on the relationship between volume and outcome lead to the start of centralization of surgical cancer care in the Netherlands. Once a body of evidence has been established on organizational change that influences professional practice, in addition some form of regulation is needed to ensure widespread implementation.

Introduction

Centralization of low-volume cancers and high-risk surgical procedures is a frequently studied organizational quality issue, especially in surgical oncology. The first volume-outcome relationship in surgery was described in 1979 by Luft et al (1). In the following decades numerous studies have addressed the question whether higher surgical volumes result in an increased quality of care (2). Many of these studies concerned cancer surgery and a large body of evidence developed in favour of centralization of surgical procedures such as pancreatectomies and oesophagectomies (3). In general, a higher volume of surgery is associated with lower post-operative mortality and morbidity (2, 4, 5). Nevertheless, in the Netherlands, referral patterns for pancreatic and oesophageal cancer remained largely unchanged up to the early 2000's, despite a lively debate on the introduction of minimum surgical volumes (6).

There may be several reasons why centralization was not directly embraced as a method to improve cancer care. The quality of the scientific evidence was questioned as many early studies were observational and not hypothesis driven and few studies actually investigated quality improvement after centralization (5). Possible differences in casemix restricted the generalizability of the available scientific evidence to the Dutch healthcare situation (as most studies were performed in the Unites States). As with any new treatment or technology there is a diffusion period before it becomes widely implemented. For example, a Dutch study on the dissemination of the sentinel node biopsy in breast cancer revealed a gradual increase over the course of five years (1998-2003)(7). There is still debate on volume thresholds, ceiling effects and the exact mechanisms through which quality is improved, though at present only a few question the need to centralize low volume and high-risk or complex procedures. Centralization of services is a delicate issue as professional pride and material interests could play a role in the debate and consequent decisions.

The first Dutch scientific evidence for a positive volume-outcome relationship in pancreas and oesophagus surgery was published by Gouma *et al.* in 1997 & 2000 and by van Lanschot *et al.* in 2001 (8-10). Wouters *et al.* showed reduced postoperative morbidity and mortality after centralizing oesophageal resections between 2000-2004 (11). In 2003, the Dutch Healthcare inspectorate started a new supervision policy based on publicly reported quality indicators including total number of surgeries for low volume tumours (12). The first form of regulation started in 2006 when the Healthcare Inspectorate (IGZ) banned oesophageal resections from hospitals with an annual surgical volume lower than 10. This number was also advised for pancreatic resections but not officially regulated. In 2010 the 'quality of cancer care' report was published by the Dutch Cancer Society (13). In this report, centralization of low-volume tumours and high-risk procedures was regarded to be one of the main strategies to reduce variation in outcome. The Healthcare Inspectorate insisted that in 2011 all medical specialists

societies published minimum volume standards (insisting on minimum volumes of 20 operations per year) for highly complicated procedures and regulation would follow from 2013 onwards. In 2011 the Association of Surgeons in the Netherlands (ASN) increased the minimum annual number of low-volume high-risk operations to 20. In 2012, the Dutch Federation of Oncological Societies (in Dutch: SONCOS, consisting of the Dutch Associations for Surgical Oncology (NVCO), Medical Oncology (NVMO) and Radiotherapy and Oncology (NVRO)) set minimum volume standards for the treatment of several types of cancer (14). In recent years, insurance companies started to use these thresholds for contracting policies adding an extra stimulus to the centralization debate.

It is unknown whether and which professional, organizational and regulatory stimuli are most effective in stimulating centralization. Studying this might also provide a more general insight in what drives quality related organizational change in cancer care. We performed a nationwide analysis on the centralization of oesophagus, pancreas and bladder cancer surgery. Oesophagus and pancreas cancer are the most frequently studied types of cancer in relation to the volume of surgery. Bladder cancer is likely to benefit from centralization but minimum thresholds were not established in the Netherlands until 2010 (15-18). We hypothesize that even though centralisation of surgery will occur voluntarily and gradually based on scientific evidence, the most important factor for widespread centralization is official regulation.

Materials and methods

Population

Data on all patients that were diagnosed with oesophagus, pancreas and bladder cancer in The Netherlands between January 1st 2000 and December 31st 2013 were retrieved from the Netherlands Cancer Registry (NCR). The NCR contains patient, tumour and (hospital of) treatment data of every newly diagnosed cancer patient. Topography and morphology is coded according to the International Classification of Diseases for Oncology (ICD-O) and staging according to the TNM-classification. Quality of the data is high and completeness is estimated to be at least 95% (19, 20). The total number of inhabitants of The Netherlands was 15.9 million in 2000 and 16.8 million in 2013 (21).

We included patients with oesophagus tumours including cardia (C15.0-15.9, C16.0), pancreas and peri-ampullary tumours (C25.0-25.9, C24.1, C17.0) and bladder tumours (C67.0-67.9). Exclusion criteria were: unknown hospital of surgery or diagnosis at obduction. Per tumour the total annual surgical volume was calculated per hospital. In the NCR the type of surgery was not completely specified before 2005. Different types of surgery could have been coded under a non-specified surgical code; patients with the same treatment code could have had a pancreatectomy or only local tumour debulking. We accepted this for oesophagus and pancreas cancer because local surgical treatment was not common practice then. From 2005 we were able to differentiate oesophagus(cardia) resections and pancreatectomies. Local surgical

treatment is more common in bladder cancer, therefore the centralisation of cystectomies is studied from 2005 onwards. Only the initial treatment (within six months after diagnosis) for every new tumour was registered, thereby disregarding cystectomy for an initial non muscle-invasive tumour that progressed to muscle-invasive disease more than six months after the first diagnosis and a salvage cystectomy after radiotherapy. When the initial treatment took more than six months to complete, e.g. in case neoadjuvant chemotherapy, the cystectomy was registered.

Analyses

Hospitals were categorized based on the surgery volume per tumour per year: <10, 10-19 and ≥20. These categories were chosen based on the first minimum annual thresholds of 10 which later changed to 20. If the year of surgery was unknown the year of incidence was used. Timelines with the proportion of patients per hospital category were plotted from 2000-2013 (cystectomies from 2005-2013) with descriptions of important influencing factors including landmark studies, regulation, and guidelines by specialists societies. STATA version 12.0 was used for the main analyses. Trendbreak was analysed using Joinpoint Software. Because the minimum surgical volume for pancreas and oesophagus cancer was 10 until 2011 and still is 10 for cystectomies we analysed trendbreak for minimum annual volumes of 10 (including the ≥10 and ≥20 category).

Results

The study population is presented in Table 1. The high number of patients with bladder cancer can be explained by the high numbers of carcinoma in situ. Figure 1 shows an increasing number of surgical procedures for oesophagus, pancreas and bladder cancer.

	Oesophagus *N* (%)	**Pancreas *N* (%)**	**Bladder *N* (%)**
Total number of patients	29399	19630	52763
Sex			
Male	21557 (73.3)	10474 (53.36)	40820 (77.36)
Female	7841 26.7)	9156 (46.64)	11943 (22.64)
Stage			
0	296 (1.01)	175 (0.89)	27539 (52.20)
1	2683 (9.13)	1,726 (8.79)	10776 (20.42)
2	3950 (13.44)	3950 (20.12)	5759 (10.91)
3	6405 (21.79)	2334 (11.89)	3125 (5.92)
4	10899 (37.07)	9876 (50.31)	4892 (9.27)
unknown	5166 (17.58)	1569 (8.00)	672 (1.27)
Receiving surgery			
Yes	8037 (27.3)	4747 (24.18)	6362 (12.06)
No	21362 (72.7)	14883 (75.82)	46401 (87.94)

Table 1. Characteristics of the study population of oesophagus and pancreas cancer (2000-2013) and bladder cancer (2005-2013)

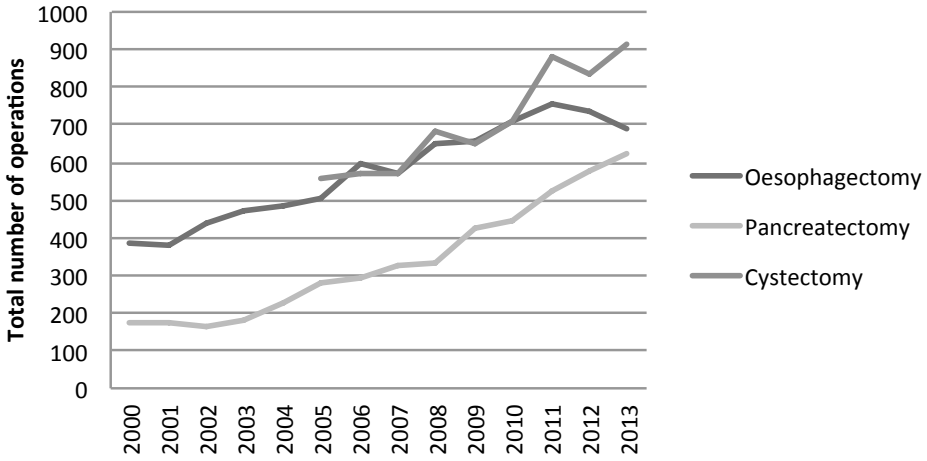

Figure 1. Total number of oesophagectomies and pancreatectomies from 2000-2013 and cystectomies from 2005-2013 in the Netherlands

Oesophagus cancer

Trendbreak analysis for centralization of oesophagus cancer surgery was significant in 2005 (Figure 2). A strong rise can be seen in the ≥20 category from 2006 onwards. This coincides with the execution of a Dutch prospective study from 2000-2004 which was published in 2009 but reported upon in national fora earlier (11). In response, the minimum threshold for oesophageal resections was set on 10 per year by the Healthcare Inspectorate in 2006. Since 2011 hospitals are required to perform resections for oesophageal cancer at least 20 times a year which results in a decreasing proportion of patients treated in a hospital with an average annual volume between 10-20. In 2013 93% of the patients were operated in hospitals that performs 20 or more surgeries per year.

Pancreas cancer

Until 2011 the minimum annual threshold for pancreas surgery was 10. Centralization occurred rapidly after an initial trendbreak in 2006 and further intensified from 2011 onwards (Figure 3). The group of patients that underwent surgery in a hospital with an annual volume ≥20 grew from 2011 to 2012 as a result of new standards set by the ASN and announced regulation by the Healthcare Inspectorate. In 2013 almost 90% of the patients was operated in a hospital with a yearly volume of 20 or higher.

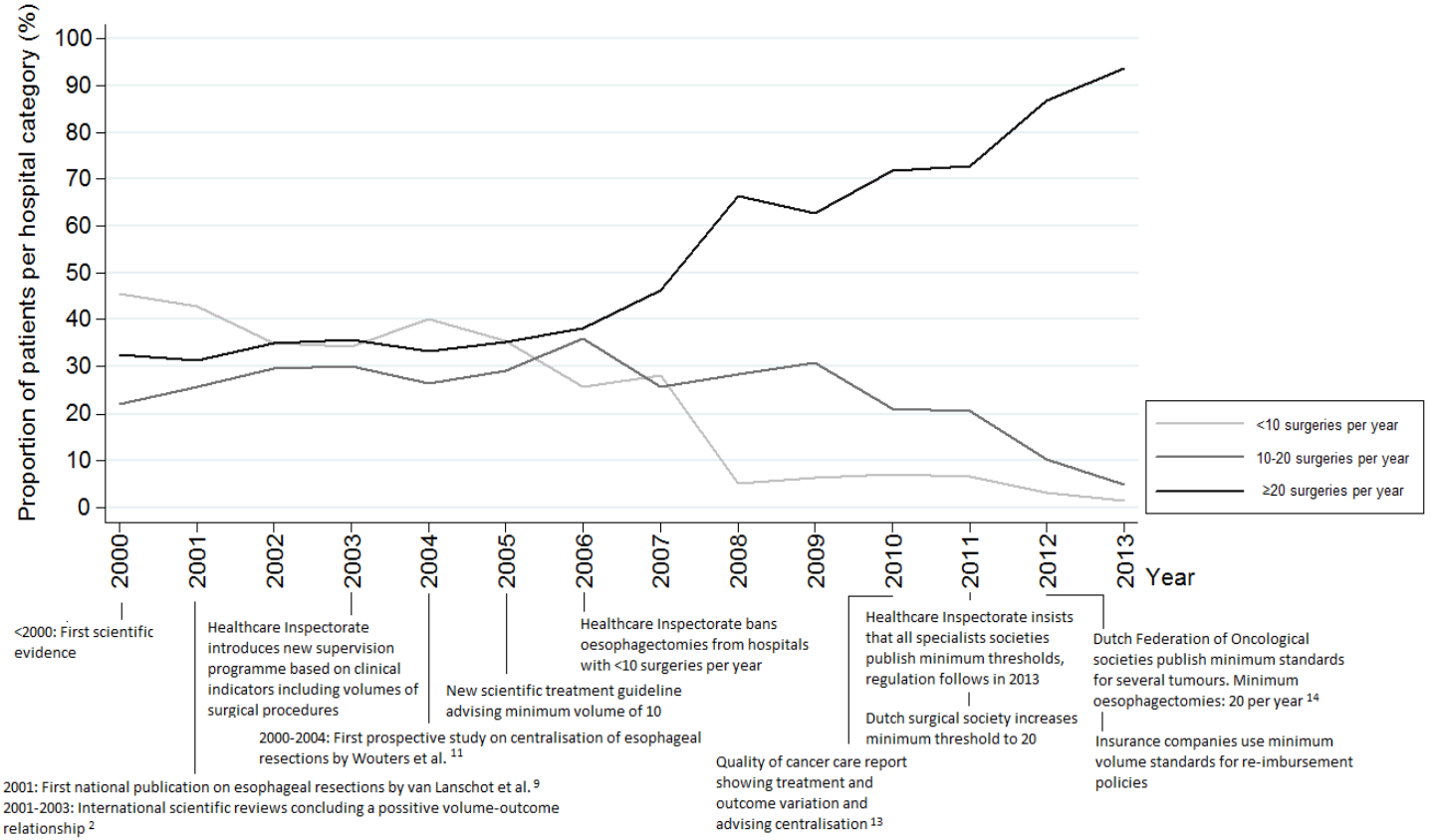

Figure 2. Changes in surgical volumes from 2000-2013: oesophageal resections and relevant external stimuli. Significant trendbreak in 2005 (for cumulative categories ≥10 and ≥20 procedures).

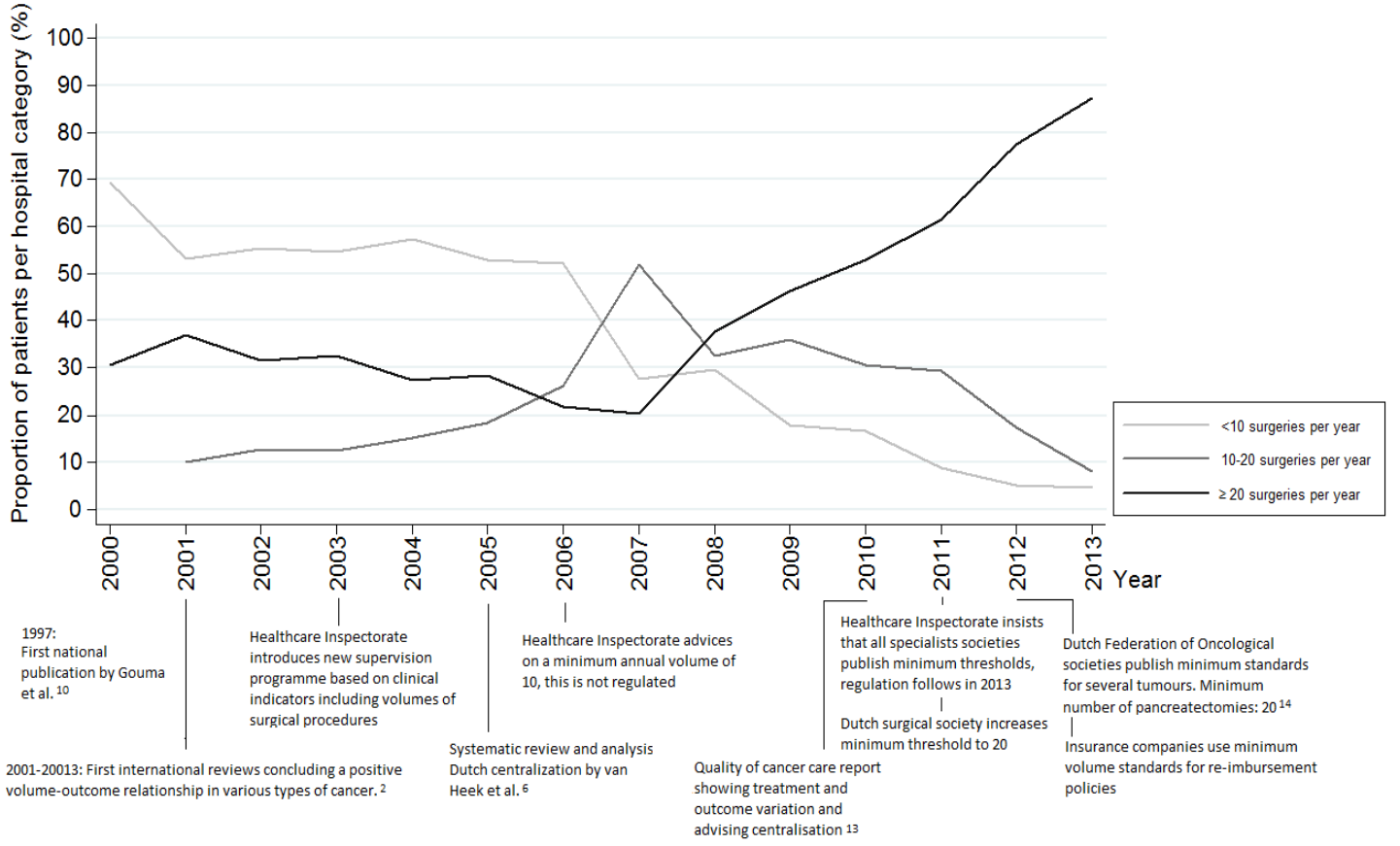

Figure 3. Changes in surgical volumes from 2000-2013: pancreas resections and relevant external stimuli. Significant trendbreak in 2005 (for cumulative categories ≥10 and ≥20 procedures).

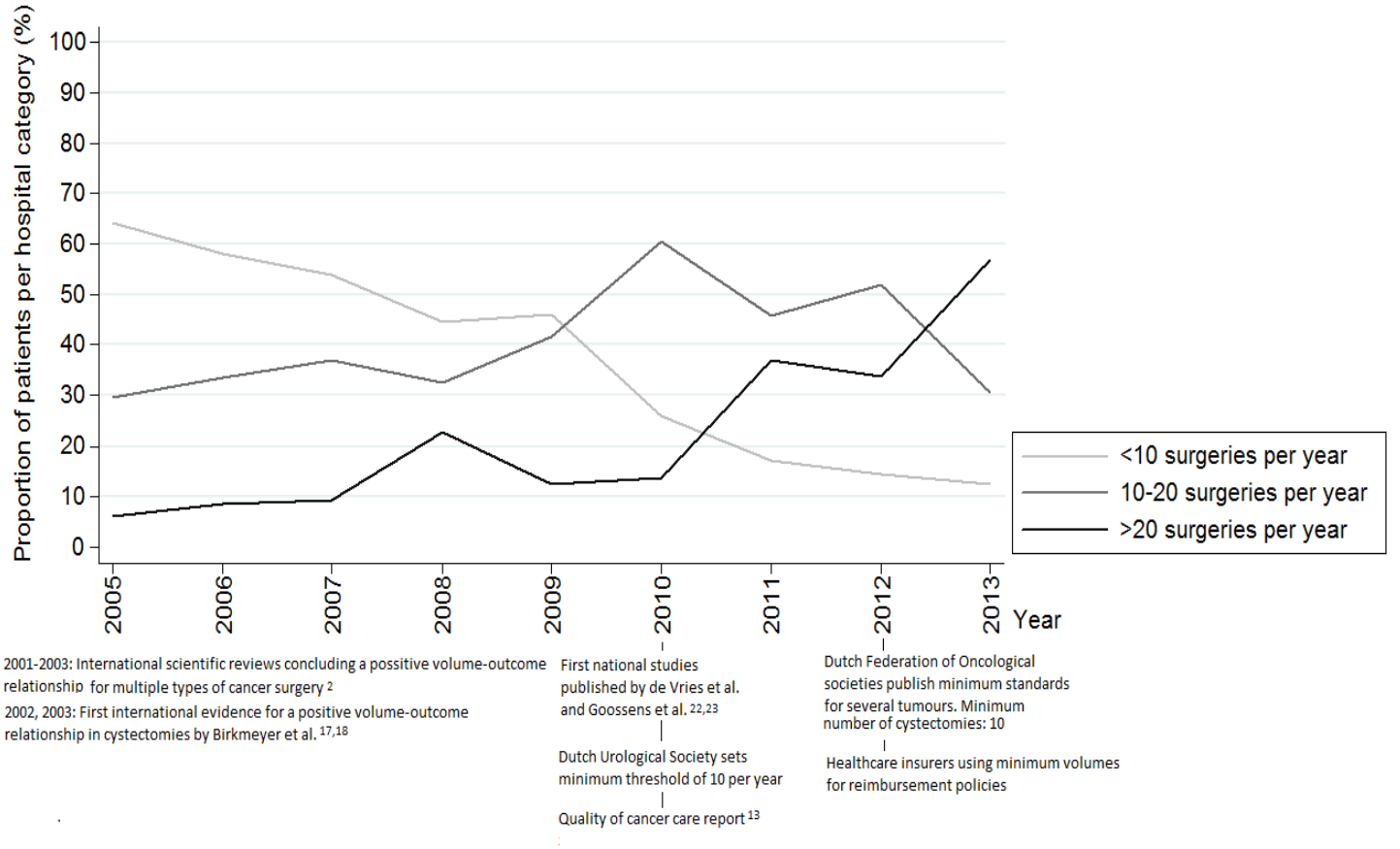

Figure 4. Changes in surgical volumes from 2005-2013: cystectomies and relevant external stimuli.

Bladder cancer

The Dutch urological society set a minimum annual threshold of 10 cystectomies per hospital in 2010. This coincides with the quality of cancer care report from the Dutch Cancer Society and two Dutch studies on the effects of volume on outcomes after cystectomy (Figure 4). De Vries et al. observed lower postoperative mortality but this difference could not reach statistical significance (22). Goossens et al. found that postoperative mortality after cystectomy is significantly inversely associated with high-volume providers (23). No significant trendbreak was found. A gradual decrease in the <10 category is seen which becomes bigger from 2009 onwards. A strong increase in centralization to 20 or more surgeries per year can be seen in 2013. This was probably caused by discussions on the appropriateness of the (low) threshold of 10: in January 2015 a minimum number of 20 cystectomies per year per hospital was decide upon by the Dutch urological society (24). No minimum volume was as yet enforced by the authorities.

Discussion

Our results show that centralization started in the years following the publication of scientific evidence from Dutch studies and international reviews. Scientific evidence obviously preludes centralization but does not seem sufficient to initiate a widespread effect. Official publication of minimum standards by the medical specialists societies intensified centralization, especially in the years before and after publication. This can be seen in all three tumour types. Because official regulation sometimes initiated the publication of minimum standards by the specialist societies and intensified after that, there seemed to be interaction between the two phenomenon's though regulation seems to have more impact.

Centralization of oesophageal resections started in 2006 and from 2008 onwards more than 90% of the patients were treated in hospitals with a surgical volume ≥10 per year. A regional prospective study in the Netherlands investigated the effects of centralisation of oesophagus resections from 2000-2004 (11). Results were shared in national conferences and combined with the growing international evidence strongly enforced the centralization of surgery for patients with oesophagus cancer. Consequently, in 2006 the Dutch Health Inspectorate set the minimum threshold on ten per year and centralization followed rapidly (Figure 2). Whether scientific evidence alone has the same effect is questionable when looking at the centralization pattern of the other two tumours. While trendbreak analyses for the centralization of pancreatic cancer surgery show a significant increase from 2006 onwards, it took until 2009 for more than 80% of the patients to be operated in a hospital with an annual volume ≥10. Unlike for oesophagectomies, between 2004 and 2011 no officially regulated minimum threshold for pancreas surgery existed. The decrease that can be seen in pancreas surgery in hospitals

with an annual volume <10 co-occurs with the threat of regulation and the centralization of oesophagus surgery. It is likely that professionals saw pancreas surgery as a logical next step in centralization. In bladder cancer, the process of centralization started later compared to oesophagus and pancreas surgery. A sharp increase in centralization can be seen in 2009, a year before the Dutch Society for Urology decided on a minimal annual cystectomy threshold of 10. Furthermore, a study comprising data from 2000-2008 confirmed the inverse relationship between hospital volume and mortality and morbidity in the Netherlands (25).

Our study had some limitations. The Netherlands Cancer Registry did not always specify the type of surgery or hospital of surgery in the period before 2005. Therefore, patients that received local tumour debulking instead of extensive surgery can be present in our analyses for oesophagus and pancreas cancer. Because these therapies are not the primary treatment options we argue that the effect on our analyses is small. Impact of excluding patients that were treated in an unknown hospital of surgery is likely to be small, for oesophagus treatment this accounted for 14% between 2000-2005. Furthermore, the question can be raised if any surgical procedure for oesophagus and pancreas cancer should take place in a high volume hospital anyway. Although the standards are based on malignancies, surgery for benign conditions is not registered in the NCR which may give an underestimation of the volume of surgeries in that organ. Our study focusses on a national level and regional initiatives such as cooperation between groups of surgeons can also have influenced centralization. These initiatives may have been triggered by scientific evidence or more general agreements between hospitals and surgeons.

Our results show that international scientific evidence was not strong enough to convince large numbers of physicians to change their daily practice and centralize surgical procedures. Arguments against the generalizability to the Dutch healthcare situation were weakened by a growing body of evidence and more importantly, national studies with convincing data. Regulation did as such not start centralization, but followed scientific evidence and subsequent voluntary centralization. Strong national scientific evidence proved to be needed for acceptance in the field and in addition, regulation seems necessary to implement widespread centralization. In contrast to 'regular clinical cancer research' the results of organizational change studies are likely to be greeted with more scepticism which hinders acceptance and implementation. Studies with solid designs unravelling the mechanisms of organizational aspects and choices (such as centralization) are needed for wider acceptance in the field. It seems inevitable that, once a body of evidence has been established on organizational change that influences professional practice, some form of regulation is needed to ensure widespread implementation.

Acknowledgements

We would like to thank professor dr. S. Horenblas, urologist in the Netherlands Cancer Institute for his valuable advice.

The authors thank the registration team of the Netherlands Comprehensive Cancer Organization (IKNL) for the collection of data for the NCR.

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7

General discussion

General discussion

The relationship between organizational external peer review and outcomes of multidisciplinary cancer care is complex. We investigated the impact of the external peer review programme for multidisciplinary cancer care by establishing four main research questions: (1) How can the impact of external peer review on quality of care be studied methodologically? (2) What is the impact of the programme on the clinical quality of cancer care? (3) What are the experiences of stakeholders and what is the perceived value of the programme? (4) What drives quality related organizational change in cancer care? Each question is addressed in the papers included in this thesis using multiple research methods including a literature review, quantitative and qualitative analyses. The research questions are answered below.

How can the impact of external peer review on the quality of care be studied methodologically?

The research question was triggered by the fact that two literature reviews on the impact of accreditation were not able to make strong claims about the effects of accreditation on the quality of care due to methodological shortcomings and variation in the studies that were included in the reviews (1, 2). Before studying the effects of external peer review we wanted to have a clear view on the methodology needed and what pitfalls to avoid. An extensive literature review was conducted on the methodology of previous studies on the impact of external peer review and accreditation. Our search strategy resulted in an initial number of 2025 articles, of which 50 were included in the review after careful screening. The majority of the studies were performed cross-sectionally (27 studies) and only answered the question whether there were differences between accredited and non-accredited hospitals. A major shortcoming of most of these studies is that the differences can be explained by participation in an accreditation programme but other internal and external factors might just be as likely. To study the programme impact, the added value of the programme needs to be studied. A longitudinal research design is more suited and a dose-response relationship (e.g. hospitals in different phases of accreditation) can also be used to study added value.

There was a difference in studying organization-focussed programmes and service-focussed programmes. We distinguished between healthcare organizations as a whole (organization-focussed) and specific medical specialties or diseases (service-focussed). Studies on organization-focussed programmes tended to study outcome categories such as 'organization', 'quality management' or 'safety measures'. These categories included several variables, e.g. availability of guidelines and protocols, number of readmissions and number of complications. In service-focussed programmes, the studied outcome categories were more clinical (e.g. survival). It seems easier to select specific care-related outcome variables when the programme is directly targeting one specific service or disease. A theoretical framework explaining the results can be used to link outcome variables to the studied programme (especially in organization-focussed

programmes), but we revealed that this is not used frequently.

A general research framework is proposed based on the items that we analysed in each study in our review (see chapter 2). The framework graphically shows what steps should be taken to design an evaluation of an external quality assessment programme. While research in this field will remain difficult because of the variation in programmes and outcomes, the framework can be used to better structure research designs and increase the comparability of studies.

What is the impact of the external peer review programme on the clinical quality of cancer care?

In chapter 3 and 4 we evaluated the impact of the external peer review programme for multidisciplinary cancer care by studying multidisciplinary treatment patterns in colorectal and breast cancer patients. Colorectal and breast cancer were amongst the first types of cancer that required multidisciplinary treatment. We hypothesized that the willingness of a hospital to have external peer review and to follow the recommendations from it, is correlated to the hospital giving higher quality of cancer treatment measured by the introduction of new multidisciplinary therapies (and better survival in our analyses for colorectal cancer patients).

Chapter 3 presents the results of the treatment evaluation of colorectal cancer patients in the Netherlands from 1990 until 2010. There were some indications that external peer review increased process related quality of care. Participation in the peer review programme and the implementation proportion (IP) of recommendations were associated with a higher proportion of stage III colon cancer patients that received adjuvant chemotherapy. For rectal cancer the implementation of recommendations seemed more relevant as patients diagnosed in hospitals with a high IP received preoperative radiotherapy more often. We did not find a difference in the percentage of patients receiving preoperative chemoradiation for T4/M0 rectal cancer related to participation nor to the implementation of recommendations. No relationship could be seen between programme participation and 5-year survival. Our results add extra evidence to the suggestions in previous studies that hospital characteristics play a role in regional and inter-hospital treatment variation in colorectal cancer (3, 4).

As the results in colorectal cancer patients suggested at least some positive influence attributable to the programme we performed a similar study in breast cancer patients (chapter 4). The study population consisted of the same hospitals but to gain more insights in possible regional (confounding) factors, the different regions were studied separately (and not aggregated into one intervention group). Several multidisciplinary treatment patterns were studied: the completeness of breast conserving treatment, introduction of the sentinel node biopsy, radiotherapy after breast conserving surgery for ductal carcinoma in situ, adjuvant radiotherapy

for locally advanced breast cancer (T3/M0 or any T,N2-3/M0), adjuvant chemotherapy for early stage breast cancer (T1-2/N+/M0) and neoadjuvant chemotherapy for T4/M0 breast cancer. No benefits could be established for breast cancer patients being treated in hospitals participating in the programme nor did the extent in which the hospitals implemented the recommendations seem to matter. The study highlighted (large) treatment differences between different regions in the Netherlands even after national guidelines were introduced. This is in line with previous research by van Steenbergen *et al.* (5). The regional differences found in our study imply that locoregional factors exerted a strong impact on the way cancer care is delivered. We could not find consistent evidence of a positive clinical impact in favour of external peer review.

It is possible that, while the impact on clinical outcomes remains doubtful, there is a positive (perceived) impact on other aspects of care that are difficult to measure by using existing (clinical) data.

What are the experiences of stakeholders and what is the perceived value of the programme?

Interviews were conducted with 31 stakeholders (medical specialists, nurses and management representatives) from 15 different hospitals that participated three times in the programme. Positive impact on several aspects of care was perceived, most frequently mentioned were the internal positioning of cancer care, formation and role of the oncology committee and multidisciplinary patient care meetings. Examples of the perceived impact revealed a transferral of responsibilities from individual physicians to multidisciplinary teams consisting of physicians, nursing and supporting personnel. This lead to prioritization of cancer care, improved communication and a central position of cancer care within general hospitals. Interestingly, an important goal for participation is the improvement of clinical care while the programme focusses more on the organization of cancer care. There are known to be two main barriers to effective cancer care coordination; barriers that are a result of ineffective team work and barriers that are the result of inadequate resources (6). Our results especially showed a perceived programme impact on those barriers resulting from ineffective teamwork. Part of the experienced impact could be attributed directly to the programme based on recommendations in the final reports. Interviewees were hesitant to attribute a clinical impact to the programme alone, as many in- and external factors can be of influence. Concerning clinical outcomes, the programme is more likely to have an indirect effect through e.g. better organised multidisciplinary patient care meetings or the introduction of cancer care pathways.

Criticism was raised, especially on the repeated organizational focus and missing links with clinical care (most outspokenly in the self-review phase). In combination with the (perceived) high investments, the acceptance and willingness for external peer review decreased after multiple participations.

What drives quality related organisational change in cancer care?

The results presented in chapters 3, 4 and 5 suggest that, although some positive effects were found in colorectal cancer treatment, external peer review was not a major factor in improving cancer care quality. In general, it is not well understood what drives (aspects of) quality improvement. Therefore, we were interested to see what stimuli are the most effective in changing the cancer care organization in hospitals and on a national level. As an example of organization of care we studied centralization patterns of surgery for oesophagus, pancreas and bladder cancer in the Netherlands and analysed which factors influenced centralization. Centralization of low-volume and highly-complex surgical procedures is probably the best studied form of quality improvement through organizational change. The results in chapter 6 reveal that the first steps were initiated by national scientific evidence. Trends towards further centralization just before and after regulatory impulses imply that official regulation is likely to play a major role. It can be doubted whether scientific evidence alone is sufficient for widespread centralization. For example, centralization of pancreas surgery was slower than oesophagus surgery; unlike for oesophagectomies, between 2004 and 2011 no official or enforced minimum threshold for pancreas surgery existed. This endorses the notion that some form of regulation is required. In contrast to 'regular clinical cancer research' the results of organizational change studies are likely to be greeted with more scepticism as many factors can additionally be of influence. The results from chapter 6 show that it is unlikely to expect widespread organizational change from a voluntary, non-regulated programme such as external peer review.

Methodological considerations

The research presented in this thesis was structured according to the research model we designed in chapter 2 and contained several additional items adding to its scientific rigor. We studied the added value by using a longitudinal design and a dose-response relationship based on the implementation proportion of recommendations from the programme. As we studied a homogeneous study population (colorectal and breast cancer patients) and a service focussed programme we used clinical outcome indicators. Because all hospitals in the intervention regions participated in the programme (even though three did not give permission to use their data), there was no programme participation bias. Hospitals that did not participate in the programme (because the programme was not available in their regions in our study period) were used to create a control group. This created a quasi-experimental study situation. By using the Netherlands Cancer Registry (NCR), non-aggregated data from individual patients could be used. Analyses were corrected for possible confounding factors such as gender, age at diagnosis, year of diagnosis, average hospital volume of diagnoses and presence of an in-hospital radiotherapy department.

The external peer review programme for multidisciplinary cancer care was well documented. Not only were the final reports per hospital available, all the data from the self-reviews and provided

documents was archived. This provided the opportunity to investigate the implementation of recommendations and use it as a proxy of how well a hospital participated instead of only comparing participating and non-participating hospitals. On the other hand, the programme was not designed with the intention to scientifically analyse its effects. More and quantitative data on the (perceived) effects after each review round would have made evaluations easier.

The NCR was the main data source for the studies in chapter 3, 4 and 6. This unique database made it possible to perform longitudinal analyses in large patient groups already starting before the first round of external peer review. Within the NCR clinical administrative data of every newly diagnosed cancer patient in the Netherlands is collected. Topography and morphology are coded according to the International Classification of Diseases for Oncology and staging according to the TNM-classification. Follow-up of vital status is achieved by linking the registry to municipal records. Quality of the data is high and data completeness is estimated to be at least 95% (7, 8). We did not have the possibility of correcting for possible confounding factors such as comorbidity and patient preference. Hospitals in the control group are likely to have introduced changes in their organization too, but we were not aware of similar (peer review) programmes that have been used.

While studying the impact on treatment patterns of colorectal and breast cancer patients, the external peer review programme was necessarily treated as a 'black box intervention'. Even though we optimised our research design based on our literature review in chapter 2, we still look at the intervention in terms of effects and less in how these effects were reached because the exact working mechanism is unknown and numerous other factors influence the quality of cancer care. Firstly, 'black box interventions' comprise the expectation that the intervention will help to improve quality of care. Secondly, they involve a set of assumptions about how and why the programme will bring change (9). Often, these underlying theories are not revealed but remain in the minds of policy makers. On the other hand, it can be argued that a 'black box' evaluation is not a contradiction in terms and outcomes can be evaluated without an explanation (10). Our qualitative study revealed part of the black box. The programme established its effect through an impact on several aspects of healthcare. This lead to prioritization of cancer care, improved communication and a central position of cancer care within general hospitals. External peer review therefore seems to work by stimulating improvement in conditions required for cancer care instead of having a direct impact on the delivery of care.

Advice on the role of external peer review in cancer care

Improving the organization of care seems a justified goal, but it may be questioned whether the effort put into it is justified if no quantifiable clinical benefits can be shown. In this thesis,

we could not find consistent evidence for a positive impact of the organizational external peer review programme on the clinical quality of cancer care. Although some positive effects on colorectal cancer treatment were seen, no programme impact could be demonstrated in breast cancer treatment. Our qualitative study in chapter 5 found a perceived positive impact on several aspects of care, but interviewees were hesitant to contribute (clinical) effects to the programme alone. This lack of consistent evidence for clinical quality improvement and the outed criticism by stakeholders implies that the external peer review programme for multidisciplinary cancer care should not be continued. Concerning the future role of external peer review in cancer care there are two options:

- Changing the design, focus and execution of the programme and incorporating evidence-based clinical performance indicators
- Stop using external peer review for quality improvement of cancer care

Changing external peer review in cancer care

While external peer review has problems in proving its added value, more recently introduced nationwide outcome registrations in the Netherlands were able to show treatment variation and improvement of outcomes over the years (11, 12). In chapter 4 we used outcome indicators for breast cancer as they are used by the National Breast Cancer Audit (NBCA). The NBCA is successful in displaying treatment variation and improvements have been made by reducing this variation. Even though outcome registries have proven their success, there is criticism on the administrative burden and the value of single outcome indicators is debated (13). There are two main concerns about the use of outcome registries to improve healthcare quality. Firstly, single outcome indicators are often overinterpreted, resulting in judgements on the underlying quality of care. External parties in their turn use these judgements for issuing rewards or punishment, e.g. reimbursement by healthcare insurance companies. This leads to a situation in which pursuing the outcomes will become a goal on its own. The danger is that other non-measurable aspects of care will be disregarded and that (too) much of a hospitals financial resources is directed to relatively small parts of cancer care.

Secondly, indicators should be a direct reflection of the quality of care and should not be collected only to show variation. For example, one of the clinical outcomes indicators of the NBCA is direct breast reconstruction after tumour resections (not used in chapter 4). Large inter-hospital variation is measured and even though it might seem better to be treated in a hospital with a high percentage of direct reconstructions, not much is known about the quality of the direct reconstructions. In these cases, inter-hospital variation can also be a marker of the difficulty of using outcome indicators (13). Performance variation, which is the difference between any given result and the optimal or ideal result, is therefore more important than outcome variation to improve quality (14).

If there is to be a role for external peer review in the future of cancer care then it should focus on bridging the gap between 'hard' outcome data and more 'soft' aspects of cancer care delivery. Peer reviewers can interpret the outcome indicators and refer these outcomes to their findings during the site visit as they are more likely to signal any problems in e.g. clinical decision making. Peer review should focus on clinical process measures that are based on scientific evidence (e.g. guideline adherence) as these are a reflection of the performance of the hospital. Chapter 5 shows that there is support for the role of external peer review serving as a bridge between 'hard' and 'soft' data. The interviewees valued the site visits highly and regarded them as the most important part of the programme because of the dialogue that occurs with the review committee. Together with the mentioned suggestions for improvement this implies that stakeholders value an approach that is not overly focussed on standards but with room for autonomy and creativity. Such an approach requires a challenging balance of improvement dynamics with standardization and assurance, but can be used to prevent the perception of external quality assessment programmes as coercive tools of over-standardization (15).

The current emphasis on care pathways can guide future external peer review. This will inevitably lead to external peer review programmes focussing on one type of cancer. Each step in the care pathway of a cancer patient can be reviewed by using 'hard' data and expert review by specially trained peers. An additional advantage of a tumour specific programme is that the peer review committee can be recruited from experts in that field.

Amongst our interviewees, the experienced time investment in the review rounds was rather high. Treatment variation can be used as a starting point for external peer review to further analyse the underlying structures and processes. Existing registries can be used, to reduce the workload of external peer review. National cancer registries can be used as well as a hospitals own documentation (e.g. patient satisfaction surveys and admission and discharge data). This will also increase the possibilities to quantitatively evaluate the impact of the external peer review programme on the quality of care. Another option is to identify the 'outliers' in existing national outcome registries and only invite them for peer review. Reducing the workload is likely to increase acceptance for peer review amongst physicians.

Stopping external peer review for cancer care

If a new role for external peer review can not be realized or if added value can not be demonstrated then the system of external peer review should not be continued in general hospital cancer care. A similar discussion was held in Denmark where the health minister proposed to stop accreditation and phase out their Danish Quality Model in order to improve quality and more importantly, reduce bureaucracy. This general accreditation programme has raised the quality of healthcare but further improvement through accreditation is not deemed to be likely. The model was introduced in 2005 and the decision follows criticism of how much time medical specialists spend on documenting care. While the alternative is yet to be described, a less

bureaucratic system is envisioned with fewer but ambitious targets and with an emphasis on outcomes. Systematic use of data (variation), decision making tools, good governance and financial incentives should put the patient in the centre and stimulate the intrinsic motivation for quality improvement.

Implications for future research

The findings in this thesis have implications for researchers and programme makers in external peer review. The research framework from chapter 2 can be used to structure future research in this field to improve our knowledge on the impact of accreditation and external peer review. More uniformity in research methods and avoiding the pitfalls of research on complex interventions can create a stronger evidence base for external peer review and accreditation.

We strongly recommend that programme makers and researchers join forces. Programme makers should set clear and measurable goals for external peer review. By incorporating clinical outcome indicators in the process of external peer review, this will also increase the possibilities for studying a programme impact. Collaboration between researchers and programme makers is the only way to perform prospective studies. Prospective studies in this field will be a novelty and stronger evidence on the impact of external peer review can be obtained.

One of the main features of external peer review is the use of specially trained peers. An important research objective is how the added value of the peer reviewers can be optimized. Do specially trained peers have added value on top of a more audit-like method using only clinical data? Another interesting research question is whether external peer review should focus on minimum standards or desired levels of care. Only incorporating minimal requirements tends to set the bar too low. It can be argued that any standard, and its corresponding metrics, should be linked to some desired end outcome (16). Setting standards to the desired level of care might keep external peer review challenging in the future.

In chapter 5 we mentioned that we had difficulties in finding management representatives to participate in our interviews. An important reason was the high management turnover. Medical staff seems to be the steady factor in hospitals but it is likely that continuity in management will benefit policy making in cancer care. We did not have enough data to research the impact of high management turnover. Future research should investigate the impact of management turnover on the organization and quality of care.

Overall conclusions

- The evidence from previous studies on the impact of external peer review and accreditation is hampered by methodological limitations. Future studies can be improved by using our general research framework.

- Positive effects were found on the impact of the external peer review programme on multidisciplinary treatment of colorectal cancer patients. Participation in the programme was associated with a higher chance of receiving adjuvant chemotherapy in colon cancer and a higher implementation rate of recommendations was associated with a higher chance of receiving preoperative radiotherapy in rectal cancer. No positive impact of the programme on breast cancer treatment could be demonstrated, regional factors seemed to exert a stronger impact on treatment variation.

- External peer review had a perceived impact on several organizational aspects of care, most importantly the internal positioning of cancer care in a general hospital, formation and role of oncology committee and multidisciplinary patient care meetings. A continuing focus on organizational requirements frustrates healthcare professionals and decreases acceptance for external peer review.

- Some form of regulation is needed for widespread implementation of quality related organizational change.

- If there is to be a role for external peer review programmes in cancer care then they should focus on bridging the gap between 'hard' outcome data and more 'soft' aspects of care. External peer review can be used to analyse the underlying structures of inter-hospital variation.

- External peer review in cancer care should be abandoned if no added value can be demonstrated on top of national outcome registries.

- Future research should expand the evidence base for external peer review, preferably through prospective, (partly) quantitative and care pathway oriented studies.

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8

Summary

Background and aim of the thesis

During the 1980's and 90's, cancer treatment became increasingly multidisciplinary. Adjuvant chemotherapy and radiotherapy transferred cancer treatment from a monodisciplinary responsibility to that of multiple medical disciplines. To improve the quality of multidisciplinary care, eight regional Comprehensive Cancer Organizations were established. They formed networks of healthcare professionals and cancer institutes aiming to improve cancer care through registry, research, guideline development, knowledge exchange and organizational improvement without having a treatment function themselves. In 2011, they fused into the Netherlands Comprehensive Cancer Organization (IKNL). Anticipating the increasing multidisciplinary character of cancer treatment, the Comprehensive Cancer Organization in the North of the Netherlands introduced an external peer review programme in 1994 to review the multidisciplinary organization of cancer care in hospitals. It gradually spread over the country and was eventually used nationwide. The majority of Dutch hospitals has gone through the procedure at least once and in some regions already thrice. The programme initially focussed on organizational requirements for multidisciplinary care. Over time, it evolved and also paid attention to important (inter)national trends such as centralization, but the primary focus remained on the organization of cancer care as a whole (not specific tumour types).

Even though there is almost 20 years of experience with the external peer review programme for multidisciplinary cancer care there is no structured evidence of its effectiveness on quality improvement. This is a more general problem for external peer review and accreditation programmes worldwide and the lack of conclusive evidence has led to many calls for research in this field. The aim of this dissertation was to investigate the impact of the external peer review programme for multidisciplinary cancer care on clinical outcomes and organization. Four main research questions structured the research in this dissertation: (1) How can the impact of external peer review on quality of care be studied methodologically? (2) What is the impact of the programme on clinical quality of cancer care? (3) What are the experiences of stakeholders and what is the perceived value of the programme? (4) What drives quality related organizational change in cancer care?

How can the impact of external peer review on quality of care be studied methodologically?

In **Chapter 2** the results of a literature review on methodological aspects from previous studies on accreditation and external peer review are presented. Only original research papers that studied the impact on the quality of care were included. Out of an initial number of 2025 retrieved references, 50 articles were included and analysed by their methodological characteristics. Wide variation in methodology was observed and with the strengths and weaknesses of these studies we proposed a general research framework. The framework graphically shows what steps

should be taken to design an evaluation study of an external quality assessment programme. While research in this field will remain difficult because of the variety of programmes and outcomes, the framework can be used to better structure research designs and increase the comparability of studies.

What is the impact of the programme on clinical quality of cancer care?

We examined the clinical impact of the external peer review programme for multidisciplinary cancer care on colorectal cancer treatment and survival in **Chapter 3**. Our hypothesis was that the willingness of a hospital to have external peer review and to follow the recommendations from it, is correlated to the hospital giving higher quality of cancer treatment measured by the introduction of new multidisciplinary therapies and survival. Using the Netherlands Cancer Registry, 45705 patients with primary colorectal cancer were included from 23 participating hospitals and 7 controls (1990-2010). Hospitals from the intervention group were dichotomized by their Implementation Proportion (IP) of the recommendations from each peer review (high IP vs low IP). Patients from intervention hospitals more frequently received adjuvant chemotherapy for stage-III colon cancer compared to the controls. T2-3/M0 rectal cancer patients from hospitals with a high IP had a higher chance of receiving preoperative radiotherapy (OR 1.31, 95% CI 1.11-1.55), patients from hospitals with a low IP had a lower chance (OR 0.75, 95% CI 0.63-0.88). There were no differences in the use of preoperative chemoradiation for T4/M0 rectal cancer. Survival was unrelated to the phase of the peer review programme in which the hospital was at time of diagnosis. Although some positive effects of external peer review on cancer care were found, the results needed to be interpreted cautiously due to the ambiguity of the outcomes and possible confounding factors.

Chapter 4 described the results of a similar study in breast cancer patients. Again, the introduction of multidisciplinary therapies was evaluated. Major difference with the previous study was that the hospitals from the two different Comprehensive Cancer Organization regions were not aggregated into one intervention group. By studying these regions separately, more insights were gained in regional (confounding) factors. Investigated treatment modalities were: the completeness of breast conserving therapy, introduction of the sentinel node biopsy, radiotherapy after BCS for ductal carcinoma in situ, adjuvant radiotherapy for locally advanced breast cancer (T3/M0 or any T/N2-3/M0), adjuvant chemotherapy for early stage breast cancer (T1-2/N+/M0) and neoadjuvant chemotherapy for T4/M0 breast cancer. Our results showed regional differences and did not reveal benefits in the multidisciplinary treatment of breast cancer patients being treated in hospitals participating in the programme nor did the extent in which the hospitals implemented the recommendations matter. Regional factors seemed to exert a stronger effect on treatment patterns than hospital participation in external peer review.

What are the experiences of stakeholders and what is the perceived value of the programme?

The perceived role and impact of external peer review in the general hospital setting is presented in **Chapter 5**. Semistructured interviews were held with 31 stakeholders (clinicians, oncology nurses and managers) from 15 general hospitals that participated in three rounds of peer review over a period of 16 years. It could be carefully concluded that the external peer review programme for multidisciplinary cancer care in the Netherlands had a perceived positive impact on several aspects of cancer care. In general hospitals, it helped in the internal positioning of cancer care and improved structures and processes that encourage multidisciplinary teamwork. Our findings suggested that, concerning actual clinical care, external peer review had an indirect impact by influencing the multidisciplinary patient care meetings, numbers of staff etc. Criticism was raised, particularly on the repeated organizational focus and missing links with clinical care (most outspokenly in the self-review phase). As a result, the acceptance of the programme that primarily focused on organizational requirements decreased after multiple participations.

What drives quality related organizational change in cancer care?

External peer review does not seem to be a major factor in improving clinical quality of cancer care. We were interested to see what stimuli are the most effective in changing the cancer care organization in hospitals and on a national level. In **Chapter 6** we studied centralization patterns of surgery for oesophagus, pancreas and bladder cancer as an example of quality improvement through organizational change. The first steps towards centralization were initiated by national scientific evidence. Strong changes in further centralization just before and after regulatory impulses implied that official regulation likely played a major role in widespread centralization. Centralization of pancreas surgery was slower than oesophagus surgery; unlike for oesophagectomies, between 2004 and 2011 no official or enforced minimum threshold for pancreas surgery existed. This endorsed the notion that some form of regulation is required. In contrast to 'regular clinical cancer research' the results of organizational change studies are likely to be greeted with more scepticism as many factors can additionally be of influence. Once a body of evidence had been established on organizational change that influences professional practice, in addition some form of regulation was needed to ensure widespread implementation.

Discussion

Our results suggest that external peer review was not a major factor in improving the quality of cancer care. Improving the organization of cancer care seems a justified goal, but it may be questioned whether the continuous effort is justified if no quantifiable clinical benefits can be

shown over the years. Concerning the future role of external peer review in cancer care we suggested two options:

- Changing the design, focus and execution of the programme and incorporating evidence-based clinical performance indicators
- Stop using external peer review for quality improvement.

If there is to be a role for external peer review in the future of cancer care then it should focus on bridging the gap between 'hard' outcome data and more 'soft' aspects of cancer care delivery. Peer reviewers are more likely to signal any problems in e.g. clinical decision making. External peer review should focus on clinical process measures that are based on scientific evidence (e.g. guideline adherence) as these are a reflection of the performance of the hospital. Care pathways can guide future peer review. Each step in the care pathway of a cancer patient can be reviewed by using 'hard' data and expert review by specially trained peers. This will inevitably lead to external peer review programmes focussing on one type of cancer. Treatment variation can be used as a starting point for external peer review to further analyse the underlying structures and processes.

If a new role of external peer review can not be realised or if added value can not be established, external peer review in cancer care should be stopped. For future research purposes, we strongly recommend that programme makers and researchers join forces. Programme makers should set clear and measurable goals for external peer review. By incorporating clinical outcome indicators in the process of external peer review, this will also increase the possibilities for studying a programme impact. Collaboration between researchers and programme makers is the only way to perform prospective studies. Prospective studies in this field will be a novelty and stronger evidence on the impact of external peer review can be obtained.

Samenvatting

Achtergrond en doel van het proefschrift

De zorg voor patiënten met kanker werd in de jaren 80 en 90 van de vorige eeuw steeds meer een multidisciplinaire verantwoordelijkheid door een toename van gecombineerde behandelingen (zoals chirurgie met aanvullende chemotherapie) en grotere aandacht voor de psychosociale gevolgen. Om de kwaliteit van de multidisciplinaire kankerzorg te verbeteren werden de Integrale Kanker Centra opgericht (IKC's). Voor de fusie tot een landelijke organisatie in 2011 (Integraal Kankercentrum Nederland, IKNL) waren er acht regionale IKC's. De IKC's behandelden zelf geen patiënten maar vormden netwerken van ziekenhuizen en zorgprofessionals met als doel om de zorg te verbeteren door middel van registratie, onderzoek, richtlijnontwikkeling, kennisuitwisseling en organisatieverbetering. Een belangrijk programma om de organisatie van kankerzorg in ziekenhuizen te verbeteren was het visitatieprogramma voor multidisciplinaire kankerzorg. Dit programma werd in 1994 geïntroduceerd door het Integraal Kankercentrum Noord en verspreidde zich gestaag over heel Nederland. Een meerderheid van de Nederlandse ziekenhuizen heeft ten minste één keer deelgenomen en een groot deel zelfs al drie keer.

Het visitatieprogramma richtte zich in eerste instantie op de organisatorische vereisten voor multidisciplinaire kankerzorg in ziekenhuizen. Door de jaren heen werd het verder ontwikkeld en werd er ook aandacht besteed aan belangrijke (inter)nationale thema's zoals centralisatie en zorgpaden. De primaire focus bleef echter op de organisatie van zorg. Ondanks ruim 20 jaar ervaring met dit programma was er geen (wetenschappelijk) bewijs voor een daadwerkelijke verbetering van de organisatie of kwaliteit van kankerzorg. Dit is een algemeen probleem voor alle visitatie- en accreditatieprogramma's en het gebrek aan bewijs heeft wereldwijd geleid tot een grote vraag naar studies naar de effecten van dit soort programma's.

Het doel van dit proefschrift was om de impact van het visitatieprogramma voor multidisciplinaire kankerzorg op de organisatie van zorg en klinische uitkomsten te bestuderen. Het onderzoek in dit proefschrift is gestructureerd door middel van vier onderzoeksvragen: (1) Hoe kan de impact van visitaties op de kwaliteit van zorg methodologisch het best bestudeerd worden? (2) Wat is de impact van het programma op de klinische kwaliteit van zorg? (3) Wat zijn de ervaringen van zorgprofessionals met het programma? (4) Wat zijn de drijfveren voor kwaliteitsverbetering door middel van organisatorische veranderingen in de zorg?

Hoe kan de impact van visitaties op de kwaliteit van zorg methodologisch het best bestudeerd worden?

In **Hoofdstuk 2** worden de resultaten gepresenteerd van een literatuurreview naar de methodologische aspecten van studies naar de impact van visitatie en accreditatie. Het doel was om meer inzicht te krijgen in de methodologische sterke en zwakke punten van deze studies om een algemeen onderzoeksmodel te maken. Er werd gezocht in de Pubmed/Medline, Embase en Web of Science databases. Alle artikelen waarin de impact van een visitatie- of accreditatieprogramma op de kwaliteit van zorg werd bestudeerd werden geïncludeerd. Deze zoekstrategie leverde 2025 artikelen op waarvan er na uitgebreide screening 50 werden geselecteerd voor de definitieve analyse. De resultaten toonden een grote variatie in gebruikte methodologie en met de sterke en zwakke punten van deze onderzoeken werd een algemeen onderzoeksmodel ontwikkeld. Met dit model kunnen nieuwe studies naar de impact van visitatie- of accreditatieprogramma's worden ontworpen. Onderzoek in dit veld zal methodologisch moeilijk blijven vanwege de grote verschillen in programma's en uitkomstmaten maar het onderzoeksmodel kan helpen om toekomstig onderzoek beter te structureren. Dit vergroot de betrouwbaarheid van de resultaten en bevordert de vergelijkbaarheid van studies.

Wat is de impact van het visitatieprogramma op de klinische kwaliteit van zorg?

De impact van het visitatieprogramma op de behandeling en overleving van patiënten met colorectaalcarcinoom is beschreven in **Hoofdstuk 3**. De hypothese was dat de bereidheid van een ziekenhuis om visitatie te ondergaan en de aanbevelingen te implementeren correleert met een hogere kwaliteit van kankerzorg, gemeten door de introductie van nieuwe multidisciplinaire behandelingen en overleving. Alle patiënten met colon- of rectumcarcinoom uit 23 aan de visitaties deelnemende ziekenhuizen uit twee IKC regio's zijn geïncludeerd (interventiegroep). Dit zijn de twee IKC regio's met de meeste ervaring met het programma (drie visitatierondes). Een controlegroep werd samengesteld met patiënten uit zeven ziekenhuizen uit regio's waar het visitatieprogramma niet beschikbaar was in de studieperiode (1990-2010). De Nederlandse Kanker Registratie (NKR) leverde patiënt-, tumor- en behandelgegevens. De interventieziekenhuizen werden onderverdeeld in twee groepen gebaseerd op de implementatiegraad van de aanbevelingen van het programma (hoge implementatiegraad vs. lage implementatiegraad). In totaal werden er 45705 patiënten geïncludeerd. Patiënten met stadium III coloncarcinoom die behandeld werden in ziekenhuizen die deelnamen aan het visitatieprogramma kregen vaker aanvullende chemotherapie ongeacht de implementatiegraad van de aanbevelingen. Bij T2/T3 rectumcarcinoom was er wel verschil op basis van de implementatiegraad. Patiënten uit ziekenhuizen met een hoge implementatiegraad van de aanbevelingen ontvingen vaker aanvullende radiotherapie (OR 1.31, 95% CI 1.11-1.55) in

vergelijking met de controlegroep, terwijl in ziekenhuizen met een lage implementatiegraad minder vaak aanvullende radiotherapie werd gegeven (OR 0.75, 95% CI 0.63-0.88). Er werden geen verschillen geobserveerd in de toediening van neoadjuvante chemotherapie voor patiënten met T4/M0 rectumcarcinoom. De 5-jaarsoverleving was niet gerelateerd aan de fase van het programma waarin het ziekenhuis zich bevond ten tijde van de diagnose.

Ondanks dat er positieve effecten van visitatie op de behandeling van patiënten met colorectaalcarcinoom werden gevonden waren deze niet consistent en moeten de resultaten derhalve voorzichtig worden geïnterpreteerd, temeer omdat er mogelijk andere factoren van invloed zijn geweest op de uitkomsten.

Hoofdstuk 4 geeft de resultaten weer van een soortgelijke studie onder borstkankerpatiënten. Wederom werd de introductie van nieuwe multidisciplinaire behandelingen bestudeerd. Het grote verschil met de studie in hoofdstuk 3 is dat de ziekenhuizen uit de twee verschillende IKC regio's niet zijn samengevoegd in één interventiegroep. Door de verschillende regio's apart te bestuderen kon meer inzicht in de regionale variatie worden verkregen. De bestudeerde nieuwe behandelingen waren: radiotherapie na borstsparende chirurgie voor ductaal carcinoma in situ, adjuvante radiotherapie voor lokaal uitgebreide borstkanker (T3/M0 of elke T/N2-3/M0), adjuvante chemotherapie voor vroeg stadium borstkanker (T1-2/N+/M0) en neo-adjuvante chemotherapie voor T4/M0 borstkanker. Daarnaast werd de compleetheid van borstsparende therapie en de introductie van de schildwachtklierprocedure bestudeerd. In totaal werden 63516 vrouwelijke borstkankerpatiënten geïncludeerd uit de NKR (1990-2010). De resultaten toonden regionale variatie in de behandeling van borstkanker en introductie van nieuwe multidisciplinaire therapieën. Een positief effect van het meedoen aan het visitatieprogramma of een hoge implementatiegraad van de aanbevelingen kon niet (consistent) worden aangetoond. Regionale factoren lijken daarmee een belangrijkere factor voor de gevonden variatie dan deelname aan het visitatieprogramma.

Wat zijn de ervaringen van zorgprofessionals met het visitatieprogramma?

De ervaren rol en impact van het programma worden beschreven in **Hoofdstuk 5**. Semi-gestructureerde interviews werden gehouden met 31 professionals (artsen, verpleegkundigen en managers) uit 15 verschillende ziekenhuizen die elk drie keer deelnamen aan het visitatieprogramma. Een positieve impact van het programma werd ervaren op meerdere aspecten van de zorg zoals de positionering van kankerzorg in de ziekenhuisorganisatie en het verbeteren van structuren en processen die multidisciplinair samenwerken ondersteunen. De impact op de klinische kwaliteit van zorg is indirect en wordt bereikt door het beïnvloeden van bijvoorbeeld zorgpaden, MDO's en personeelsbezetting.

Er was veel kritiek op het programma, met name op de terugkerende organisatorische focus, hoge tijdsinvestering en de ontbrekende directe link met klinische zorg (vooral in de zelfevaluatie). Het gevolg hiervan is dat de acceptatie voor het programma afneemt na meerdere deelnames en een nieuwe deelname door een meerderheid niet zinvol wordt geacht.

Wat zijn de drijfveren voor kwaliteitsverbetering door middel van organisatorische veranderingen in de zorg?

Zoals de resultaten van de voorgaande hoofdstukken laten zien is visitatie geen sterk middel om de (klinische) kwaliteit van zorg aanwijsbaar en op lange termijn te verbeteren. In **hoofdstuk 6** werd daarom onderzocht welke stimuli het meest effectief zijn in het bewerkstelligen van kwaliteitsverbetering door middel van organisatorische veranderingen. De concentratiepatronen van oesophagus-, pancreas- en blaaschirurgie werden bestudeerd. Concentratie van laagvolume-hoogcomplexe chirurgie is de best bestudeerde vorm van kwaliteitsverbetering door organisatorische verandering. Door de jaren heen hebben talrijke studies aangetoond dat een hoger behandelvolume correleert met een hogere kwaliteit van zorg. Tijdlijnen van de concentratie van oesophagus-, pancreas- en blaaschirurgie werden geplot en belangrijke stimuli (o.a. wetenschappelijk bewijs, richtlijnen, regulatie) hierin weergeven. De eerste stap naar concentratie van chirurgie werd gezet na de eerste nationale wetenschappelijke publicaties. Sterke toename van concentratie net voor en na officiële handhaving van volumenormen impliceert dat regulatie een belangrijke rol speelt. Concentratie van pancreaschirurgie vond later plaats dan oesophaguschirugie. In tegenstelling tot oesophagectomieën bestond er tussen 2004 en 2011 geen officiële volumenorm voor pancreatectomieën. Het belang van officiële handhaving wordt hierdoor verder onderstreept. In tegenstelling tot klinisch onderzoek worden de resultaten van studies naar organisatorische verandering met meer scepsis bekeken. Daarnaast spelen er meerdere professionele en financiële belangen bij drastische organisatorische veranderingen. De resultaten in hoofdstuk 6 tonen dat als er eenmaal een basis van (nationaal) wetenschappelijk bewijs is gevormd dat aanvullende officiële handhaving nodig is voor wijdverspreide implementatie van volumenormen. Daarnaast suggereren de resultaten dat een vrijwillig visitatieprogramma zonder aanvullende handhaving waarschijnlijk geen drastische organisatorische veranderingen zal kunnen bewerkstelligen.

Discussie

De resultaten in dit proefschrift laten zien dat visitatie geen sterk middel is om de kwaliteit van de oncologische zorg in ziekenhuizen aanwijsbaar en op lange termijn te verbeteren. Verbeteren van de organisatie van zorg is een doel op zich, maar het mag betwijfeld worden of de voortdurende investeringen van tijd en geld te verantwoorden zijn als er geen klinische effecten meetbaar zijn. Betreffende de toekomstige rol van visitaties zijn er twee opties:

- Veranderen van de opzet, focus en uitvoering van het programma en gebruik maken van wetenschappelijk onderbouwde prestatie-indicatoren
- Stoppen met visitaties in de oncologie.

Als er een rol is voor visitatie in de toekomst van de kankerzorg dan moet een programma fungeren als brug tussen 'harde' klinische uitkomstdata en de 'zachte' processen die hier aan ten grondslag liggen. Om de voorbereidingstijd te verminderen is het aan te raden gebruik te maken van reeds bestaande uitkomstregistraties. Variatie in de geleverde zorg zoals aangetoond in de hoofdstukken 3, 4 en 6 kan fungeren als uitgangspunt. De rol van de visitator ligt vervolgens in het herkennen van problemen en verbeterpunten in klinische processen zoals bijvoorbeeld de totstandkoming van klinische besluiten. De huidige focus op zorgpaden kan gebruikt worden om elke stap in het zorgproces van een patiënt te beoordelen. Dit leidt onvermijdelijk tot een tumorspecifieke visitatie. Aanvullend voordeel hiervan is de mogelijkheid om experts in elk tumorgebied aan te stellen als visitator.

Als een nieuwe rol voor visitaties zoals hierboven beschreven niet gerealiseerd kan worden of als een positieve impact hiervan niet kan worden bewezen dan dient visitatie voor oncologische zorg gestopt te worden.

Voor toekomstig onderzoek is het van groot belang dat de ontwikkelaars van visitatieprogramma's samenwerken met onderzoekers. Organisatorische en klinische uitkomstindicatoren moeten vooraf worden vastgesteld om het effect van het programma te beoordelen. Samenwerking tussen programma ontwikkelaars en onderzoekers is de enige manier om prospectieve studies op te zetten. Prospectieve studies zouden een unicum zijn in dit onderzoeksgebied en een welkome aanvulling op het huidige wetenschappelijk bewijs.

9

Dankwoord

Dankwoord

9 December 2013: Ergens in een bus tussen Pnomh Penh en Siem Reap, Cambodja: Na een lange dag reizen die begon aan de kust in Sihanoukville en zou eindigen in Siem Reap, dicht bij de tempels van Angkor, check ik uit verveling nog maar een keer mijn mail op mijn telefoon. In die gammele Cambodjaanse bus lees ik dat mijn eerste artikel geaccepteerd wordt door het British Journal of Cancer.

31 December 2013: Luang Prabang, Laos: Op mijn laptop bekijk ik de proofs van het artikel en geef nog enkele wijzigingen door. Na 3 jaar is de eerste publicatie dan bijna een feit!

Op reis door Zuidoost-Azië na drie jaar promotieonderzoek werden de eerste resultaten van mijn promotietraject tastbaar. Promoveren is op zichzelf ook als een lange reis waarin je gaandeweg je rugtas vult met kennis en nieuwe ervaringen. In de afgelopen jaren heb ik veel geleerd over onderzoek, schrijven en ook over mijzelf. Een reis als deze maak je nooit alleen en graag wil ik al mijn 'reisgenoten' bedanken:

In de eerste plaats gaat mijn dank uit naar mijn promotoren: prof. dr. Wim van Harten en prof. dr. Sabine Siesling. Beiden wil ik bedanken voor de fijne samenwerking. Ik heb het gewaardeerd om vrijgelaten te worden en op de juiste momenten weer een zetje in de goede richting te krijgen. Wim, jouw inhoudelijke en wetenschappelijke kennis bleken van grote waarde. Je bent analytisch sterk en wist vaak met enkele vragen en adviezen tot de kern te komen. Onze afspraken sloot je steevast af met de zin: "Kun je hier verder mee?" en ik ben dan ook nooit weggegaan zonder ideeën voor nieuwe analyses of aanpassingen aan een artikel. Onlangs ben je in Arnhem aan een nieuwe uitdaging begonnen, ik wens je hierbij alle succes. Sabine, of moet ik voor deze keer SaBine schrijven? Je mails lezen soms als een syntax die ik door de jaren heen steeds beter heb leren te ontcijferen. Hartelijk dank voor alle adviezen en enthousiaste begeleiding. In september werd je hoogleraar op de Universiteit Twente en in je oratie liet je je ambitie blijken, ik ben erg benieuwd naar alles wat er nog komen gaat!

Renée Otter, als voormalig directeur van het IKNO was jij de initiator van dit promotietraject, daarnaast was jij de grondlegger van het visitatieprogramma dat centraal staat in dit proefschrift. Helaas is door de fusie je rol vervaagd maar desondanks wil ik je bedanken voor alle adviezen.

De beoordelingscommissie: prof. dr. A. Boer, prof. dr. P.C. Huijgens, prof. dr. M.J. IJzerman, prof. dr. N.S. Klazinga, prof. dr. J.A.M. van der Palen en Prof. dr. R.A.E.M. Tollenaar, hartelijk dank dat jullie mijn manuscript wilden lezen en beoordelen.

Het IKNL wil ik bedanken voor de mogelijkheid om dit promotietraject af te ronden en de ondersteuning die ik hierbij heb mogen ontvangen. Ik bedank alle collega's, met name van de afdeling onderzoek, voor de prettige samenwerking.

In het bijzonder wil ik bedanken dr. Boukje van Dijk, mijn kamergenoot in Groningen. Boukje, jij hebt mij veel geleerd over onderzoek, statistiek en STATA. Je bent een rasonderzoeker met grote kennis van epidemiologie en statistiek. Van dichtbij heb ik gezien hoe jij je eigen 'area of expertise' hebt opgebouwd en hierin ook steeds zelfbewuster werd. De zorg mag zich in haar handen knijpen met onderzoekers zoals jij!

Graag wil ik alle registratiemedewerkers bedanken die dagelijks in de ziekenhuizen in Nederland gegevens van kankerpatiënten registeren voor de Nederlandse Kanker Registratie. Jullie werk is de basis voor heel veel wetenschappelijk onderzoek en daarmee zo ongelofelijk belangrijk.

Zonder namen te noemen, bedank ik al mijn vrienden die mij in de afgelopen jaren hebben gesteund of juist de druk van de ketel haalden.

Harmen en Berend, in vervlogen tijden koos je je sterkste vrienden als paranimf voor het geval de verdediging op een handgemeen uitdraaide. De keuze voor jullie is daarom vanzelfsprekend. Van onze studententijd in Groningen naar stapavonden in verre steden als Praag, Skopje, Riga en Zagreb tot après-ski in Macedonië. Het is mooi om nu ook op een beschaafde gebeurtenis schouder aan schouder te staan.

Mijn familie. Iris, grote zus, ik had je nog bijna ingehaald maar uiteindelijk promoveerde jij 1 maand eerder dan ik. Je hebt een topprestatie geleverd met het combineren van je promotie en je specialisatie tot radioloog. Ik ben supertrots op je. Jeroen, alweer bijna 2 jaar samen met Iris en ondanks je drukke leven altijd van de partij. Bedankt voor de gezelligheid en je wijnadviezen.

Mijn grote dank gaat uit naar mijn ouders. Papa, mama, dankzij jullie hebben Iris en ik een prachtleven waarin we altijd hebben kunnen doen wat we wilden. Jullie hielden ons voor dat als je je ergens voor inzet dat je alles kunt bereiken. Wie had gedacht dat dit tot twee promoties in een maand zou leiden! Dit proefschrift was er zonder jullie dan ook nooit geweest. Bedankt voor jullie onvoorwaardelijke support en liefde.

Schoonouders, schoonzussen en aanhang: bedankt voor de interesse, steun en gezelligheid.

Lieve Janneke, alles is liefde.
Als coassistenten in Enschede werden we verliefd. Via Groningen zijn we weer terug waar alles begon. Ik kan mij geen leven zonder jou voorstellen. Je bent lief, slim en ontzettend grappig, hoewel ik dat laatste niet altijd zal toegeven. Ik heb grote bewondering voor de bevlogenheid waarmee je jouw werk als SEH-arts KNMG uitvoert. Na mijn promotie mag je dan eindelijk los, tijd voor een volgend feestje, gezamenlijk!

Lieve, lieve Lotte, door jou is al het andere onbelangrijk. Ik verheug mij op alle dingen die gaan komen. Je bent mijn alles.

10

Curriculum Vitae

Curriculum Vitae

Melvin Jorrit Kilsdonk was born on September 3rd 1985 in Zwolle, the Netherlands. He attended secondary school at the Van der Capellen Scholengemeenschap in Zwolle and received his VWO diploma in 2003. The same year he started studying medicine at the University of Groningen. During his study, Melvin worked as a kidney perfusionist during outtake and transplantation procedures for the European multicentre trial on kidney preservation. After internships at the University Medical Centre Groningen and Medisch Spectrum Twente in Enschede he carried out his final internship at the department of Ear, Nose and Throat surgery at the University Medical Centre St. Radboud, Nijmegen. He wrote his master thesis at the same department on patient logistics in head and neck cancer. This triggered his enthusiasm for healthcare policy and quality of care. After obtaining his medical degree in 2009 he started working as a registrar in ENT surgery at the University Medical Centre Groningen. As this did not bring the fullfillment he was looking for, he resigned and began working on the PhD project resulting in this thesis. During the last two years, the PhD project was combined with his job as a medical doctor in eldery care (Zorggroep Sint Maarten) and rehabilitation medicine (Roessingh Centrum voor Revalidatie/Medisch Spectrum Twente).

Passionate about sports and football in particular, Melvin co-founded indoor-football club A.S. Exstudiantes Groningen in 2010 and was a boardmember from 2010 until 2013. At present, the club has spin-offs in Utrecht, Amsterdam and Zwolle.

Melvin is engaged to Janneke Wolters, they have one daughter: Lotte Catharina (2015).