Quality assurance in breast cancer care and breast implant surgery

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CHAPTER 10

General Discussion and Future Perspectives

GENERAL DISCUSSION

There are several reasons why national clinical quality audits can and should help us in the provision of good quality of care:

1. *Quality Assurance and Patient Safety:* Participation in quality improvement initiatives, with continuous quality measurement and benchmarked feedback of data, reveals opportunities to improve health care, decreases unintended variation and eventually might improve the value of healthcare delivery.[1,2]
2. *Scientific importance:* The outcomes of 'real world' medical practice data are becoming of increasing practical and scientific importance.[3] By using nationwide clinical data, the actual applicability of important findings of biomedical and clinical research can be evaluated according to daily practice.
3. *Shared decision making:* Patients want to know the quality of care they are about to receive. And, shared decision making is becoming increasingly important in achieving patient-centered care. Dynamic clinical data mining can be used to provide real-time decision support.[4]
4. *Cost-effectiveness*: Health care systems costs in developed countries are rising, in part due to the introduction of advanced medical technology, pharmaceutical disbursement as well as growing cancer burden.[5] Clinical audits can function as a quality instrument to increase the efficiency of care, and therefore as a tool to reduce costs.[6]

Quality assurance in breast cancer care

The main purpose of a national clinical quality audit is to provide healthcare providers with reliable, benchmarked information on structure, process and outcome parameters. We have shown that the NABON Breast Cancer Audit (NBCA) has reached that goal and is continuously working on exploring this purpose even more.[7] In five years' time, all hospitals reached the predefined standards for the management of breast cancer in the Netherlands; e.g. 'more than 90% of patients being discussed in the multidisciplinary meetings', 'more than 90% of patients with a standard defined pathology report', and 'less than 15% of patients with involved margins for invasive breast cancer'. This demonstrates that guideline adherence has been improved and a multidisciplinary approach is widely adopted in the Netherlands.

Producing meaningful quality indicators that inform clinicians is essential in the support of benchmarked feedback. The current quality indicator set of the NBCA predominantly consists of quality process indicators, covering different aspects of the multidisciplinary care path for breast cancer patients, from diagnostic work-up to different treatment options. Two types of quality process indicators can be distinguished: **I.** Quality indicators that measure compliance with clinical guidelines with the aim to improve adherence to guidelines and reduce variation in delivered care **II.** Quality indicators that monitor the implementation of new treatment modalities and techniques, where variation is expected.

Figure 1 shows examples of different quality process indicators and their trends in time, indicating the relevance of a particular indicator for quality improvement. An increase or decrease on a nationwide level on a quality indicator represents its adoption as a component in the multimodality care of breast cancer. In addition, decreasing inter-hospital variation reflects the process of implementation.

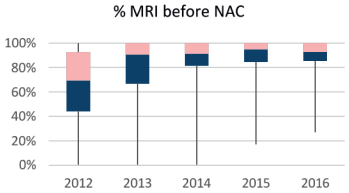

Figure 1A. The use of Magnetic Resonance Imaging – scan (MRI) before the start of Neoadjuvant Chemotherapy (NAC) in invasive breast cancer; an upward trend ↑ and decreasing variation ↓.

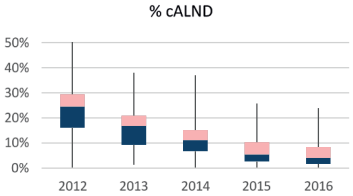

Figure 1B. The use of a completion axillary lymph node dissection (cALND) in cT1-2N0* sentinel node-positive breast cancer; a decreasing trend ↓ and decreasing variation ↓.

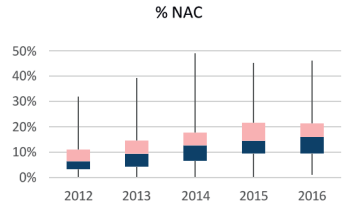

Figure 1C. The use of Neoadjuvant Chemotherapy (NAC) in invasive breast cancer; an upward trend ↑ and a constant range of variation X.

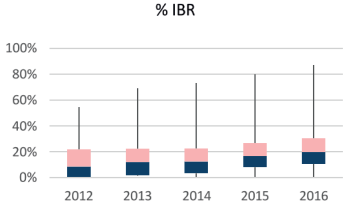

Figure 1D. The use of immediate breast reconstruction (IBR) in invasive breast cancer; an upward trend ↑ and a constant range of variation X.

Examples of *Type I indicators* are a. 'the use of a Magnetic Resonance Imaging scan (MRI) before the start of Neoadjuvant Chemotherapy (NAC)' and b. 'the omission of a completion axillary lymph node dissection (ALND) in clinical early-stage sentinel node-positive breast cancer patients'. Both these indicators are based on clear recommendations in the Dutch guideline. An upward (1A), respectively downward (1B) trend in combination with decreasing variation is shown, representing an improvement of guideline compliance for both the use of MRI before NAC as well as the omission of ALND in patients with a positive sentinel node.

In figure 1 c and d, 'the use of NAC' and 'the use of immediate breast reconstruction (IBR) after mastectomy' in invasive breast cancer –are depicted as examples of *Type II indicators*; as evidence from research studies has not yet been included in the national guideline. Despite an upward trend on a nationwide level, the routine of application of these modalities remains different between hospitals; as being shown by a persisting wide variation.

Although the general trend in breast cancer treatment in the Netherlands shows an improvement of the quality of care and a rapid adaptation of new study results, transparency on inter-hospital variation may increase the exposure to new approaches, in particular for treatment modalities without a set standard (yet). Where national guidelines are rigid, feedback from clinical audits could be interpreted as a 'dynamic guideline' that provides new insights and reduces unintended clinical practice gaps.

Today, the challenge of the NBCA is to move beyond a national benchmark mainly centered on process information to a national breast cancer audit centered on outcomes, including composite measures and patient-reported outcomes (PROMs), that visualizes the actual results of care. This approach is complex, and can only occur with continuous evaluation of the given quality indicators, and to redefine and test potential new quality indicators with the support of data over time. In the meantime, quality process indicators may still be relevant in improving the more rapid implementation of innovates.

Scientific importance

Furthermore, a national clinical quality audit provides complete information on clinical care and outcomes, with the inclusion of patients that do not fit within the inclusion criteria of clinical trials. The database of the NBCA consists of an amount of data and any person or hospital who is involved in the NBCA audit can submit a research question. This has led to a scale of scientific research, of which the most important studies are shown in **table 1**. In particular, nationwide studies on the use of MRI, the use of neoadjuvant systemic treatment, surgical management of the breast, axillary lymph-node management, the prognostic value of the 70-gene signature (70-GS) and the use of boost irradiation have been conducted.

This thesis includes the results of one of the largest nationwide studies demonstrating a trend of more breast-conserving surgery (BCS) after NAC (chapter 5). Moreover, this study confirms that clinicians in the Netherlands are increasingly able to perform 'BCS after NAC' while maintaining good surgical outcomes (including margins and re-excision rates), compared to primary BCS.

Another notable finding in this thesis is the downward trend in the use of an axillary lymph node dissection (ALND) in cT3-4N0M0 sentinel node-positive breast cancer patients (chapter 6). While no randomized trials have been published before to justify less extensive axillary surgery in this group of patients, this study reflects the confidence of clinicians in the concept that not every positive axillary sentinel lymph node will develop into clinical detectable axillary disease.

Though these are promising results, however, the reliability of this developmental data is limited by the retrospective nature and missing data on follow-up. Therefore, we recommend that future research should include epidemiological sound data and patient-reported outcomes (e.g. quality of life, functional and cosmetic outcomes), in order to provide more meaningful outcomes that matter to patients.

Table 1. Studies on trends and causes of inter-hospital variation, supported by NBCA data (2015-2018)

Discipline		Publications
Radiology	1	M.B.I. Lobbes. *Breast MRI increases the number of mastectomies for ductal cancers but decreases them for lobular cancers.*
	2	I.J.H. Vriens. *Breast MRI use in patients undergoing NAC is associated with fewer mastectomies in large ductal cancers but not in lobular cancers.*
Surgery	3	P.E.R. Spronk. *Breast-conserving therapy after neoadjuvant chemotherapy; data from the Dutch Breast Cancer Audit.*
	4	I.G.M. Poodt. *Trends on Axillary Surgery in Nondistant Metastatic Breast Cancer Patients Treated Between 2011 and 2015. A Dutch Population-based Study in the ACOSOG-Z0011 and AMAROS Era.*
Plastic Surgery	5	A.C.M. van Bommel. *Large variation between hospitals in immediate breast reconstruction (IBR) rates after mastectomy for breast cancer in the Netherlands.*
	6	K. Schreuder. *Hospital organizational factors affect the use of IBR after mastectomy for breast cancer in the Netherlands.*
	7	K. de Ligt. *The effect of being informed on receiving IBR in breast cancer patients.*
	8	A.C.M. van Bommel. *Discrepancies between surgical oncologists and plastic Surgeons in patient information provision and personal opinions towards IBR.*
Radiotherapy	9	K. Schreuder. *Variation in the use of boost irradiation in breast-conserving therapy in the Netherlands: The effect of a national guideline and confounding factors.*
Systemic	10	A. Kuijer. *Using a gene expression signature when controversy exists regarding the indication for adjuvant systemic treatment reduces the proportion of patients receiving adjuvant chemotherapy.*
treatment	11	A. Kuijer. *Factors Associated with the Use of gene-expression profiling (GEP) in Estrogen Receptor-Positive Early-Stage Breast Cancer Patients.*
	12	K. Schreuder. *Impact of GEP in patients with early breast cancer, when applied outside the guideline, directed indication area.*
	13	P.E.R. Spronk. *Variation in the use of neoadjuvant chemotherapy in patients with stage III breast cancer: results of the Dutch Breast Cancer Audit.*
	14	P.E.R. Spronk. *Current decisions on neoadjuvant chemotherapy for early breast cancer: Experts' experiences in the Netherlands.*
	15	I.G.M. Poodt. *The administration of adjuvant chemo(-immuno) therapy (AC) in the post ACOSOG-Z0011 era; a population-based study.*
	16	K. de Ligt. *Patients' experiences with decisions on timing of chemotherapy for breast cancer.*

Shared decision making

Multiple determinants might attribute to unintended inter-hospital variation;

- patients' preferences
- clinicians' preferences
- the organizational context

An example of a treatment modality without a predefined standard is the use of neoadjuvant chemotherapy (NAC) for breast cancer. Despite an international trend of increasing implementation for NAC, considerable variation in the use of NAC remains between hospitals [this thesis].

Patients' preference

Where in earlier years the patient was happy with a doctor who decided the best treatment plan; nowadays, patients' preference and the level of shared decision-making are important factors in clinical decision making, especially in breast cancer care. There are multiple factors affecting patients' considerations, including information related to treatment efficacy and toxicity, prior experience with the treatment, quality of life during or after treatment, opinion of their care provider and of partner or family preference.[13] However, as described in chapter 4, the results of our study revealed that the need to make a treatment decision on NAC was found to be made explicit in only a small number of patients, and there remains room for improvement in the delivery of shared-decision making.

Clinicians' opinions exert one of the most powerful influences over patients' preferences.[14] In order to meet the needs of patients with cancer and their families, the system should be oriented to the provision of 'patient-centered care'. As defined by the Institute of Medicine: *"Patient-centeredness is providing care that is responsive to individual patient preferences, needs, and values and ensuring that patient values guide all clinical decisions"* [15]. As a component of patient-centered care, structured decision aids have been advocated to help patients become active participants in making treatment choices.[16] In the future, NBCA data may contribute to providing more individualized information about treatment options.

Clinicians' preferences

Whether a patient is a candidate for chemotherapy (NAC or AC) depends on multiple factors; e.g. our ability to preoperatively estimate the change on a pathological complete response. The results of our survey among specialists confirm that clinicians' considerations on NAC differ significantly (chapter 3). In particular opinions on the surgical management following NAC were inconclusive. The restraint to perform BCS after NAC may arise from the challenge for surgeons to determine the extent and original location of the residual lesion after NAC. Another possible contributing aspect is the concept of accessibility and proximity.[8] Similar to other choices made with equivocal information, clinicians may satisfice by choosing an advice source who is known. Again, this highlights the importance of continuous up-to-date feedback on new treatment modalities.

The organizational context

Non-clinical influences may play an important role either in the adoption of new treatment modalities; such as the interaction within a professional community and features of clinical practice such as local management policies. Clinicians are more likely to be early adopters if they are actively involved in the medical community.[9,10] It creates more awareness among physicians and it narrows the gap between the best available evidence and current practice. Of notice, we observed a significantly higher use of NAC in hospitals participating in neoadjuvant clinical studies [this thesis]. Also, companies can influence physicians in certain ways; for example by arranging interaction with a pharmaceutical representative, funding physicians for travel or attending educational symposia as well as providing research funding.[11,12]

Quality assurance and Patient safety in breast implant surgery

Breast implants are routinely used for breast augmentation. In the Netherlands, an estimated of more than 11.000 implants are annually inserted for cosmetic reasons.[17] Moreover, improved outcomes of breast cancer have resulted in a growing number of breast cancer survivors, who choose for reconstructive surgery of the breast following mastectomy.[18,19] Implant-based breast reconstruction is the most commons means of reconstructive surgery. Compared to a reconstruction with autologous tissue, the advantages of and implant-based breast reconstruction are the short operative time, lack of donor-site morbidity, and quicker return to normal life activities.[20] According to the NBCA audit, an estimate of 10% of patients with invasive breast cancer received a mastectomy followed by an immediate breast implant reconstruction in the Netherlands in 2016.[21]

Despite the increase in implant procedures, there are currently no reliable or epidemiologically sound data to measure implant performance. Therefore, the main purpose of the Dutch Breast Implant Registry (DBIR), founded in 2015, is to provide sufficient data on breast implant surgery, to address potentially serious complications such as implant removal, reoperation, and rupture or deflation of the implant. Moreover, the registry can be used as a track-and-trace system in case of an implant recall. Patients with the implant(s) of interest can be identified and hospitals can be addressed to prevent further implantation of faulty devices. An example of this is the recent withdrawal from the market of Silimed implants after German health officials found that the surfaces of some devices were contaminated with unknown particles.[22] In general, a medical device cannot be marketed in Europe without carrying a certificate of conformity. After this report became known, within a few hours the number of Silimed implants in the Dutch Breast Implant Registry could be determined, thereby providing clarity for patients and institutions.

Scientific importance

In addition, in the absence of high-quality, randomized controlled trials to assess the effect of various intraoperative techniques on surgical and cosmetic outcomes, data of the national DBIR registry provide a pragmatic alternative source of evidence. For example, previous studies suggest that the risk of capsular contracture is reduced when implants are placed in a subpectoral position, or if an inframammary surgical incision is

used instead of an areolar incision.[23,24] However, most of these studies are biased due to treatment by indication, loss of follow-up and lack information on potential risk factors as the effect of the implant itself. Simultaneously, unexplained variation between hospitals in the use of antiseptic precautions (antibiotics, antiseptic rinse, glove change prior to implant handling and the use drains) has been observed. [this thesis].

Most importantly, epidemiologically data will reveal the actual health effects of breast implants in relation to breast implant-associated Anaplastic Large Cell Lymphoma (BIA-ALCL) and/or potential other long-term adverse outcomes. BIA-ALCL is a rare cancer of the immune system believed to be causally associated with textured breast implants.[25,26] So far, various, not mutually exclusive causal factors have been suggested. Specifically, a local inflammatory response, elicited by silicone derived products or specific bacterial species adherent to the prosthesis surface (biofilm). In our DBIR data, between 2016 and 2017, a significant decrease in the use of textured implants and an increase in the use of smooth implants was observed already, that appears to coincide with the critical issue of BIA-ALCL [this thesis].

International collaborations

It is important that quality improvement initiatives are aligned as much as possible. Harmonization of indicator sets, data points, and data definitions is key to eventually pool and compare data from different clinical audits. The process undertaken by the International Collaboration of Breast Registry Activities (ICOBRA) in which they developed a standardized global minimum dataset for breast implant surgery, is an attempt in achieving this goal [this thesis]. Importantly, the use of large pooled international datasets is the only way we can address adverse events with a low incidence. In addition, an international approach can help in the exchange of information on practical hurdles that will be faced when starting a clinical quality audit; including (1) funding, (2) medical ethical issues, (3) privacy and legal issues (4) compliance (5) dataset and registry principles (5) benchmarking and output (6) quality assurance, data governance and research.[27,28]

FUTURE PERSPECTIVES

The NABON Breast Cancer Audit has been useful by serving as a platform for initiatives of quality improvement in breast cancer care in the Netherlands. The Dutch Breast Implant Registry (DBIR) is one of the first up-and-running breast implant registries worldwide, and the result of an international collaborative and conjoint effort by the ICOBRA network. Now that a sound foundation for quality assurance in breast cancer care and breast implant surgery has been laid, further national and global initiatives should be taken towards a common interconnecting registration system for multiple purposes.

Interconnecting data systems

Access to a vast volume of data, to identify and collect identifiable information on best practices, will contribute to individualized strategies for diagnostic or therapeutic decision-making. However, several challenges with data in healthcare have yet to be addressed; the technical expertise required to pool data, a lack of robust integrated security surrounding it, and a joint venture between facilitating companies in the field of health care monitoring. A. A patient-centered system will not be able without the involvement of all disciplines in the multidisciplinary pathway of care. B. A connection of clinical audits to other data systems is fundamental in order to move beyond a linear data structure to a multidimensional model. It would not only create an enormous resource for outcome research, but it may also support prescriptive modeling in order to more effective diagnosis and treatment.[32,33]

Patient-centered care

The use of Patient-Reported Outcome Measures (PROMs); reports and ratings provided by patients or their proxies about their health, functioning, health behaviors and quality of care, is set to rise in clinical and research setting.[29] It can be used for screening early symptoms or side effects of treatments, monitoring outcomes meaningful to patients, and most importantly, improves communication at the individual level. Their use in clinical practice helps to ensure the patient 'voice' is present during the consultation and evaluation of treatment, and may help in better patient-physician dialogues. In 2016, a global standard set of value-based patient-centered outcomes for breast cancer was developed by the International Consortium for Health Outcomes

Measurement (ICHOM), a multidisciplinary international working group comprised of patient advocates and health care providers, including members of the Dutch Institute for Clinical Auditing (DICA) and NBCA scientific committee.[30] This standard breast cancer set consists of outcomes of almost a full cycle of breast cancer care, with an emphasis on patient-reported outcomes.

In-hospital health care programs

Health care providers are increasingly incorporating clinical auditing into daily practice, and that is changing perspectives into how to make care more efficient and valuable. An example of a quality improvement program is the 'Santeon Value-Based Health Care Program', a conjoint effort of seven teaching hospitals across the Netherlands that use benchmarked information on the process, outcomes, and costs, including the use of the ICHOM breast cancer set.[31] The strength of this collaboration lies in its set-up in which a 'quality improvement team' is assigned per hospital (consisting of a project manager, data manager, data analyst). As a result, expertise on clinical auditing is not limited to a national audit board, but an in-hospital clinical team creates a sustainable base for continued implementation of quality culture improvement activities. In addition, the implementation of the 'Codman dashboard', an application from DICA that provides dynamic feedback on process and outcomes of data per hospital, will increase the use of clinical audits in daily practice even more.[35]

Cost-effectiveness

Beyond the scope of this thesis, a national clinical quality audit can also function as a tool to reduce costs.[6] Medical innovation has delivered significant improvements in clinical care, but the changes in healthcare are also reflected by the expenditure in healthcare costs.[36] And, the fact is that we are faced with an aging population and the demand for care will only increase. As raised by Michael E. Porter, the overall goal in healthcare should be maximizing value for patients.[37] An opportunity to improve insight in the efficiency and value of healthcare is the introduction of more accurate cost calculations when evaluating care processes. As seen in the study of Govaert et al. in which they investigate whether improvements in surgical colorectal cancer care leads to a reduction of hospital costs, the reduction of complications or other undesired outcomes is undoubtedly beneficial to patients and reduces costs.[38]

CONCLUSION

The results of this thesis show that clinical audits as The NABON Breast Cancer Audit (NBCA) and The Dutch Breast Implant Registry (DBIR) have the potential to provide quality assurance and further extensive outcome research. Several important nation-wide trends on breast cancer treatments and breast implant surgery are described, what no randomized trials have been published before. Furthermore, data from clinical audits can be used for clinical decision-support systems and may support broader health care effectiveness research. Future quality initiatives should focus on (international) collaborations and sharing data, which may help to improve the quality of care in a more efficient and focused manner.

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