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ORIGINAL RESEARCH

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An analysis of deviation from the ESGO quality indicators for surgical treatment of cervical cancer in a large referral center in the Netherlands

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Abstract

Recently, the European Society of Gynaecological Oncology (ESGO) presented fifteen quality indicators (QIs) with the aim to improve quality of surgical treatment for cervical cancer. In this study, we analyzed compliance with these QIs in a large referral center in the Netherlands. A critical analysis of the QIs that deviated from the targets was performed. Data of all 402 patients, who were surgically treated for cervical cancer with International Federation of Gynaecology and Obstetrics (FIGO) 2009 stage IA–IIA at the Amsterdam University Medical Center from 2007–2016, were retrospectivly analyzed with regard to adherence to the ESGO QIs. Targets set for three out of 15 ESGO QIs were not met. A pre-operative Magnetic Resonance Imaging (MRI) was performed in 92% of patients (target 100%). The percentage of upstaging of clinical stage into a higher pathological stage after surgery was 17.2% (target $<$10%). The third target that was not met was the minimally required elements in the pathology report. Parametrial length measured in two dimensions, histological grade and extra-nodal extension of lymph node metastasis were reported in respectively 0%, 32% and 42%, whereas the target was $\geq$90%. In contrast to the three QI targets that were not met, performance with regard to two out of 15 QI was far better than the targets set. This included recurrence rate at 2 years and the percentage of adjuvant (chemo)radiotherapy in (p)T1b1N0. QIs are important to evaluate care. They should be clearly described to ensure they are correctly interpreted. QIs and their targets should be based on solid evidence to ensure that reaching the target results in improvement of quality of care. Although the three QI targets that were not reached in our center are subject to criticism, they are still useful for prospective data collection and quality evaluation.

Keywords

Cervical cancer; Quality indicator; Surgery

1. Introduction

Cervical cancer is the fourth most common cancer in women worldwide [1]. In the Netherlands, with a nationwide screening programme, a low absolute incidence of cervical cancer of 947 patients was seen in 2021, and the European standardized rate (corrected for age and population increase) in the Netherlands was 10.38 per 100,000 women [2]. One of the strategies to improve quality of care in cervical cancer patients is the implementation of quality indicators (QIs). In tumors other than cervical cancer, improving quality of care and, consequently, oncological outcome, is directly related to compliance with QIs [3]. The European Society of Gynaecological Oncology (ESGO) recently published a quality improvement program aimed at improving quality of surgical treatment for cervical cancer [4]. A group of 94 external reviewers (physicians and patients) evaluated proposed QIs, and an expert committee selected fifteen relevant QIs by consensus. These QIs were categorized into three groups, namely structural, process and outcome indicators [4, 5]. Structural QIs refer to health care facility resources, such as case load, and number and qualifications of staff. Process indicators include requirements for specific actions in the treatment of patients aimed at achieving favorable outcomes. Examples of process indicators are minimum requirements for pre-operative investigations and for elements in surgical or pathological reports. Outcome indicators reflect the total health of the patients, and include survival, and treatment-related morbidity. After the selection of the fifteen ESGO QIs, targets were defined for each indicator, specifying the level that each gynecological oncology center should be aiming to achieve. The retrospective Surgery in Cervical Cancer, Observational, Retrospective (SUCCOR) cohort study showed that patients with early cervical cancer treated by a radical hysterectomy

in centers with high compliance with the before mentioned ESGO quality indicators had a lower risk of recurrence [6]. The primary objective of this study was to analyze compliance with the ESGO QIs in a large referral center in the Netherlands. The second objective was to analyze the scientific evidence underlying the quality indicators and the target set for these indicators, with a focus on the targets that were not met.

2. Materials and methods

Data of all consecutive patients, surgically treated for cervical cancer in the Amsterdam University Medical Center (UMC) between 01 January 2007 and the 31 December 2016, were retrieved from the institutional database. In this database, which was established in 1995, 85 variables of all newly diagnosed gynaecological cancer patients at our instition are registered. The data extraction process was carried out by one of the authors (JvdV). Inclusion criteria were International Federation of Gynaecology and Obstetrics (FIGO) 2009 stage IA, IB or IIA cervical cancer, treatment in a curative setting, and definitive surgical treatment performed at the Amsterdam UMC. Surgical treatment included conization, radical trachelectomy, simple hysterectomy (with or without pelvic lymphadenectomy) and radical hysterectomy with pelvic lymphadenectomy. All patients who underwent a radical hysterectomy and pelvic lymphadenectomy were treated by a type C2 radical hysterectomy through laparotomy, according to the description of the radicality in the Querleu-Morrow classification [7]. From 2012 onward, selected patients with a tumor <2 cm in diameter (n = 22) were referred to another gynaecological oncology center for radical hysterectomy by minimally invasive surgery. These patients were not included in these analyses. Only patients with high risk features (positive lymph nodes, parametrial involvement and irradical resection margins) received adjuvant (chemo)radiotherapy, according to the guidelines of the ESGO [8]. In patients with squamous cell cancer and only one high risk feature, adjuvant radiotherapy was given without concurrent chemotherapy.

We collected the data needed to evaluate adherence to the 15 ESGO QIs (Table 1) [4].

Data on the number of radical parametrectomies performed per year and per gynaecological oncologist were collected, as well as information on the percentage of patients discussed in a multidisciplinary tumor board, and on clinical trials performed during the study period. The surgeons (n = 4) performing the radical procedures were all gynaecological oncologists and certified as such by the Dutch Society for Obstetrics and Gynecology (NVOG). Data on age, FIGO 2009/2018 stage, pathological (p) Tumor, Nodes, Metastasis (TNM) stage, histological tumor type, pre-operative diagnostic procedures (n = 4), and peri- and post-operative morbidity were recorded. The FIGO 2018 stage was retrospectively assigned on the basis of the pathology results of the surgical specimen. In addition, information regarding the number of patients with stage (p)T1 who had some form of lymph node staging, the number of patients with clear vaginal and parametrial margins after surgery, and the number of patients with clinical stage IB that were upstaged after surgery on the basis of their (p)T stage, were collected. Additionally, information on the recurrence rate at 2 years for patients with stage (p)T1b1N0 (2009) squamous cell cancer or usual adenocarcinoma, and on the proportion of patients (all histotypes) in stage (p)T1b1N0, receiving adjuvant (chemo)radiotherapy was also recorded. Time to recurrence was defined as the time interval between the date of surgery and the date of histological confirmation of the recurrence. Data on the minimum requirements for the pathology (n = 14) and surgery (n = 1) reports were retrieved from the final pathology report, the surgical and the multidisciplinary tumor board notes. Furthermore, data on counseling about fertility sparing treatment in eligible patients were recorded. The collected data were compared with the targets set for all 15 QIs as described in the publication by Cibula *et al*. [4].

Statistical analysis: Descriptive statistics were used. The proportion of patients that fulfilled the target for a specific QI were calculated using the numerators and denominators as defined by ESGO [4].

3. Results

A total of 402 patients with cervical cancer FIGO stage IA–IIA weas surgically treated at the Amsterdam UMC between 2007 and 2016. Clinical and pathological characteristics are shown in Table 2. Median age was 42 years (range 22–84 years). FIGO 2009 stage IB cervical cancer was present in 331/402 (82.3%), and 262/402 (65.2%) of the patients had a squamous cell carcinoma. Histological types other than squamous cell carcinoma or adeno(squamous) carcinoma were seen in 7/402 (1.7%) patients. Positive nodes were detected in 65/402 (16%) patients and 86/402 (21.4%) received adjuvant treatment with radiotherapy, either with or without chemotherapy. All patients were discussed at a multidisciplinary tumor board consisting of gynaecological oncologists, medical oncologists, radiation oncologists, a radiologist and a pathologist.

3.1 Surgical treatment

The type of surgical treatment per FIGO 2009 stage is shown in Table 3. The majority of patients 332/402 (82.6%) were treated by a radical hysterectomy Querleu type C2 with pelvic lymphadenectomy. All patients who had a parametrectomy and/or lymph node dissection were operated by a certified gynaecological oncologist, usually assisted by a fellow in training for gynaecological oncologist. Eight patients with stage IB1 did not receive standard treatment, of which five underwent a simple hysterectomy only (four without, and one with pelvic node dissection) and three a fertility sparing conization (two with pelvic node dissection, and one without). The reasons for deviation from standard treatment were as follows: refusal of the proposed (additional) therapy, the postoperative pathology report showed different histology than the preoperative histology, and the origin of the tumor was preoperatively thought to be endometrial and postoperatively defined as endocervical in origin.

3.2 Quality indicators

Table 4 shows the targets for the ESGO QIs compared with the results per QI. In three out of 15 QIs (QI 5, 7 and 11) the target was not met. The first QI in which the target was not reached

TABLE 1. Overview of the 15 quality indicators for surgical treatment of cervical cancer as defined by the ESGO.

Quality indicators related to case load/training/experience surgeon
• QI 1: Radical procedures (parametrectomies) in cervical cancer performed per center/yr (≥15)
• QI 2: Surgery performed by a certified gynecologic oncologist or a trained surgeon dedicated to gynecological cancer (100%)
Quality indicators related to overall management
• QI 3: Center participating in ongoing clinical trials in gynecological cancer (≥1)
• QI 4: Treatment discussed at a multi-disciplinary team meeting (100%)
• QI 5: Required pre-operative investigation according to ESGO guidelines (100%)
Quality indicators related to pertinent information according to ESGO guidelines
• QI 6: Minimum required elements in surgical reports (100%)
• QI 7: Minimum required elements in pathology and pathology reports (≥90%)
• QI 8: Structured reporting of the follow-up and 30-day post-operative morbidity (≥90%)
Quality indicators related to the quality of surgical procedures
• QI 9: Urological fistula rate within 30-post-operative days after a radical parametrectomy (≤3%)
• QI 10: Clear vaginal (invasive disease) and parametrial margins (≥97%)
• QI 11: Proportion of patients with a stage T1b disease T-upstaged after surgery (<10%)
• QI 12: Recurrence rate at 2 years in stage pT1b1N0 after surgery (<10%)
Quality indicators related to the compliance of management with the standards of care
• QI 13: Proportion of patients with a stage T1 disease treated by primary surgery who have undergone lymph node (LN) staging according to the ESGO guidelines (≥98%)
• QI 14: Counseling about a possibility of fertility sparing treatment (100%)
• QI 15: Proportion of patients receiving adjuvant chemoradiotherapy after a primary surgical treatment for a stage pT1b1N0 disease (<15%)

The proposed targets are displayed in brackets.

concerned the required pre-operative investigation. Workup should be according to the ESGO-ESTRO-ESP guideline [8]. This guideline states that pelvic magnetic resonance imaging (MRI) is mandatory (target 100%) in the workup for cervical cancer patients to assess the extension of the cancer and to plan treatment. At our institution a target of 92% was reached. The remaining 8% of the patients, all with stage IA, did not receive a pre-operative MRI. The second QI in which the target was not met concerned the percentage of patients with a clinical stage T1b that was pathologically upstaged after surgery with regard to T status (patients in whom positive nodes were discovered after surgery were excluded). The target is <10%, while we observed upstaging in 17.2% of the cases. In this total group of patients with clinical stage T1b and negative lymph nodes adjuvant radiotherapy was administered in 7.2%. The third QI in which the target was not reached concerned the minimum required elements (n = 14) in the pathology report. This should be ≥90% for all 14 elements. Our pathology reports mentioned the length of the parametrium in two dimensions in 0%. In case of lymph node metastases, the status of the capsule of the nodes was mentioned in 46% of patients. In addition, tumor grade was reported in 32%.

For two QIs the results were well below the maximum target set. One of these QIs was <10% recurrence in patients with a common cervical cancer type stage pT1b1 with negative nodes within two years after surgery. At our institution, we observed a 4.2% recurrence rate. The other QI, the proportion of patients receiving adjuvant (chemo)radiotherapy after primary surgery for stage pT1b1 without nodal metastases, has a target set at <15%. In our population it was 3.1% (chemoradiotherapy: 0.9%; radiotherapy: 2.2%).

4. Discussion

4.1 Summary of main results

In this study, targets set for 12/15 ESGO QIs for surgical treatment of cervical cancer [6] were met. In three QIs the target was not reached. Required pre-operative investigations (QI 5) were performed in less than 100% of patients (target 100%). Three elements minimally required in the pathology report (QI 7) were present in <90% (target ≥90%). The percentage of patients upstaged (QI 11) due to involvement of parametria or vagina, or a stage shift from clinical stage T1b1 to pathological T1b2 or higher, was 17.2% (target <10%).

4.2 Results in the context of the published literature

As yet four studies have been published analyzing the ESGO QIs [6, 9–11]. The objective of three studies was to audit the quality of surgery for early cervical cancer according to the QIs proposed by ESGO. Ponce *et al*. [11] and Boria *et al*. [9] showed that the only target that was not met in their studies was the target of <15% for adjuvant therapy in patients with pT1b1N0 tumors. The study by Ponce *et al*. [11] reported adju-

TABLE 2. Clinical and pathological characteristics of 402 patients with cervical cancer who were surgically treated.

Characteristics	n = 402 (%)
Age (median/range)	42 (22–84)
FIGO 2009 stage	
IA1	43 (10.7)
IA2	7 (1.7)
IB1	292 (72.6)
IB2	39 (9.7)
IIA1	21 (5.2)
FIGO 2018 stage	
IA1	58 (14.4)
IA2	21 (5.2)
IB1	114 (28.4)
IB2	85 (21.1)
IB3	32 (8.0)
IIA1	12 (3.0)
IIA2	1 (0.2)
IIB	12 (3.0)
IIIC1	67 (16.7)
IIIC2	0 (0.0)
Histotype	
Squamous	262 (65.2)
Adenocarcinoma	108 (26.9)
Adenosquamous	25 (6.2)
Other	7 (1.7)
Tumor diameter(clinical)	
≤2 cm	207 (51.5)
>2–≤4 cm	135 (33.6)
>4 cm	60 (14.9)
LVSI	
No	232 (57.7)
Yes	139 (34.6)
Missing	31 (7.7)
DOI	
≤5 mm	134 (33.3)
>5–≤15 mm	163 (40.4)
>15 mm	67 (16.6)
Missing	38 (9.7)
Positive pelvic nodes	65 (16.2)
Parametrial involvement	34 (8.5)
Tumor free margin	
≤1 mm	13 (3.2)
0 mm (not radical)	6 (1.5)
Adjuvant treatment	
Radiotherapy	38 (9.5)
Chemoradiation	48 (11.9)

Abbreviations: FIGO, International Federation of Gynaecology and Obstetrics; LVSI, lymphovascular space involvement; DOI, depth of invasion.

TABLE 3. Type of surgical treatment per FIGO 2009 stage in 402 patients with cervical cancer.

FIGO stage	Treatment n (%)						
	Conization	Conization with PLND	Simple hyst	Simple hyst with PLND	Rad hyst with PLND	Rad trach with PLND	Total
IA1	27 (62.8)	0 (0.0)	15 (34.9)	1 (2.3)	0 (0.0)	0 (0.0)	43 (100)
IA2	5 (71.4)	0 (0.0)	0 (0.0)	2 (28.6)	0 (0.0)	0 (0.0)	7 (100)
IB1	1 (0.3)	2 (0.7)	4 (1.4)	1 (0.3)	272 (93.2)	12 (4.1)	292 (100)
IB2	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	39 (100)	0 (0.0)	39 (100)
IIA	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	21 9 (100)	0 (0.0)	21 (100)
Total	33 (8.2)	2 (0.5)	19 (4.7)	4 (1.0)	332 (82.6)	12 (3.0)	402 (100)

Abbreviations: FIGO, International Federation of Gynaecology and Obstetrics; hyst, hysterectomy; rad hyst, radical hysterectomy; rad trach, radical trachelectomy; PLND, pelvic lymph node dissection.

vant therapy in 28.1% without further subdividing this group in adjuvant radiotherapy and adjuvant chemoradiotherapy. Boria *et al*. [9] showed that adjuvant radiotherapy was administered in 19.1% and adjuvant chemoradiotherapy in 7.7%. The study by Ding *et al*. [10], analyzing all 15 QIs in a large cohort of patients (n = 5952) also showed that the target for adjuvant therapy (not further subdivided in adjuvant radiotherapy and adjuvant chemoradiotherapy) was not met (28.3%). In addition, targets for upstaging, pre-operative work up and treatment discussed at a multi-disciplinary team meeting were not met. It is interesting to see that the target of <15% adjuvant therapy, when defined as both radiotherapy and chemoradiotherapy, is not met in all three studies, while the 3.1% adjuvant therapy rate (0.9% adjuvant chemoradiotherapy), as shown in our data, is well below the maximum target. This is most likely due to our treatment policy of not recommending adjuvant therapy for patients with intermediate risk cervical cancer on the basis of the Sedlis criteria [12]. When a type C2 radical hysterectomy has been performed in patients with intermediate risk factors, observation is recommended as an alternative option in the ESGO guidelines [4]. It seems that in centers where adjuvant therapy is recommended based on the Sedlis criteria, this 15% target is hard to reach. Since we could not find literature data on the frequency of positive Sedlis criteria in patients with pT1b1N0 tumors, the target for this QI should be critically re-evaluated. Also, it should be clarified whether the QI-concers only adjuvant concurrent chemoradiotherapy or both chemoradiotherapy and radiotherapy. The remaining fourth study evaluated the compliance with the ESGO QIs in relation to the disease-free survival [6]. Disease-free survival at 5-years of follow-up was 84% in the centers with low compliance with QIs and 92% in the centers with high compliance ($p < 0.001$). Below we will discuss the QIs in which the target was not reached in our cohort.

4.2.1 Required pre-operative investigations

A 100% target for performing an MRI as pre-operative investigation is set in both the ESGO guidelines and as QI [4, 8]. The 32 patients who did not receive a pre-operative MRI in our study all had stage IA disease, without lymphovascular space involvement (LVSI), in whom it was decided not to perform a radical hysterectomy. It has previously been shown that in stage IA2, without LVSI, the risk of positive lymph nodes was estimated to be 1.3%, while the risk of parametrial involvement was absent [13]. It is unlikely that lack of an MRI would have influenced quality of care for these stage IA patients. Theoretically, it even could have resulted in unnecessary further diagnostic procedures due to potential false positive results, such as the finding of (false positive) lymph nodes suspect for metastases [14]. The Scottish Cancer Taskforce excluded stage IA1 in their target of 95% pre-operative MRI scans, with a tolerance of 5% for unexpected situations, such as urgent treatment or an incidental finding of cervical cancer at surgery [15]. Therefore, we recommend a better specification of the characteristics of patients in whom an MRI is considered obligatory in future ESGO QIs.

4.2.2 Minimum required elements in pathology report

The minimum requirements for the pathology report were not met with regard to 3/14 elements, including reporting of extra-nodal extension of tumor, tumor grade and measurement of parametrium in two dimensions. Not all required pathological elements are equally important for the treatment and prognosis in cervical cancer. Extra-nodal extension is considered as an obligatory element in the pathology report. However, this cannot be justified on the basis of its prognostic significance in cervical cancer, because there are few studies on this subject. One of these studies showed extra-nodal extension to be an independent prognostic variable for both recurrence-free and overall survival [16], while this was not an independent variable for survival in another study [17]. This was the reason for the International Collaboration on Cancer Reporting (ICCR) not to include extra-nodal extension into their data set for recommended reporting of cervical carcinomas [18].

Tumor grade is also included in the ESGO QI on pathology. The ICCR recommends to mention “grade”, but does not require this, as there is debate on the prognostic value of the conventional grading system, especially in squamous cell cancers [18]. The length of parametrium, measured in two dimensions, is obligatory as well. For recommendations like this, it is important to know what the impact is of parametrial dimensions on oncological outcome, morbidity and adjuvant treatment. Especially as registration of the type of radical pro-

TABLE 4. Comparison of targets for ESGO 2020 QI's and reached numbers in the Amsterdam UMC population of 402 cervical cancers treated by surgery (in bold the targets not met).

Quality indicator	ESGO target (n or %)	Amsterdam UMC (n or %)
1. Radical parametrectomies/year/per institute	≥15 (≥30 optimal)	34
2. Radical parametrectomies by gyn oncologist	100%	100%
3. Participation in gynecological oncology clinical trials	≥1	10 in 10 years
4. Patients discussed at multidisciplinary board	100%	100%
5. Required pre-operative investigations	100%	<**100%**
• Pelvic exam/biopsy ± colposcopy		100%
• MRI		**92%**
• Cystoscopy/rectoscopy indicated on MRI		100%
• PET or CT chest in ≥T1b2 or suspect nodes on MRI		100%
6. Minimum required elements in surgery report		
Querleu classification	100%	100%
7. Minimum required elements in pathology report	≥90%	
Macroscopic description		
• 3 dimension measurement tumor		90%
• Length vaginal cuff/parametrium (2d)		**100%/0%**
• Macroscopic tumor site		100%
Microscopy		
• Two dimension tumor measurement		100%
• Tumor type/grade		**100%/32%**
• LVSI		93%
• Co-existing pathology		100%
• Minimum distance uninvolved stroma		100%
• Margin status		100%
• Number of removed/pos nodes		100%
• Extra-nodal extension		**46%**
• SLN: micrometastasis/ITC		100%
• Distant metastasis		100%
• Provisional pathological staging AJCC 8th edition		100%
8. Prospective follow-up reporting and 30 day postoperative morbidity	≥90%	100%
9. Urological fistula within 30 day postoperatively after radical parametrectomy over a three year period	≤3%	2.9%
10. Clear pathological margin	≥97%	98.5%
11. Upstaged cT1b after surgery (T1b1/T1b2 to T1b2/T2b)	<10%	**17.2%**
• Upstaging requiring radiotherapy		7.2%
12. Recurrence rate (p)T1b1N0 at 2 yr	<10%	4.2%
13. Patients with lymph nodes staging in T1 disease	≥98%	98%
14. Fertile patients T1b1 ≤2 cm counseled for FST	100%	100%
15. Adjuvant (chemo)radiotherapy in (p)T1b1N0	<15%	3.1%
• Chemoradiotherapy		0.9%
• Radiotherapy		2.2%

Abbreviations: QI, quality indicator; MRI, magnetic resonance imaging; PET, positron emission tomography; CT, computed tomography; 2d, two dimensions; LVSI, lymphovascular space involvement; SLN, sentinel lymph node; ITC, isolated tumor cells; c, clinical; p, pathological; FST, fertility sparing treatment; ESGO: European Society of Gynaecological Oncology; UMC: University Medical Center; AJCC: American Joint Committee on Cancer.

cedure is a QI, it is unclear what the measurement of parametrial length will add. In literature, there is a wide variability in individual length of measured parametrium during surgery (4–12 cm), and consequently a wide variety in pathologically measured length of removed parametrium (0.8–5.3 cm) [19]. This is most likely due to individual variations in anatomy and variations in surgical techniques [20]. Finally, there are no data on two dimensional measurements of parametrium in relation to oncological outcome in literature.

4.2.3 Upstaged cT1b after surgery

The percentage of upstaging of the clinical stage into a higher pathological stage after surgery should be <10%. The motivation for this target is the fact that pathological upstaging may reflect incorrect pre-operative staging, resulting in inadequately tailored treatment. In many cases however, upstaging is of no clinical value, because the preferred treatment for a FIGO 2009 stage IB1 >2 and <6 cm at our hospital is a type C2 radical hysterectomy. The fear for non-tailored treatment or undertreatment is therefore not justified. This is underlined by our relatively low 2-year recurrence rate of 4.2%, with an upper target limit of 10% for this QI. If this QI was meant to prevent too many patients getting adjuvant radiotherapy, the target of <10% was met in our center, because after upstaging only 7.2% required adjuvant radiotherapy. We would therefore suggest modification of QI 11 into the percentage of patients "upstaged and requiring radiotherapy", instead of the percentage "upstaging".

4.3 Strengths and weaknesses

One of the strengths of this study is the use of detailed data that have been recorded meticulously in the institutional database over the past decades, allowing for careful evaluation of QIs. In addition, we critically assessed the targets that were not met in our center with the ultimate goal to improve our quality of care and, also, to add to the discussion on how to define evidence-based targets for QIs. Main weakness is the retrospective nature of the study.

4.4 Implications for practice and future research

QI are used to improve quality of care, resulting in better outcomes for patients. Setting targets for QIs enables evaluation of clinical practice and detection of aspects of suboptimal care [5]. These indicators should be clearly described to improve validity and ensure they are correctly interpreted. Furthermore, indicators and targets should be based on the best available evidence to make sure that reaching the target results in improved quality of care. Thus, meeting the targets should improve prognosis and lead to reduction of treatment-related morbidity. Although the targets that were not met in our center are subject to criticism, they are still useful for prospective data collection. However, we would suggest, that these targets are not proposed as required, but as recommended.

5. Conclusions

Targets for QIs must either have impact on prognosis or on treatment strategy. They should be based on solid evidence and clearly described to ensure that applying these QIs results in improvement of quality of care. Our results show that the data necessary for QI analysis can be extracted from patient records, that targets are mostly met, and are, in our case, associated with excellent clinical outcome.

AVAILABILITY OF DATA AND MATERIALS

The data presented in this study are available on reasonable request from the corresponding author.

AUTHOR CONTRIBUTIONS

CHM and JvdV—study design, research and writing the manuscript. MCGB—help and advice on data from pathology report. LRCWvL and GF—help and advice on data from surgical report. All authors contributed to editorial changes, read and approved the final manuscript.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Approval was obtained from the Institutional Review Board (IRB) of the Amsterdam UMC (reference number W19_104#19.137). Written informed consent was waived by the IRB, because, according to Dutch law, this is not obligated in case anonymized patient data are used, keeping in mind the rules of good clinical practice. In accordance with the journal's recommendations, we will provide our data for independent analysis for the purposes of additional data analysis or for the reproducibility of this study in other centers if such is requested.

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CONFLICT OF INTEREST

The authors declare no conflict of interest. JvdV is serving as one of the Editorial Board members/Guest editors of this journal. We declare that JvdV had no involvement in the peer review of this article and has no access to information regarding its peer review. Full responsibility for the editorial process for this article was delegated to AEM.

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