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Implementation of quality indicators for ovarian cancer in gynecological cancer centers certified by the German Cancer Society (DKG)

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Abstract

Purpose

Since 2008, the German Cancer Society (DKG) has certified gynecological cancer centers to ensure high-quality care. Guideline-based quality indicators (QIs) are a core component. This article aims to summarize development and update of ovarian cancer (OC) QIs based on the current S3-guideline and presents their performance.

Methods

QIs were derived from strong S3-guideline recommendations through a structured multi-step process. Experts identified potential QIs according to standardized criteria (including feasibility and impact on care). QIs required ≥ 75% agreement. Since 2017, each tumor entity is limited to five key QIs in the certification dataset. Datasets from treatment years 2019–2024 were analyzed.

Results

Eight guideline-derived QIs are currently defined for OC. Five QIs are included in the certification program. In 2024, 184 certified centers treated 4951 primary OC cases. At center level, target values were achieved for surgical staging (93.5%) offering genetic testing (97.8%), complete macroscopic resection (99.5%), and surgery by a gynecologic oncologist (98.9%). All centers met plausibility limits for first-line chemotherapy:(75% of advanced-stage patients). At patient level, pooled adherence rates improved over time; the median rate of offering genetic testing rose from 61% to 84%. Two QIs retired in 2021, and one QI is pending until further guideline updates.

Conclusion

Guideline-based QIs translate essential recommendations into measurable metrics, allowing objective assessment of quality. High and increasing adherence rates were observed in certified centers. These findings support the use of guideline-based QIs for benchmarking and continuous quality improvement, although the observational design precludes causal attribution to certification.

Introduction

Ovarian cancer (OC) remains the gynecological malignancy with highest disease-specific mortality, with approximately 7040 new cases (2023) diagnosed annually in Germany [1]. Despite advances in surgical techniques and systemic therapies, timepoint of diagnosis is still late. At the time of diagnosis, 72% of OC patients have UICC (union internationale contre le cancer) stage III or higher OC and survival rates in those high stages stay relatively low with five year survival rates in stage III of 42% [1]. In a German retrospective cohort study (WiZen), treatment in a certified gynecological cancer center was associated with a lower mortality risk in the statutory health insurance cohort, (HR = 0.883; 95%CI: 0.824–0.948; p = 0.001) [2]. In the German statutory health insurance (SHI) data and among patients documented in clinical cancer registries especially the cohort with UICC stage I-III disease, receiving treatment at certified centers was associated with improved survival outcomes (HR 0.825, 95% CI 0.708–0.961; p = 0.014) [2].

The German Cancer Society (Deutsche Krebsgesellschaft, DKG) initiated a comprehensive certification program for gynecological cancer centers in 2008. This certification system aims to ensure standardized, high-quality care through structural requirements, process optimization, and continuous quality monitoring [3–5]. A central component of this certification framework is the implementation of guideline-derived quality indicators (QIs) that translate evidence-based recommendations into measurable metrics of care quality [4, 5].

Quality indicators serve as essential tools for assessing and improving healthcare delivery by providing objective, quantifiable measures of clinical performance [6]. QIs have been shown to correlate with improved patient outcomes, including enhanced survival rates, less surgical complications, and better adherence to evidence-based treatment protocols [6–8].

The German National Cancer Plan established a quality cycle in oncology, integrating the interaction of guidelines and QIs development, their implementation within certified cancer centers, and the systematic use of outcome data for quality assurance and continuous improvement of care. This quality cycle of oncology provides an interdisciplinary network (Fig. 1) [9].

For ovarian cancer, key areas addressed by QIs include comprehensive surgical staging in early-stage disease, complete cytoreductive surgery in advanced disease, involvement of specialized gynecologic oncologists, genetic testing for hereditary cancer syndromes, and adherence to evidence-based chemotherapy regimens [10]. These process measures are directly linked to established prognostic factors: complete surgical cytoreduction is one of the strongest predictors of survival in advanced ovarian cancer. Surgical expertise and hospital volume correlate with improved outcomes [11–13]. However, one effect of certification in Germany appears to be high rates of macroscopic tumor resection irrespective of hospital volume [14]. Genetic testing influences both treatment decisions regarding PARP inhibitor maintenance therapy and familial risk assessment [15].

The current article provides a comprehensive overview of the development, implementation, and performance of quality indicators for ovarian cancer based on the most recent S3-guideline diagnosis, therapy and Follow-Up of patients with ovarian malignancies (AWMF-Registernummer: 032-035OL) [10]. We therefore aimed to describe the development and revision of ovarian cancer QIs within the German certification system and to assess longitudinal changes in center-level target achievement and pooled patient-level adherence between 2019 and 2024.

Methods

Data and Statistical Analysis

The analysis utilized results from the 2026 annual report of DKG-certified gynecological cancer centers with audit year 2025 and treatment year 2024 [16]. All centers seeking (re-)certification in accordance with DKG requirements report their key performance indicators for the preceding year prior to the annual audit. The data are checked for completeness and plausibility by the certification institute OnkoZert. For the annual report, quality-assured, aggregated data regarding the certified centers' key performance indicators are summarized anonymously and published. Most indicators have plausibility thresholds and/or target values. The median and range are calculated, and the report indicates how many centers meet or fail to meet the target values, as well as the reasons provided for falling below or exceeding these benchmarks. The 2026 annual report includes results from 184 certified gynecological cancer locations. The total caseload was 23909; Among these, 18115 were primary cases of gynecological cancer. The median number of primary cases treated per location was 83. Among the primary cases, 4951 (27,3%) involved ovarian cancer.

Development and Updating of Guideline-Derived QI

The development, implementation, and updating of guideline-derived quality indicators within the German Guideline Program in Oncology (Leitlinienprogramm Onkologie; OL) follows a standardized and previously published methodological framework [4]. QIs are systematically derived from evidence-based S3 guidelines. Only strong recommendations (grade of recommendation “A”) formulated with the wording “should” / “should not” are eligible as candidate indicators [4]. Each potential QI is formally evaluated by the dedicated QI working group (AG Qualitätsindikatoren, AG QI). This interdisciplinary panel includes representatives from clinical cancer registries, the DKG certification system, the Association of the Scientific Medical Societies in Germany (AWMF), the OL methodological team, patient representatives and members of the respective guideline group. Candidate indicators are assessed using a standardized evaluation form addressing clinical relevance, strength of evidence, feasibility of data collection, clarity of numerator and denominator definitions, susceptibility to bias, and potential for quality improvement [4]. If a guideline recommendation underlying a QI was modified, the QI was adjusted accordingly or considered for removal. New strong recommendations were assessed for potential new QIs. For example, in the 2019 update, a new strong recommendation was added that all ovarian cancer (OC) patients should be offered genetic counselling and testing for *BRCA1/2* mutations (and other predisposition genes), consequently, a new QI “offer of genetic testing to OC patients” was developed and added to the OC QI set (QI 2) [17]. In the current guideline version 6.1 (2026), no further updates of the ovarian cancer QIs were performed [10]. The most recent comprehensive revision of the QI set occurred in guideline version 5.0, the corresponding guideline report (both in September 2021) describes the structured re-evaluation of the ten QIs introduced in 2019 [3, 17]. The update process was conducted by the working group QI according to the standardized German Guideline Program in Oncology methodology [4]. Target values (TV) and tresholds for mandatory justifications are defined by the certification commission. Fulfilment (result) was defined as the proportion of patients included in the denominator who met a certain QI. It was calculated by dividing the number of patients who met a certain QI (numerator) by the total number of eligible patients (denominator) and multiplying by 100. Site-level adherence was considered fulfilled if the resulting rate was met. The percentage of the resulting rate depends on the QI. In the following section, the set of OC QIs and the results of the implemented QIs will be presented.

Results

Quality indicator set and Inclusion in certification: In the first edition of the OC guideline, the working group identified nine potential QIs based on more than 40 strong recommendations [18]. All recommendations were adopted and resulted in nine QIs, which were included in the data sheet for the gynecological cancer centers from 2015. However, in 2017 it was decided by the certification commission to limit the number of QI to the five most important QIs for each entity. This was necessary to prevent an overly demanding documentation burden, because all gynecological entities, ovarian cancer, endometrial cancer, cervical cancer, and vulvar cancer, are treated in gynecological cancer centers, and thus, the tumour-specific QIs also have to be documented (Summary Protocol of the Meeting of the Certification Committee for Gynecological Cancer Centers 2017) [19]. The selected five QIs for inclusion in the DKG data sheet were considered most crucial for ovarian cancer outcomes and showed variability between cancer centers. By the time of the previous guideline (2024), the active QIs for ovarian cancer are as listed in Tables 1 and 2: QI 1 (surgical staging in early-stage disease), QI 2 (offer of genetic testing), QI 3 (complete debulking in advanced disease), QI 4 (surgery performed by a gynecologic oncologist), and QI 8 (first-line chemotherapy regimen), aligned with important guideline recommendations (Table 1). Three principal modifications were implemented. In 2021, QI 6 (“No adjuvant chemotherapy in early-stage ovarian cancer”) and QI 10 (“No adjuvant therapy in borderline ovarian tumors”) were discontinued because target values had consistently been achieved in certified gynecological cancer centers, indicating sustained full implementation and limited additional improvement potential. QI 5 (“Postoperative chemotherapy in advanced ovarian cancer”) and QI 8 (“First-line chemotherapy in advanced ovarian cancer” with Carboplatin and Paclitaxel) were adapted to reflect changes in the underlying guideline recommendations: QI 5 Furthermore, QI 9 (“Combination therapy in platinum-sensitive recurrence”) was suspended but formally remained pending in the revision of the corresponding guideline recommendation [3].

Table 1
Quality indicators (QIs) for ovarian cancer as defined in the S3-guideline [10]

QI	QI name	Numerator	Denominator	Target value
1	Surgical staging in early-stage ovarian cancer	Patients in the denominator who underwent surgical staging including: laparotomy, peritoneal cytology, peritoneal biopsies, bilateral adnexectomy, hysterectomy, if necessary, an extraperitoneal approach, infracolic omentectomy, and bilateral pelvic and paraaortic lymphadenectomy	All patients with a primary diagnosis of ovarian cancer FIGO I–IIIA	from 2024: ≥ 40% of early-stage OC patients staged (*until 2023: treshold for mandatory justification of < 20%*)
2	Offer of genetic testing	Patients in the denominator who were offered genetic testing	All patients with a primary diagnosis of ovarian cancer	from 2024: ≥ 70% of OC patients were offered testing (*until 2023: no target value/ treshold defined*)
3	Macroscopical complete resection in advanced ovarian cancer	Patients in the denominator with macroscopically complete tumor resection	All patients with a primary diagnosis of ovarian cancer ≥ FIGO IIB who underwent primary surgery without prior chemotherapy	≥ 30% TR0 rate in primary debulking surgeries (due to many Stage IV or inoperable cases).
4	Surgery for advanced ovarian cancer performed by a gynecologic oncologist	Patients in the denominator whose definitive surgical treatment was performed by a gynecologic oncologist	All patients with a primary diagnosis of ovarian cancer FIGO ≥ IIB after completion of surgical therapy	≥ 80% of advanced OC surgeries by a gynecological oncologist specialist.
5	Postoperative chemotherapy in advanced ovarian cancer (removed from the cerfication program in 2021)	Patients in the denominator who received postoperative chemotherapy	All patients with a primary diagnosis of ovarian cancer ≥ FIGO II who received chemotherapy	*treshold for mandatory justification of < 30%*
6	QI archived in 2021 (*adjvuant chemotherapy in early stage ovarian cancer*			
7	Platinum-based chemotherapy in early-stage ovarian cancer	Patients in the denominator who received platinum-based chemotherapy	All patients with a primary diagnosis of ovarian cancer FIGO IC or FIGO IA/B and grade 3	
8	First-line chemotherapy in advanced ovarian cancer	Patients in the denominator who received first-line chemotherapy with carboplatin and paclitaxel	All patients with a primary diagnosis of ovarian cancer ≥ FIGO II	from 2024: <40% triggers review (standard of care is carboplatin/paclitaxel for most; lower rates need justification) (until 2023: treshold for mandatory justification of < 20%)
9	Combination therapy for platinum-sensitive recurrence *(suspended in the guideline, 2021)*	Patients in the denominator receiving platinum-based combination therapy	All patients wit platinum-positive recurrence of ovarian cancer undergoing chemotherapy	
10	Postoperative chemotherapy in borderline tumors *(removed from the cerfication program in 2021)*	Patients in the denominator who received postoperative chemotherapy	All patients with primary diagnosis of a ovarian borderline tumor	

Table 2
QI over Time (years refer to the treatment years)

QI	2024		
	Results/ cases Rate	**Median per site [range]**	**Centers meeting target value**
1	N 1124 D 1499 75%	5 [0–62] 7 [1–65]	93.5% [172/184]
2	N 4259 D 4951 86%	19 [6-235] 22 [8-262]	97.8% [180/184]
3	N 1965 D 2560 76.8%	8 [1-125] 10 [1-179]	99.5% [183/184]
4	N 2494 D 2560 97.4%	10 [1-179] 10 [1-179]	98.9% [182/184]
5	-	-	-
8	N 2959 D 3941 75.1%	12 [3-216] 17 [4-227]	100% [184/184]
∑*	23909		

QI	2023			2022			2021			2020			2019
	Results/ Cases/ Rate	Median per site [range]	Centers meeting target value	Results/ Cases/ Rate	Median per site [range	Centers meeting target value	Results/ Cases/ Rate	Median per site [range	Centers meeting target value	Results/ Cases/ Rate	Median per site [range	Centers meeting target value	Result Cases Rate
1	N 1064 D 1408 76%	5 [0–50] 7 [1–61]	92% [168/183]	N 971 D 1318 74%	4 [0–44] 6 [1–51]	95% [175/185]	N 976 D 1266 77%	4 [0–49] 6 [1–49]	97% [170/175]	N 995 D 1297 77%	5 [1–39] 6 [1–51]	99% [166/167]	N 992 D 122 81%
2	N 4143 D 4823 86%	17 [4-257] 21 [5-257]	94% [175/186]	N 3890 D 4717 82%	16 [2-189] 19 [7-229]	-	N 3343 D 4373 76%	14 [0-155] 20 [5-219]	-	N 3057 D 4250 72%	14 [0-160] 19 [3-232]	-	N 187 D 299 63%
3	N 1980 D 2578 77%	8 [1-136] 10 [1-182]	99% [184/186]	N 1916 D 2549 75%	7 [1-128] 10 [2-173]	99% [186/187]	N 1718 D 2345 73%	7 [0-119] 10 [1-170]	98% [174/177]	N 1747 D 2325 75%	8 [0-134] 10,5 [2-174]	99% [166/168]	N 169 D 236 72%
4	N 2505 D 2578 97%	9 [1-182] 10 [1-182]	98% [182/186]	N 2471 D 2549 97%	9 [1-173] 10 [2-173]	97% [182/187]	N 2272 D 2345 97%	10 [1-170] 10 [1-170]	96% [170/177]	N 2206 D 2325 95%	10 [2-174] 10,5 [2-174]	99% [167/168]	N 221 D 236 94%
5	-	-	-	-	-	-	-	-	-	N 1769 D 2216 84%	8 [1-171] 9 [1-174]	99% [167/168]	N 177 D 221 84%
8	N 2911 D 3910 74%	11,5 [3-210] 17 [4-216]	100% [186/186]	N 2872 D 3882 74%	11 [2-188] 5 [5-197]	100% [187/187]	N 2562 D 3579 72%	12 [1-180] 16 [3-192]	99% [176/177]	N 1887 D 3314 57%	9 [0-182] 15 [2-199]	98% [165/169]	N 191 D 319 60%
∑*	23928			23161			21859			21194			21194

*Total number of patients with ovarian cancer treated in certified gynecological cancer centers

QI: Quality indicator; N: numerator; D: denominator

The first gynecological cancer centers were certified in 2008. As of the 2026 reporting year, there were 192 certified gynecological cancer centers (no multi-site centers) treating ovarian cancer in Germany. The Annual Report of 2026 includes 184 of the 192 certified clinical sites. In 2024, these centers cared for 4951 primary OC patients of the overall 7385 OC patients. This constituted in 27.3% of all primary cases with gynecologic malignancies treated in the certified network (second to endometrial cancer with 6137 cases; 34%). This number also represented 64% of the estimated incident OC cases in Germany for 2024 compared to 59% in 2023.Therefore, an increasing amount of and more than half of overall OC patients receive treatment in certified high-volume centers. The total number of primary cases treated in certified gynecologic cancer centers has increased from the treatment years 2015 (n = 11587) to 2024 (n = 23909). Since 2018, the results for five QIs are annually reported by the gynecological cancer centers and published in the annual reports (Jahresbericht der deutschen Krebsgesellschaft (DKG) - Gynäkologische Krebszentren) [16].

Results for the active QIs are presented for the most recent available treatment year, 2024, and longitudinally for 2019–2024 (Table 2). Figure 2 shows the proportion of centers meeting the respective target or plausibility threshold, whereas Fig. 3 shows the corresponding patient-level adherence rates. In the following, each active QI result based on the latest available data (treatment year 2024) is summarized.

QI 1: Adequate surgical staging in early ovarian cancer.

This indicator applies to patients who undergo surgery (FIGO I–IIIA). In 2024, 93.5% of the centers met the target of ≥ 40% staged cases. Overall, about 75% of all early-stage OC patients in 2024 received the recommended staging. 12 centers (6.5%) performed below the target.

QI 2: Offer of genetic testing to ovarian cancer patients.

Given the implications for targeted therapies (PARP inhibitors) and familial risk, the guideline strongly recommends the offer of genetic testing to all OC patients [20–23]. The predefined target required genetic testing to be offered to now at least 70% of eligible patients. In the first year of data collection (2019), the offering rate was 63%, indicating that many centers had not been routinely offering testing. Centers then showed a marked descriptive improvement: by 2024 the offer of genetic testing in OC patients nationwide was 86%. The range among centers now is closer than in 2019: even the lowest-performing centers in 2024 offered testing to 46% of patients, whereas in 2019 some were at 0%. The distribution of testing rates shifted upward from 2019 to 2024: the 5th percentile rose from ~ 8% to 72%, and the median from ~ 61% to ~ 84% (see Table 2 und Figs. 2 and 3).

QI 3: Macroscopic complete resection in upfront cytoreductive surgery for advanced OC.

The most important prognostic factor in advanced ovarian cancer is the absence of residual tumor after cytoreductive surgery. In 2024, 183 of 184 centers (99.5%) met the target threshold of ≥ 30%. This median has gradually increased from ~ 73% in 2019 to 80% in 2024, reflecting improvements such as advanced surgical techniques and patient selection. Only 1 center fell below the 30% threshold in 2024, with a rate of 20% and had a very low number of primary surgeries. At the patient level, complete macroscopic resection in upfront cytoreductive surgery was achieved in 1965 out of 2560 advanced OC surgeries (76.8%).

QI 4: Advanced OC surgery performed by a gynecologic oncologist.

In 2024, 184 centers reported on having performed advanced OC surgery by a gynecologic oncologist. Among these, 182 (98.9%) met the 80% target. The median value was 100%, indicating that in at least half of the centers, every single advanced OC surgery was done by a qualified specialist. Even the 25th percentile was 100% in 2024, meaning three-quarters of centers had exclusively specialist surgeons for these cases. This is a significant improvement from earlier years – for example, in 2019 the 25th percentile was around 89%.

QI 8: First-line chemotherapy regimen for advanced disease.

The S3-guideline (and international standards) specifies that, unless contraindicated, advanced OC should be treated with 6 cycles of carboplatin (AUC5) and paclitaxel (175 mg/m²) after surgery (or before and after surgery if neoadjuvant) [18, 24]. In contrast, QI 5 ("postoperative chemotherapy advanced OC") referred to any postoperative chemotherapy regimen after surgery. On average, about 75.1% of advanced OC patients in the centers received first-line carboplatin-paclitaxel chemotherapy (2959 of 3941 patients across all centers). The median per center was with 75% higher in comparison to prior years (57% in 2019).

Discussion

The certification process is based on recommendations from interdisciplinary, formally consensus-based guidelines, mostly including a formally evidence-based approach. QIs are used to evaluate guideline adherence in clinical practice, especially in certified oncological cancer centers due to standardized documentation. The analysis of quality indicator outcomes from 184 certified gynecological cancer centers treating 4951 primary ovarian cancer cases in 2024 demonstrates high adherence to evidence-based treatment standards. The analysis showed high center-level target achievement for the active QIs (QI 1-QI 4) within the certified centers. However, target achievement should be distinguished from complete patient-level adherence, and the results cannot be generalized to all ovarian cancer care in Germany.

The pooled proportion of patients documented as having been offered genetic testing increased from 63% in 2019 to 86% in 2024. In 2024, 180 of 184 centers (97.8%) met the predefined target of ≥ 70%. Even the slower adopting centers caught up to a reasonable level within a few years, driven by the guideline mandate and certification oversight [10, 17].

Complete macroscopic tumor resection (TR0 resection) in advanced (stage FIGO IIB-IV) ovarian cancer surgery (QI 3) showed steady improvement (median TR0 rates from 73% in 2019 to 80% in 2024) and constant rates (99.5%) of centers meeting the target value. This descriptive increase is clinically relevant in view of the established prognostic importance of complete cytoreduction: multiple meta-analyses and systematic reviews demonstrate that complete tumor removal is the strongest modifiable predictor of survival in advanced ovarian cancer [11, 12, 25, 26]. A recent systematic review and meta-analysis found that median overall survival increased by about 13% for every 10% increase in complete cytoreduction rates, with this effect potentiated to 19.1% in patients receiving modern maintenance therapies [12]. Similarly, a large French study found that ovarian cancer surgery in hospitals performing ≥ 20 procedures per year was associated with significantly improved overall and recurrence-free survival, with the most differences observed between hospitals performing fewer than 10 surgeries per year and all other institutions (HR 1.27; 95% CI 1.14–1.41 for overall survival) [27].The aggregate TR0 rate of 77% across all certified centers in 2024 compares favorably with international benchmarks and reflects the concentration of complex ovarian cancer surgery in specialized high-volume centers [13, 28–30]. However, another analysis of QI (adequate staging in early-stage ovarian cancer and macroscopic tumor resection in advanced-stage ovarian cancer) investigated the association between surgical case volume and quality of OC surgery with certification audit data from 2020 to 2022. This study suggests that hospital volume alone is not a sufficient indicator of high-quality OC care. Rather, structural and process quality such as multidisciplinary structures, guideline adherence, and specialized cancer center certification as well as surgical expertise and competence, appear to be more important determinants of quality [14].

Likewise, for specialist surgery (QI 4), by 2022–2024 the entire cohort's lower range had moved up, essentially closing the gap between centers. The effect of retiring QIs that reached near-universal compliance (such as no chemotherapy in stage IA, G1) also suggests that what used to be a quality concern is now standard practice everywhere, therefore resources can focus on other areas.

A recent evaluation (the "WiZen" trial) suggests that patients treated in certified cancer centers have improved outcomes in gynecologic cancers including ovarian cancer [2]. Specifically for ovarian cancer, the study demonstrated that treatment in DKG-certified gynecological oncology centers was associated with a significantly lower mortality risk in the statutory health insurance cohort (HR 0.883; 95% CI 0.824–0.948; p = 0.001). Among patients from clinical cancer registries diagnosed with UICC stage I–III disease, the survival benefit was even more pronounced (HR 0.825; 95% CI 0.708–0.961; p = 0.014), suggesting that the certification effect may be particularly relevant in earlier, potentially curable stages [2]. Although these findings support the clinical relevance of certified care structures, the WiZen study does not identify which components of certification account for the observed survival association. In this context, high performance for ovarian cancer QIs—particularly those related to surgical expertise and complete cytoreduction—are likely to represent important drivers of this survival benefit.

These QIs serve as important management tools in an ongoing quality improvement cycle. Each year, every center's QI results are reviewed in the context of certification. If a center does not meet a target, it must analyze why and implement corrective actions. These actions are discussed during the audit by external surveyors. By the next audit, the center needs to demonstrate that these actions were performed and whether improvement occurred. This structured feedback loop has led to a "consistent and successful quality improvement process". It embodies Deming's quality cycle (Plan-Do-Check-Act).

Limitations

Several limitations should be considered. First, the analysis was based on aggregated data from certified centers and did not include a non-certified comparison group. The findings therefore cannot establish a causal effect of QI implementation or certification. Second, changes in the number and composition of participating centers, as well as revisions of QI definitions, may limit comparability across treatment years. Third, center-level rates may be unstable when based on small denominators, and no risk adjustment for case mix, disease stage, comorbidity, or treatment selection was available. Fourth, the analysis did not include patient-level survival, morbidity, quality of life, or patient-reported outcome data. Finally, the predefined certification thresholds represent pragmatic quality-management targets and should not be interpreted as complete guideline adherence.

Conclusions

Overall, the use of guideline-based QIs in ovarian cancer has significantly impacted quality management by making quality measurable and transparent. It has enabled each center to benchmark itself against peers and identify any shortcomings in structure (like specialist availability) or process (like adherence to protocol). The fact that nearly all centers now meet the targets suggests a high degree of standardization – a direct result of the QIs driving quality improvement initiatives. Moreover, the collected QI data are being used at the national level to update guidelines and certification criteria, closing the quality cycle loop. Although quality-of-life measures are not directly incorporated into QIs, patients still benefit from the implementation of QIs through improvements of health care delivery.

Declarations

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Competing Interests

The authors declare no competing interests.

Author Contribution

All authors contributed to the study conception and design. Material preparation, data collection and analysis were performed by CES and PP. The first draft of the manuscript was written by CES, PP and JE. All authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

Data Availability

The datasets generated during and analysed during the current study are available from the corresponding author on reasonable request.

References

1. Krebsdaten. *Krebs in Deutschland. Eierstockkrebs* (2025). https://www.krebsdaten.de/Krebs/DE/Content/Publikationen/Krebs_in_Deutschland/kid_2025/kid_2025_c56_eierstoecke.pdf?__blob=publicationFile. *(accessed 05.08.2026)*
2. Hansinger J et al (2025) Comparison of survival in ovarian cancer patients following treatment in certified gynecologic oncology centers and non-certified hospitals: a German retrospective cohort study (WiZen). J Ovarian Res 18(1):238
3. Leitlinienprogramm (2021) *Onkologie (Deutsche Krebsgesellschaft, Deutsche Krebshilfe, AWMF): S3-Leitlinie Diagnostik, Therapie und Nachsorge maligner Ovarialtumoren, Leitlinienreport Version 5.0*, AWMF-Registernummer: 032/035OL. https://www.leitlinienprogramm-onkologie.de/leitlinien/ovarialkarzinom/; *(accessed 26.07.2026)*
4. Leitlinienprogramm Onkologie V, *Stiftung Deutsche Krebshilfe, Arbeitsgemeinschaft der Wissenschaftlichen Medizinischen Fachgesellschaften (AWMF) e.V.) Entwicklung von leitlinienbasierten Qualitätsindikatoren. Methodenpapier für das Leitlinienprogramm Onkologie, Version 4.0*, (2025), http://www.leitlinienprogramm-onkologie.de/methodik/informationenzur-methodik/; *(accessed 26.07.2026)*
5. Beckmann MW et al (2016) Considerations on the Improved Integration of Medical Guidelines into Routine Clinical Practice - a Review and Concept Proposal. Geburtshilfe Frauenheilkd 76(4):369–376

6. Piekarska K et al (2025) The Impact of Implementing Indicators of Quality of Oncological Care on Improving Patient Outcomes: A Cross-Sectional Review of Experiences from Countries Using Indicators in the Quality Assessment Process. Cancers (Basel), 17(8)
7. Stirling RG et al (2025) Impacts of a Clinical Quality Registry on Lung Cancer Quality Measures: A Retrospective Observational Study of the Victorian Lung Cancer Registry. 44:103878 Clin Oncol (R Coll Radiol)
8. Thamm C et al (2025) A systematic review and meta-analysis of patient-relevant outcomes in comprehensive cancer centers versus noncomprehensive cancer centers. Cancer 131(1):e35646
9. Rückher J et al (2022) Guideline-Based Quality Indicators for Kidney and Bladder Cancer in Germany: Development and Implementation. Urol Int 106(4):360–367
10. Leitlinienprogramm (2026) *Onkologie (Deutsche Krebsgesellschaft, Deutsche Krebshilfe, AWMF): Diagnostik, Therapie und Nachsorge maligner Ovarialtumoren, Langversion 6.1*, AWMF-Registernummer: 032-035OL. https://www.leitlinienprogramm-onkologie.de/leitlinien/ovarialkarzinom/; (*accessed 26.07.2026)*
11. du Bois A et al (2009) Role of surgical outcome as prognostic factor in advanced epithelial ovarian cancer: a combined exploratory analysis of 3 prospectively randomized phase 3 multicenter trials: by the Arbeitsgemeinschaft Gynaekologische Onkologie Studiengruppe Ovarialkarzinom (AGO-OVAR) and the Groupe d'Investigateurs Nationaux Pour les Etudes des Cancers de l'Ovaire (GINECO). Cancer 115(6):1234–1244
12. Kim JH et al (2023) Impact of postoperative residual disease on survival in epithelial ovarian cancer with consideration of recent frontline treatment advances: A systematic review and meta-analysis. Gynecol Oncol 179:24–32
13. Vernooij F et al (2009) Specialized and high-volume care leads to better outcomes of ovarian cancer treatment in the Netherlands. Gynecol Oncol 112(3):455–461
14. Ortmann O et al (2025) Correlation of surgical volume in gynecological cancer centers with the quality of ovarian cancer care. J Cancer Res Clin Oncol 151(8):239
15. Sessa C et al (2023) Risk reduction and screening of cancer in hereditary breast-ovarian cancer syndromes: ESMO Clinical Practice Guideline. Ann Oncol 34(1):33–47
16. *Jahresbericht der deutschen Krebsgesellschaft (DKG) - Gynäkologische Krebszentren (*(2026)). https://www.krebsgesellschaft.de/jahresberichte.html. *(Accessed 27.07.2026)*
17. Leitlinienprogramm (2019) *Onkologie (Deutsche Krebsgesellschaft, Deutsche Krebshilfe, AWMF): S3-Leitlinie Diagnostik, Therapie und Nachsorge maligner Ovarialtumoren, Langversion 3.0*, AWMF-Registernummer: 032/035OL. https://www.leitlinienprogramm-onkologie.de/leitlinien/ovarialkarzinom/; (*accessed 26.07.2026)*
18. Leitlinienprogramm *Onkologie (Deutsche Krebsgesellschaft, Deutsche Krebshilfe, AWMF): S3-Leitlinie Diagnostik, Therapie und Nachsorge maligner Ovarialtumoren, Langversion 1.0, AWMF Registrierungsnummer*: http://leitlinienprogramm-onkologie.de/Leitlinien.7.0.*html; (accessed 27.07.*(2026))
19. *Summary Protocol of the Meeting of the Certification Committee for Gynecological Cancer Centers_29.06.*(2017) https://www.krebsgesellschaft.de/zertkomm-protokolle.html?file=files/dkg/deutschekrebsgesellschaft/content/pdf/Zertifizierung/ProtokolleZertkomm/GZProtokoll170629.pdf&*cid=43707. (Accessed 04.08.2023)*
20. Ray-Coquard I et al (2023) Olaparib plus bevacizumab first-line maintenance in ovarian cancer: final overall survival results from the PAOLA-1/ENGOT-ov25 trial. Ann Oncol 34(8):681–692
21. DiSilvestro P et al (2023) Overall Survival With Maintenance Olaparib at a 7-Year Follow-Up in Patients With Newly Diagnosed Advanced Ovarian Cancer and a BRCA Mutation: The SOLO1/GOG 3004 Trial. J Clin Oncol 41(3):609–617
22. Ray-Coquard I et al (2019) Olaparib plus Bevacizumab as First-Line Maintenance in Ovarian Cancer. N Engl J Med 381(25):2416–2428
23. González-Martín A et al (2019) Niraparib in Patients with Newly Diagnosed Advanced Ovarian Cancer. N Engl J Med 381(25):2391–2402
24. Armstrong DK et al (2021) Ovarian Cancer, Version 2.2020, NCCN Clinical Practice Guidelines in Oncology. J Natl Compr Canc Netw 19(2):191–226
25. Timmermans M et al (2019) The prognostic value of residual disease after neoadjuvant chemotherapy in advanced ovarian cancer; A systematic review. Gynecol Oncol 153(2):445–451
26. Emons J et al (2025) Update Gynecologic Malignancies 2025 - Expert Opinion on Systemic Therapy for Early and Advanced Gynecological Cancers. Geburtshilfe Frauenheilkd 85(7):736–745
27. Prost P et al (2024) Impact of Ovarian Cancer Surgery Volume on Overall and Progression-Free Survival: A Population-Based Retrospective National French Study. Ann Surg Oncol 31(5):3269–3279
28. Nasioudis D et al (2019) Impact of hospital surgical volume on complete gross resection (CGR) rates following primary debulking surgery for advanced stage epithelial ovarian carcinoma. Gynecol Oncol 154(2):401–404
29. Wright JD et al (2017) Association of Hospital Volume and Quality of Care With Survival for Ovarian Cancer. Obstet Gynecol 130(3):545–553
30. Pietschmann M et al (2024) The Impact of Upper Abdominal Surgery Regarding the Outcome of Patients with Advanced Ovarian Cancer. Geburtshilfe Frauenheilkd 84(9):866–875

Figures

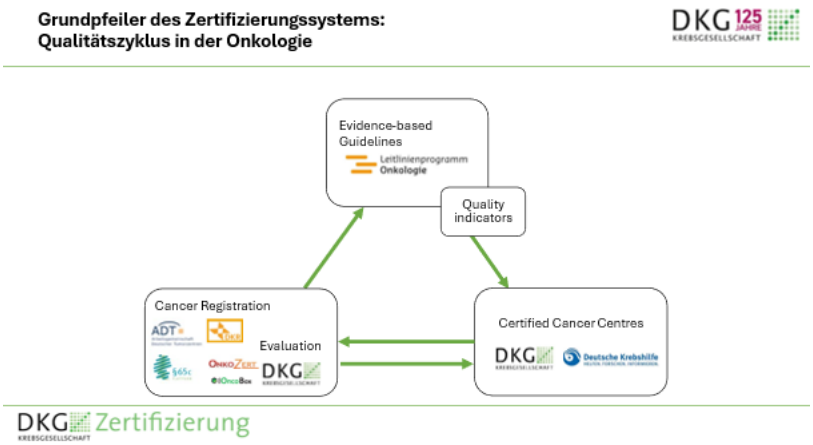


Figure 1

Quality cycle in oncology [9]

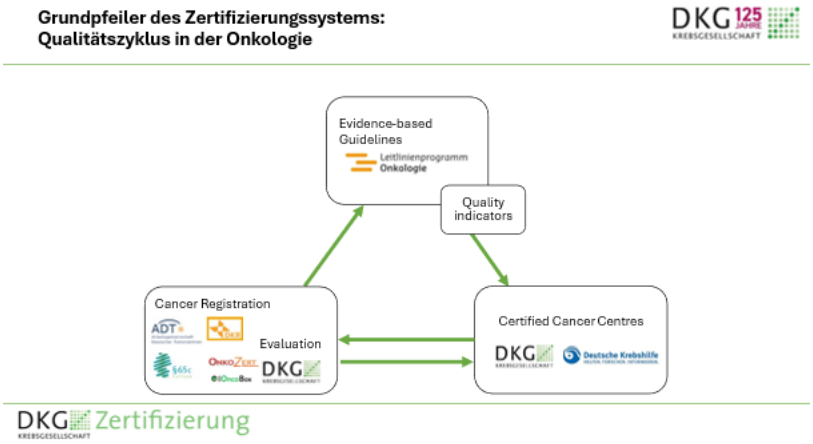
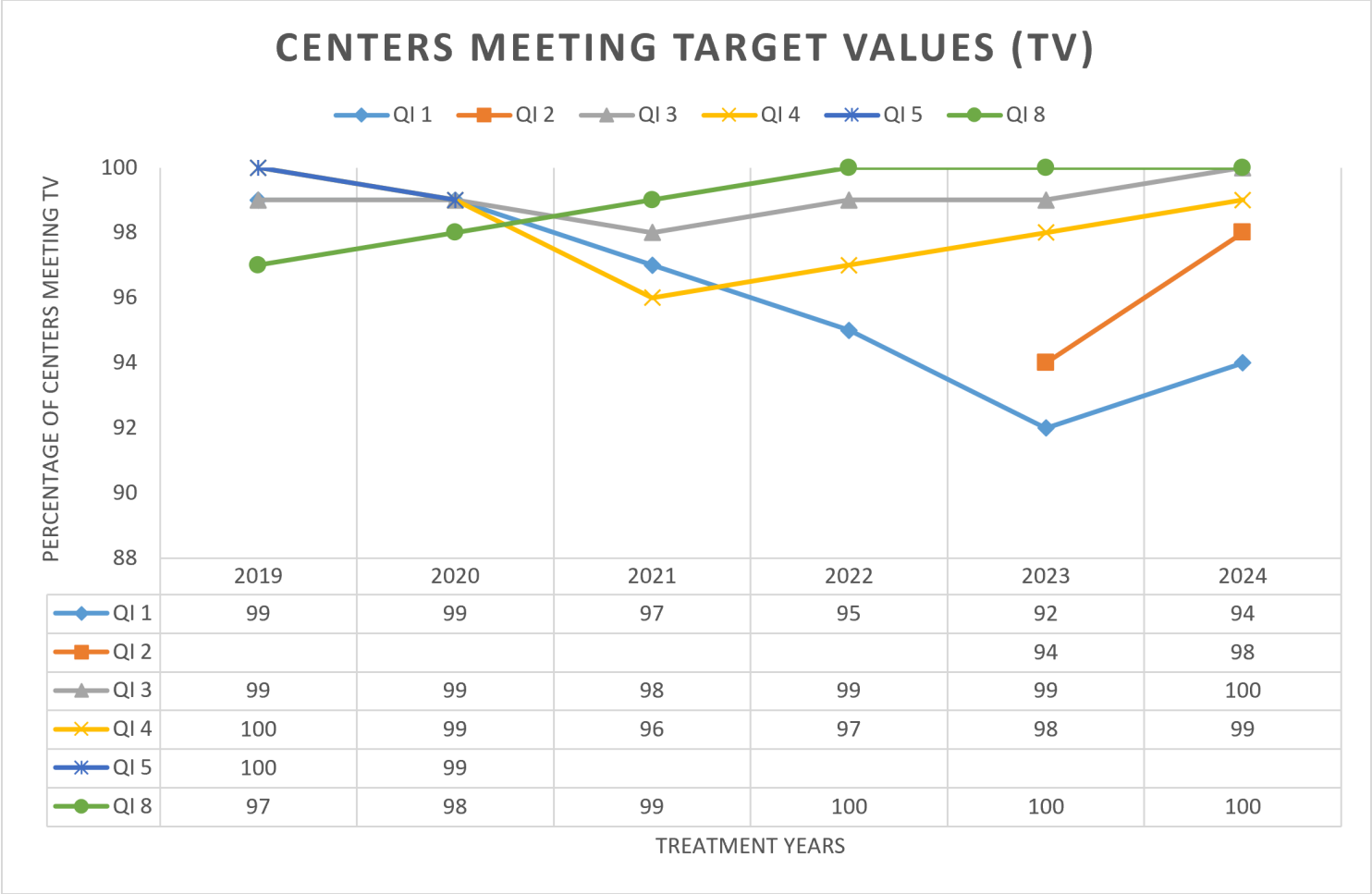


Figure 1

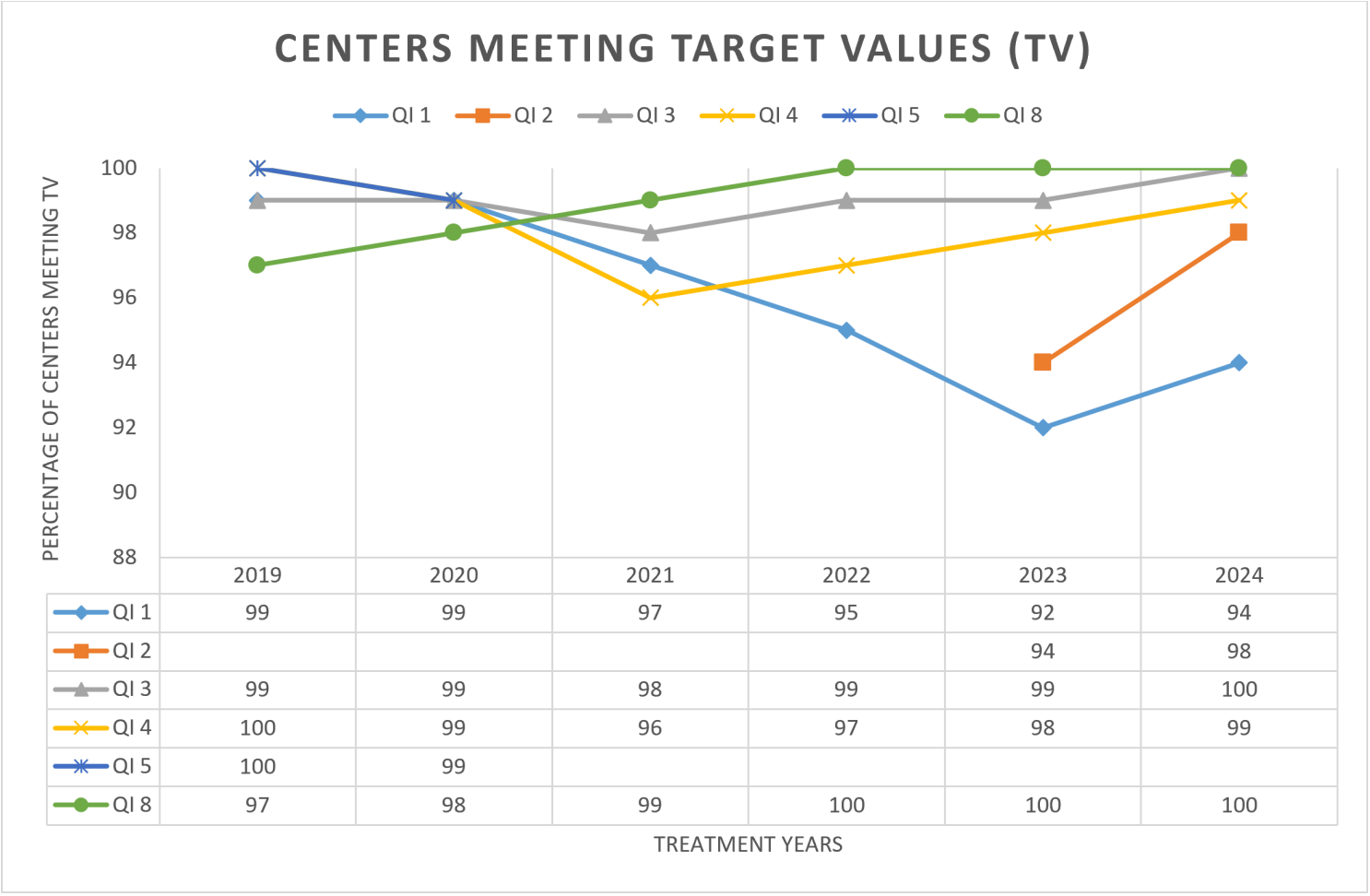
Quality cycle in oncology [9]



	2019	2020	2021	2022	2023	2024
QI 1	99	99	97	95	92	94
QI 2					94	98
QI 3	99	99	98	99	99	100
QI 4	100	99	96	97	98	99
QI 5	100	99				
QI 8	97	98	99	100	100	100

Figure 2

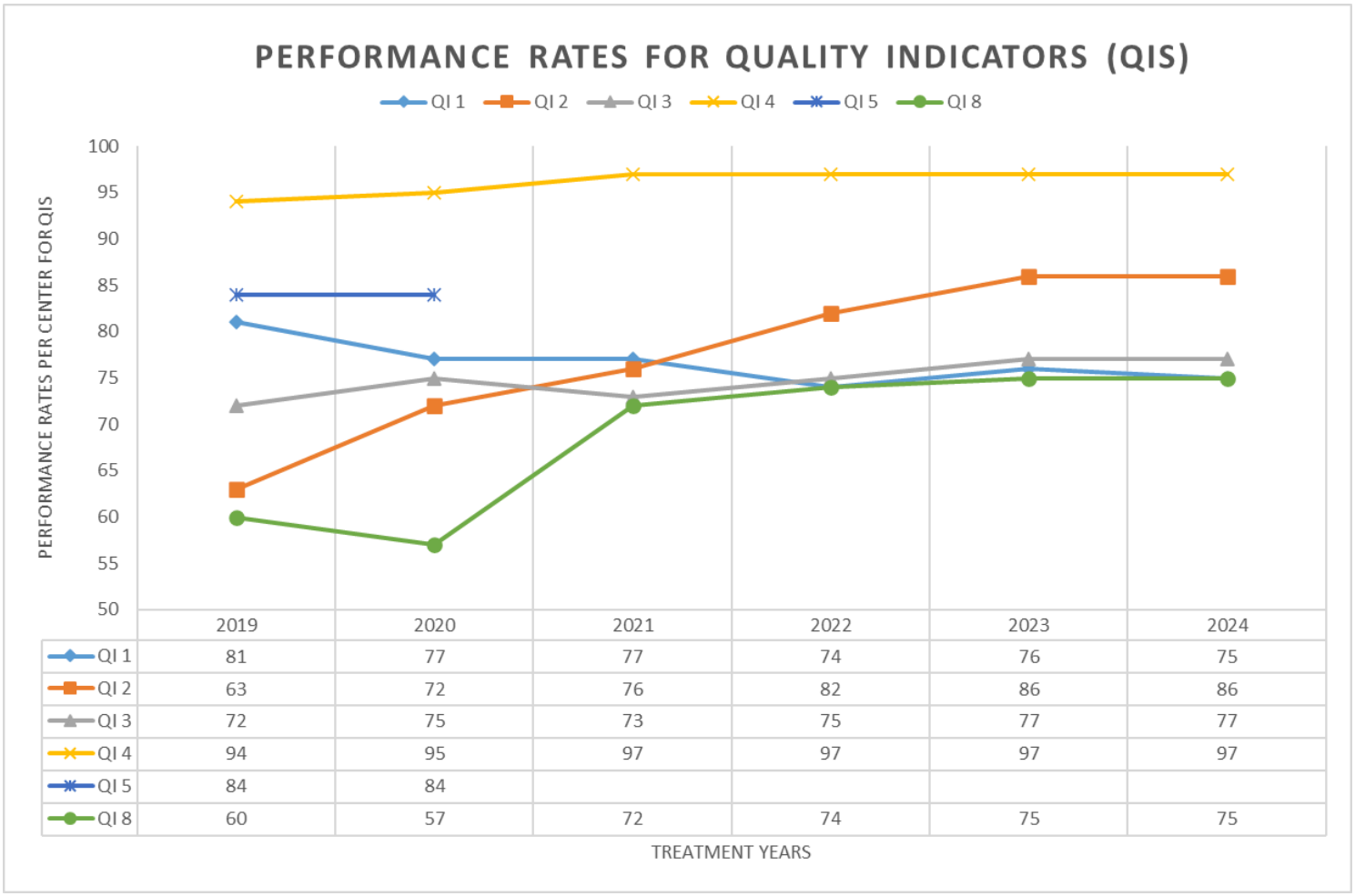
Centers meeting target values (TV) over time (years refer to the treatment years



	2019	2020	2021	2022	2023	2024
QI 1	99	99	97	95	92	94
QI 2					94	98
QI 3	99	99	98	99	99	100
QI 4	100	99	96	97	98	99
QI 5	100	99				
QI 8	97	98	99	100	100	100

Figure 2

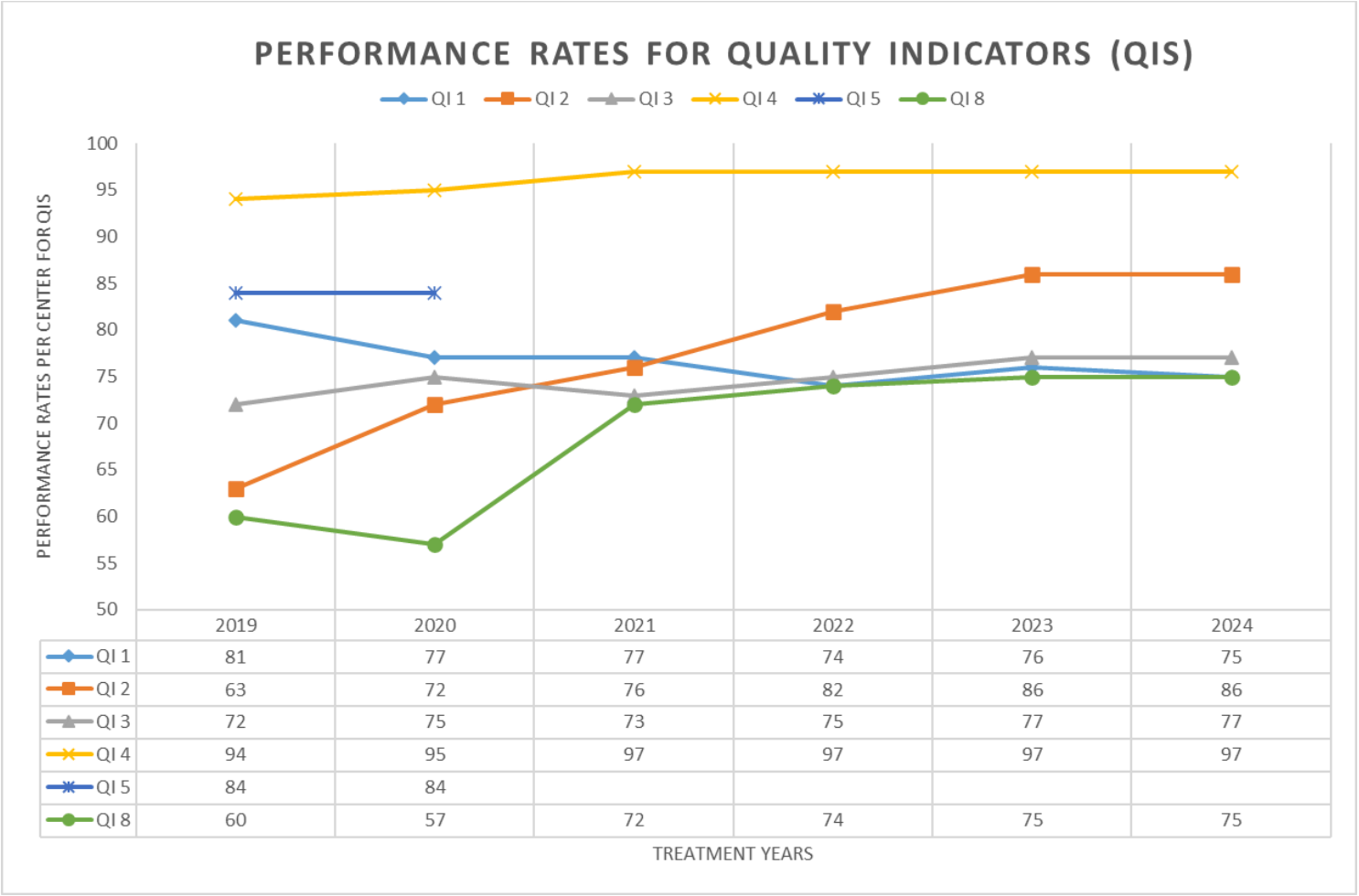
Centers meeting target values (TV) over time (years refer to the treatment years



	2019	2020	2021	2022	2023	2024
QI 1	81	77	77	74	76	75
QI 2	63	72	76	82	86	86
QI 3	72	75	73	75	77	77
QI 4	94	95	97	97	97	97
QI 5	84	84				
QI 8	60	57	72	74	75	75

Figure 3

Overall performance rates (R) for Quality Indicators (QIs) over time (years refer to the treatment years)



	2019	2020	2021	2022	2023	2024
QI 1	81	77	77	74	76	75
QI 2	63	72	76	82	86	86
QI 3	72	75	73	75	77	77
QI 4	94	95	97	97	97	97
QI 5	84	84				
QI 8	60	57	72	74	75	75

Figure 3

Overall performance rates (R) for Quality Indicators (QIs) over time (years refer to the treatment years)