European Society of Gynaecological Oncology quality indicators for the surgical treatment of endometrial carcinoma

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ABSTRACT

Background Quality of surgical care as a crucial component of a comprehensive multi-disciplinary management improves outcomes in patients with endometrial carcinoma, notably helping to avoid suboptimal surgical treatment. Quality indicators (QIs) enable healthcare professionals to measure their clinical management with regard to ideal standards of care.

Objective In order to complete its set of QIs for the surgical management of gynecological cancers, the European Society of Gynaecological Oncology (ESGO) initiated the development of QIs for the surgical treatment of endometrial carcinoma.

Methods QIs were based on scientific evidence and/or expert consensus. The development process included a systematic literature search for the identification of potential QIs and documentation of the scientific evidence, two consensus meetings of a group of international experts, an internal validation process, and external review by a large international panel of clinicians and patient representatives. QIs were defined using a structured format comprising metrics specifications, and targets. A scoring system was then developed to ensure applicability and feasibility of a future ESGO accreditation process based on these QIs for endometrial carcinoma surgery and support any institutional or governmental quality assurance programs.

Results Twenty-nine structural, process and outcome indicators were defined. QIs 1–5 are general indicators related to center case load, training, experience of the surgeon, structured multi-disciplinarity of the team and active participation in clinical research. QIs 6 and 7 are related to the adequate pre-operative investigations. QIs 8–22 are related to peri-operative standards of care. QI 23 is related to molecular markers for endometrial carcinoma diagnosis and as determinants for treatment decisions. QI 24 addresses the compliance of management of patients after primary surgical treatment with the standards of care. QIs 25–29 highlight the need for a systematic assessment of surgical morbidity and oncologic outcome as well as standardized and comprehensive documentation of surgical and pathological elements. Each QI was associated with a score. An assessment form including a scoring system was built as basis for ESGO accreditation of centers for endometrial cancer surgery.

INTRODUCTION

Optimizing and ensuring the quality of surgical care is essential to improve the management and outcome of patients with endometrial carcinoma. The quality of surgical care as a component of comprehensive multi-disciplinary management has been shown to improve outcomes in patients with endometrial carcinoma, notably helping to avoid suboptimal surgical treatment.¹ Adoption of guidelines is an effective tool for disease control and should be considered as a process measure of quality of gynecological cancer care.² QIs enable healthcare professionals to compare their clinical management with the ideal standards according to the guidelines in order to detect aspects of suboptimal care.³ In order to complete its set of QIs for the surgical management of gynecological cancers, the European Society of Gynaecological Oncology (ESGO) initiated a project aiming to develop a list of QIs for surgical treatment of endometrial carcinoma.

The idea behind the project is to improve the standard of surgical care by providing a set of quality criteria that can be used on many levels: self-assessment, institutional quality assurance programs, governmental quality assessment, and eventually, to build a network of certified centers for endometrial carcinoma surgery. Certified centers can make the award known to doctors, patients, patient advocacy groups, and lay persons. The intention is incentive, not punitive. The targets defined by the international development group should not be used to penalize or litigate doctors or institutions. These QIs will be updated and modified based on new evidence.

METHODS

QIs for the surgical treatment of endometrial carcinoma were developed using a three-step evaluation process (Figure 1). This development process involved two meetings of an international development group, chaired by Professor Nicole Concin (Medical University of Innsbruck, Innsbruck, Austria/Evangelische

Figure 1 Development process.

Kliniken Essen-Mitte, Essen, Germany) and Professor Jan Persson (Skåne University Hospital, Lund University, Faculty of Medicine, Clinical Sciences, Lund, Sweden).

Nomination of an International Development Group

The ESGO Council nominated 17 gynecologic oncologists from its membership body, with well-recognized expertise, clinical and research activity, and leadership in the field as surrogate markers for their continuous effort in improving patients care.

Identification of Potential QIs

All potential QIs for endometrial carcinoma surgery were defined from the guidelines jointly developed by ESGO, the European Society for Radiotherapy and Oncology (ESTRO), and the European Society of Pathology (ESP), and published indicators identified using a systematic literature search in Medline without any restriction of the search period (indexing terms: QI, quality assurance, endometrial carcinoma, endometrial cancer, uterine neoplasms, surgery, methodology, consensus statements, evidence-based medicine).^{4–11} Another systematic literature search was then conducted in Medline to identify available scientific evidence which supports the potential QIs (Online supplemental appendix 1). The reference list of each identified article was reviewed for other potentially relevant papers. The development group members were allowed to provide any additional references they deemed relevant (if any).

Evaluation of Potential QIs

Potential QIs were formatted as a questionnaire and sent to the international development group. Experts were asked to evaluate each indicator according to relevance and feasibility in clinical practice. They were also free to propose any additional possible QIs they deemed relevant. Acceptance, rejection, or the need for further consideration of each indicator was discussed during the first meeting (February 3–4, 2021). QIs were retained if a large consensus among experts was reached.

External Evaluation of the Retained QIs: International Review

The ESGO Council established a large panel of practicing clinicians who provide care to patients with endometrial carcinoma. These international reviewers are independent of the international development group and are from different European and non-European countries to ensure global perspective. Patients with endometrial

carcinoma were also included. The retained indicators were formatted as a questionnaire and sent to the reviewers for quantitative evaluation of each indicator according to relevance, feasibility in clinical practice, and quality of care improvement (physicians only). Open comments were encouraged (qualitative evaluation). Patients were asked to qualitatively evaluate each QI (according to their experience, preferences, feelings, etc). Evaluations of the indicators were returned by 140 independent physicians and by three patients with endometrial carcinoma (the list of international reviewers is available in Online supplemental appendix 2). Responses were pooled and sent to experts who convened during the second meeting (May 26–27, 2021). The comments were reviewed and discussed by the international development group members. Definitions of QIs, specifications, and targets were validated during the second meeting. Although the strengths of the process include an international development group, an international expert consensus to support the QIs, an international external review process (physicians and patients), a structured format to present the QIs, and management of potential conflicts of interests, the QIs result from a consensus of experts, with inherent bias in this type of method. They may have to be modified in the future based on publication of new data.

RESULTS

The key characteristics of an ideal indicator are clear definition, clinical relevance, measurability, and feasibility in clinical practice. Each retained QI is categorized as a structural indicator, process indicator, or outcome indicator and has a description which specifies what the indicator is measuring.¹² The measurability specifications are then detailed. The latter highlight the way in which the indicator will be measured in practice to allow audits. The time frame for assessment of criteria is the last calendar year (unless otherwise indicated). Further to measurement of the indicator, a target is indicated. This specifies the level which each unit/center should be aiming to achieve. When appropriate, two targets were defined: an optimal target, expressing the best possible option for patients and a minimal target, expressing the minimal requirement when practical feasibility factors are taken into account. Targets are based on available scientific evidence, personal experience of the international development group members, on expert consensus, and on feedbacks from external reviewers. QIs 1–5 are general indicators related to center case load, training, experience of the surgeon, structured multi-disciplinarity of the team, and active participation in clinical research (Table 1). QIs 6 and 7 are related to the adequate pre-operative investigations (Table 2). QIs 8–22 are related to the compliance of the peri-operative management with the standards of care (Table 3). QI 23 is related to molecular markers for endometrial carcinoma diagnosis and as determinants for treatment decisions (Table 4). QI 24 addresses the compliance of management of patients after primary surgical treatment with the standards of care (Table 5). QIs 25–29 highlight the need for a systematic assessment of surgical morbidity and oncologic outcomes as well as standardized and comprehensive documentation of surgical and pathological elements (Table 6).

Society statement

Table 1 General indicators

QI 1 - Number of newly diagnosed cases of endometrial carcinoma treated per center per year

Type	Structural indicator
Description	Number of newly diagnosed cases of endometrial carcinoma treated (surgically or not surgically) per center per year.
Specifications	<i>Numerator:</i> number of newly diagnosed endometrial carcinoma cases treated per center per year. <i>Denominator:</i> not applicable.
Targets	Optimal target: ≥ 90 Minimum required target: ≥ 50

QI 2 - Number of endometrial carcinoma primary surgeries (including early and advanced stages) performed per center per year

Type	Structural indicator
Description	Primary surgeries, including lymph node assessment, hysterectomy, and cytoreductive surgeries for early and advanced-stage endometrial carcinoma
Specifications	<i>Numerator:</i> number of patients undergoing a primary surgery as defined above performed per center per year <i>Denominator:</i> not applicable
Targets	Optimal target: ≥ 80 Minimum required target: ≥ 50

QI 3 - Surgery performed by a gynecologic oncologist or a trained surgeon specifically dedicated to gynecological cancer management

Type	Process indicator
Description	Surgery is performed or supervised by a certified gynecologic oncologist, or in countries where certification is not established, by a trained surgeon dedicated to the management of gynecological cancer (accounting for more than 80% of his or her practice) or having completed an ESGO-certified fellowship
Specifications	<i>Numerator:</i> number of patients with endometrial carcinoma operated by a surgical specialist as defined above or supervised by this category <i>Denominator:</i> number of patients with endometrial carcinoma undergoing surgery
Target	$\geq 95\%$

QI 4 - Treatment and/or follow-up plan discussed at a multi-disciplinary team meeting

Type	Process indicator
Description	The decision for any therapeutic intervention and/or follow-up plan has been made by a multi-disciplinary team including at least a certified gynecologic oncologist (or in countries where certification is not organized, a trained surgeon dedicated to the management of gynecological cancer (accounting for more than 80% of his or her practice) or having completed an ESGO-certified fellowship), a radiologist, a radiation oncologist, a physician certified to deliver chemotherapy (a gynecologic oncologist and/or a physician with special interest to gynecologic oncology (medical or clinical oncologist)), and a pathologist
Specifications	<i>Primary treatment:</i> ► <i>Numerator:</i> number of patients with endometrial carcinoma in whom the decision for any primary treatment has been made by a multi-disciplinary team ► <i>Denominator:</i> all patients presenting with newly diagnosed endometrial carcinoma <i>Relapse treatment:</i> ► <i>Numerator:</i> number of patients with endometrial carcinoma in whom the decision for any relapse treatment has been made by a multi-disciplinary team ► <i>Denominator:</i> all patients presenting with relapsed endometrial carcinoma
Targets	Primary treatment: 90% Relapse treatment: 99%

QI 5 - Center participating in ongoing prospective studies in gynecological oncology

Type	Structural indicator
Description	The center actively accrues patients in ongoing prospective studies (including notably studies on imaging, translational research, quality of life, and/or tissue procurement) in gynecological oncology. The studies should be approved by an ethical committee
Specifications	<i>Numerator:</i> not applicable <i>Denominator:</i> not applicable

Continued

Table 1 Continued

Targets	Optimal target: participation in ongoing prospective studies in endometrial carcinoma Minimum required target: participation in ongoing prospective studies in gynecological oncology

General Indicators

Although the number of cases treated per center per surgeon per year is not a sufficient guarantee of surgical quality, it is major prerequisite. The volume effect on outcomes of cancer operation is related to a surgeon's skill and experience defined notably by surgical volumes, as well as hospital infrastructure and the supporting team dedicated to surgical care. Available data support a positive relationship between number of cases operated on and outcomes (eg, survival, increased technical expertise, adherence to evidence-based treatment recommendations, and appropriate management of complications) for different types of cancer, indicating a benefit for centralization of care pathways.^{13–112} Volume appears to have more effects on outcomes for high-risk procedures that are associated with substantial morbidity. In a large National Cancer Database in the United States including 441 863 patients with uterine cancer patients, survival was significantly increased with increasing hospital volume for women with all stages of endometrioid, clear cell, serous, or carcinosarcoma endometrial cancer (25, 50, or 100 cases per year).⁸⁸

Wright et al explored the association between changes over time (from 2000 to 2014) in volume and peri-operative outcomes for 44 558 women undergoing hysterectomy for endometrial cancer at 218 hospitals and showed that increased hospital volume was associated with lower rates of surgical and medical complications, mortality, transfusion, and prolonged length of stay.¹⁰⁹ Diaz-Montes et al aimed to characterize the short-term outcomes for uterine cancer according to hospital case volume (6181 women undergoing primary surgery by 894 surgeons at 49 hospitals).³⁴ Although there was a trend toward a lower in-hospital death rate for women

managed at high-volume hospitals compared with low-volume hospitals, this trend did not reach statistical significance. Dividing volume hospitals depending on the average annual number of surgeries for endometrial carcinoma (using relatively low case number cut-off points: low <15/year, medium 15–24/year, and high ≥25/year), Becker et al observed no relation between surgical volumes and relative survival of patients with endometrial cancer.¹⁸

In Europe, the organization of gynecologic oncology training differs among countries, but there is a trend towards centralization and subspecialization. ESGO has developed a subspecialty training program in gynecologic oncology. Increasing evidence shows that the subspecialty backgrounds of treating physicians affect treatment outcomes of patients with malignant disease.^{113–120} Chan et al explored this hypothesis specifically for patients with endometrial carcinoma.¹²¹ Treatment by gynecologic oncologists was an independent prognostic factor for improved disease-specific survival after adjusting for age, stage, and grade of disease. According to the ESGO/ESTRO/ESP guidelines, treatment should be undertaken in a specialized center by a dedicated team of specialists in the diagnosis and management of gynecological cancers, especially in high-risk and/or advanced-stage disease.^{4–6}

Multi-disciplinary care is recognized as best practice in treatment planning and care for patients internationally. In several cancer types, there is evidence that decisions made by a multi-disciplinary team are more likely to be in accord with evidence-based guidelines than those made by individual clinicians, and the role of a multi-disciplinary approach in the quality of care is recognized.^{119 122–129} According to the ESGO/ESTRO/ESP guidelines, planning of staging and treatment should be made on a multi-disciplinary basis

Table 2 Adequate pre-operative investigations

QI 6 - Proportion of patients with a pre-operative work-up according to the ESGO/ESTRO/ESP guidelines	
Type	Outcome indicator
Description	The pre-operative mandatory work-up, based on the ESGO/ESTRO/ESP guidelines, includes: family history; general assessment and inventory of co-morbidities; geriatric assessment, if appropriate; clinical examination, including pelvic examination; expert vaginal or transrectal ultrasound or pelvic MRI. Depending on clinical and pathologic risk, additional imaging modalities (thoracic, abdominal, and pelvic CT scan, MRI, positron emission tomography scan, or ultrasound) should be considered to assess ovarian nodal, peritoneal, and other sites of metastatic disease
Specifications	<i>Numerator:</i> number of patients who have undergone pre-operative work-up according to the ESGO/ESTRO/ESP guidelines (as defined above) <i>Denominator:</i> all patients who have undergone surgery
Target	90%
QI 7 - Proportion of presumed FIGO stage I–II upstaged to IVB disease	
Type	Outcome indicator
Description	Presence of peritoneal carcinomatosis and distant metastases in patients who have been considered early-stage disease (stage I–II) pre-operatively
Specifications	<i>Numerator:</i> number of patients with post-operative stage IVB including peritoneal carcinomatosis <i>Denominator:</i> all patients with presumed stage I–II disease undergoing surgery
Target	<5%

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Table 3 Compliance of the peri-operative management with the standards of care

QI 8 - Proportion of cases of early-stage endometrial carcinoma with non ruptured uterus after hysterectomy

Type	Outcome indicator
Description	Uterus should be removed intact. Intra-operative rupturing/fragmentation/morcellation of the uterus (including in a bag) must be avoided
Specifications	<i>Numerator:</i> number of patients with early-stage endometrial carcinoma after hysterectomy with intact/non-ruptured/non-fragmented/non-morcellated uterus <i>Denominator:</i> all patients with early-stage (I-II) endometrial carcinoma who underwent hysterectomy.

Target 99%

QI 9 - Proportion of patients with early-stage endometrial carcinoma who have undergone successful minimally invasive surgery

Type	Outcome indicator
Description	Minimally invasive surgery (laparoscopic or robotic) is considered successful if performed without any intra-peritoneal tumor spillage, tumor rupture, or morcellation (including in a bag). If vaginal extraction risks uterine rupture, other measures should be taken (eg, mini-laparotomy, use of endobag). If a mini-laparotomy for such purpose is performed within a minimally invasive procedure, the surgery is still considered a successful minimally invasive surgery
Specifications	<i>Numerator:</i> number of patients with presumed early-stage endometrial carcinoma who have undergone successful minimally invasive surgery (as defined above) <i>Denominator:</i> all patients who have undergone surgery for presumed early-stage (I-II) endometrial carcinoma

Targets Optimal target: ≥80%
Minimum required target: 60%

QI 10 - Proportion of patients with BMI >35 kg/m² who have undergone successful minimally invasive surgery

Type	Outcome indicator
Description	Minimally invasive surgery (laparoscopic or robotic surgery) is considered successful if performed without any intra-peritoneal tumor spillage, tumor rupture, or morcellation (including in a bag). If vaginal extraction risks uterine rupture, other measures should be taken (eg, mini-laparotomy, use of endobag). If a mini-laparotomy for such purpose is performed within a minimally invasive procedure, the surgery is still considered a successful minimal invasive surgery
Specifications	<i>Numerator:</i> number of patients with BMI >35 kg/m ² with presumed early-stage endometrial carcinoma who have undergone successful minimally invasive surgery (as defined above) <i>Denominator:</i> all patients with BMI >35 kg/m ² who have undergone surgery for presumed early-stage (I-II) endometrial carcinoma

Target >60%

QI 11 - Proportion of conversions from minimally invasive surgery to open surgery

Type	Outcome indicator
Description	Minimally invasive surgery includes laparoscopic and robotic surgery. Conversions to laparotomy occur due to intra-operative findings or complications. Mini-laparotomy to extract the uterus is not considered as conversion to laparotomy
Specifications	<i>Numerator:</i> number of patients with endometrial carcinoma who have undergone minimally invasive surgery in whom a conversion to open surgery has been required <i>Denominator:</i> all patients with endometrial carcinoma who have undergone minimally invasive surgery

Target <10%

QI 12 - Proportion of patients with intra-operative injuries

Type	Outcome indicator
Description	Intra-operative injuries include positioning complications and urinary, bowel, vascular, and neural injuries
Specifications	<i>Numerator:</i> number of patients with endometrial carcinoma who have undergone a surgery in whom intra-operative injuries as described above have been reported <i>Denominator:</i> all patients with endometrial carcinoma who have undergone a surgery

Target <2%

QI 13 - Proportion of infracolic omentectomy in patients with endometrial carcinoma and presumed early-stage serous, undifferentiated carcinoma or carcinosarcoma

Type	Outcome indicator
Description	According to the ESGO/ESTRO/ESP guidelines, staging infracolic omentectomy should be performed in apparent uterus-confined serous, undifferentiated carcinoma, or carcinosarcoma

Continued

Table 3 Continued

Specifications	<i>Numerator:</i> number of patients with endometrial carcinoma and presumed early-stage serous, undifferentiated carcinoma, or carcinosarcoma who underwent infracolic omentectomy <i>Denominator:</i> all patients with endometrial carcinoma and presumed early-stage (I–II) serous, undifferentiated carcinoma, or carcinosarcoma who underwent surgery
Target	≥90%
QI 14 - Proportion of lymph node staging performed in patients with presumed early-stage high-intermediate or high-risk endometrial carcinoma	
Type	Outcome indicator
Description	According to the ESGO/ESTRO/ESP guidelines, surgical lymph node staging should be performed in patients with early-stage endometrial carcinoma deemed pre-operatively as high-intermediate or high risk Sentinel lymph node biopsy is an acceptable alternative to systematic lymphadenectomy for lymph node staging in stage I–II. Sentinel lymph node procedure and lymph node dissection are taken into account for lymph node staging
Specifications	<i>Numerator:</i> number of patients with presumed early-stage high-intermediate or high-risk endometrial carcinoma who underwent lymph node staging <i>Denominator:</i> all patients with presumed early-stage (I–II) high-intermediate or high-risk endometrial carcinoma who underwent surgery
Target	>85%
QI 15 - Proportion of sentinel lymph node procedures in patients undergoing lymph node staging	
Type	Outcome indicator
Description	Lymph node staging in early-stage (I–II) endometrial carcinoma is defined as sentinel lymph node procedure and/or systematic pelvic lymphadenectomy
Specifications	<i>Numerator:</i> number of patients with early-stage endometrial carcinoma for whom sentinel lymph node procedure was attempted or performed <i>Denominator:</i> all patients with early-stage (I–II) endometrial carcinoma who have undergone a lymph node staging
Target	90%
QI 16 - Number of sentinel lymph node procedures for endometrial carcinoma performed or supervised per surgeon per year	
Type	Outcome indicator
Description	Sentinel lymph node procedures require high surgeon skills to improve the identification rate and to minimize the false-negative rate. Sentinel lymph node procedures should be performed by a certified gynecologic oncologist or a trained surgeon specifically dedicated to gynecological cancer management (see QI 3). Surgeons must ensure that their colleagues in radiology, nuclear medicine, and/or pathology are actively involved in the successful implementation of this multi-disciplinary procedure
Specifications	<i>Numerator:</i> number of sentinel lymph node procedures performed or supervised in patients with endometrial carcinoma per surgeon per year <i>Denominator:</i> not applicable
Target	≥20
QI 17 - Proportion of indocyanine green cervical injection	
Type	Outcome indicator
Description	According to the ESGO/ESTRO/ESP guidelines, indocyanine green cervical injection is the preferred detection technique
Specifications	<i>Numerator:</i> number of patients with presumed early-stage endometrial carcinoma in whom indocyanine green cervical injection was performed <i>Denominator:</i> all patients with presumed early-stage (stage I–II) endometrial carcinoma who underwent sentinel lymph node procedure
Target	≥95%
QI 18 - Proportion of high-intermediate/high-risk patients with side-specific systematic pelvic lymphadenectomy in cases of failed sentinel lymph node detection	
Type	Outcome indicator
Description	According to the ESGO/ESTRO/ESP guidelines, side-specific systematic lymphadenectomy should be performed in high-intermediate/high-risk patients if sentinel lymph node is not detected on either pelvic side. Low-risk and intermediate-risk patients are not taken into account as systematic lymphadenectomy is not recommended in these patients

Continued

Society statement

Table 3 Continued

Specifications	<i>Numerator:</i> number of high-intermediate/high-risk patients who underwent side-specific or bilateral systematic pelvic lymphadenectomy <i>Denominator:</i> all high-intermediate/high-risk patients with unilaterally or bilaterally failed sentinel lymph node detection
Target	>90%
QI 19 - Proportion of patients who underwent ultrastaging of sentinel lymph nodes	
Type	Outcome indicator
Description	Intensive pathologic assessment of sentinel lymph node (sentinel lymph node ultrastaging) supports the detection of small metastases which could be missed by standard evaluation. According to the ESGO/ESTRO/ESP guidelines, pathologic ultrastaging of sentinel lymph nodes is recommended, although there is no universal ultrastaging protocol
Specifications	<i>Numerator:</i> number of patients who underwent ultrastaging of sentinel lymph nodes <i>Denominator:</i> all patients who underwent a sentinel lymph node procedure
Target	≥99%
QI 20 - Proportion of bilateral mapping rate of sentinel lymph node procedures	
Type	Outcome indicator
Description	The ESGO/ESTRO/ESP guidelines suggest cervical injections of indocyanine green as the preferred technique to detect sentinel lymph nodes. Tracer re-injection is an option if sentinel lymph node is not visualized upfront. The aim is bilateral detection of sentinel lymph nodes
Specifications	<i>Numerator:</i> number of patients with presumed early-stage endometrial carcinoma who underwent successful bilateral sentinel lymph node detection <i>Denominator:</i> all patients with presumed early-stage (stage I–II) endometrial carcinoma who underwent sentinel lymph node procedure
Target	≥75%
QI 21 - Proportion of complete macroscopic resection for curative intent in patients with primary advanced endometrial carcinoma (stage III–IV)	
Type	Outcome indicator
Description	In advanced endometrial carcinoma (stage III–IV), surgical tumor debulking, including removal of enlarged lymph nodes, should be considered when complete macroscopic resection (no residual disease) is feasible with an acceptable morbidity and quality of life profile. Debulking surgery should be preceded by a full pre-operative staging and discussion by a multi-disciplinary team. This includes patients with neoadjuvant chemotherapy
Specifications	<i>Numerator:</i> number of patients with advanced endometrial carcinoma who have undergone a cytoreductive surgery and in whom complete macroscopic resection was achieved <i>Denominator:</i> all patients with primary advanced endometrial carcinoma (stage III–IV) who have undergone a cytoreductive surgery
Target	≥75%
QI 22- Proportion of patients who underwent salvage surgery for loco-regional recurrent disease (isolated pelvic or nodal recurrent disease) in whom complete macroscopic resection is achieved	
Type	Outcome indicator
Description	Indications of salvage surgery for loco-regional recurrent disease are defined according to the ESGO/ESTRO/ESP guidelines, as follows: Treatment of patients with recurrent endometrial carcinoma involves a multi-disciplinary approach with surgery, radiotherapy, and/or systemic therapy depending on the fitness and wishes of the patient, the tumor dissemination patterns, and prior treatment In radiotherapy naïve patients, a decision about surgery needs to take account of patient morbidity and wishes, available non-surgical treatments, and resources. The interval between primary treatment and recurrences should also be taken into consideration. Patients with recurrent disease (including peritoneal and lymph node relapse) should be considered for surgery only if it is anticipated that complete removal of macroscopic disease can be achieved with acceptable morbidity In radiotherapy pre-treated patients (external beam radiotherapy ±brachytherapy) with loco-regional recurrence, radical surgery, including exenteration, should be considered when the intention is complete resection with clear margins
Specifications	<i>Numerator:</i> number of patients in whom complete macroscopic resection and clear margins (if applicable) are achieved <i>Denominator:</i> all patients who underwent salvage surgery for recurrent disease (isolated pelvic or nodal recurrent disease)
Target	≥85%

Table 4 QI related to molecular markers for endometrial carcinoma diagnosis and as determinants for treatment decisions

QI 23 - Proportion of patients undergoing complete molecular classification of their tumor according to the ESGO/ESTRO/ESP guidelines	
Type	Process indicator
Description	According to the ESGO/ESTRO/ESP guidelines, molecular classification (<i>POLE</i> mutation, mismatch repair deficiency, non-specific molecular profile, p53 abnormality) is encouraged in all endometrial carcinoma, especially high-grade tumors. <i>POLE</i> mutation analysis may be omitted in low-risk and intermediate-risk endometrial carcinoma with low-grade histology. All diagnostic tests to identify these four molecular subgroups should be performed in conjunction due to the occurrence of 'double classifiers' (referred to as complete molecular classification). Molecular classification can be performed in the treating center or in a referred to institution
Specifications	<i>Numerator</i> : number of patients with endometrial carcinoma undergoing complete molecular classification of their tumor <i>Denominator</i> : all patients treated for an endometrial carcinoma
Targets	Optimal target: $\geq 90\%$ Minimum required target: $\geq 50\%$

(generally at a tumor board meeting, composed according to local guidelines) and based on the comprehensive and precise knowledge of prognostic and predictive factors for outcome, morbidity, and quality of life.⁴⁻⁶

Treatment requires centralization and involvement of a broad multi-disciplinary team including at least a certified gynecologic oncologist (or in countries where certification is not organized, a trained surgeon dedicated to the management of gynecological

Table 5 Compliance of management of patients after primary surgical treatment with the Standards of care**QI 24 - Compliance with the ESGO/ESTRO/ESP adjuvant treatment guidelines**

Type	Outcome indicator
Description	The ESGO/ESTRO/ESP guidelines recommend specific adjuvant treatments based on prognostic risk groups stratification of patients, as follows: ► <i>Low risk</i>: no adjuvant treatment is recommended. When molecular classification is known, omission of adjuvant treatment should be considered for patients with endometrial carcinoma stage I–II, low risk based on pathogenic <i>POLE</i> mutation. For the rare patients with endometrial carcinoma stage III–IVA and pathogenic <i>POLE</i> mutation, there are no outcome data with the omission of the adjuvant treatment. Prospective registration is recommended ► <i>Intermediate risk</i>: adjuvant brachytherapy can be recommended to decrease vaginal recurrence. Omission of adjuvant brachytherapy can be considered, especially for patients aged <60 years. When molecular classification is known, <i>POLE</i> mutation and p53 abnormal with myometrial invasion have specific recommendations ► <i>High-intermediate risk (pN0 after lymph node staging)</i>: adjuvant brachytherapy can be recommended to decrease vaginal recurrence. External beam radiation therapy can be considered for substantial lymphovascular space involvement and for stage II. Adjuvant chemotherapy can be considered, especially for high-grade and/or substantial lymphovascular space involvement. Omission of any adjuvant treatment is an option. When molecular classification is known, <i>POLE</i> mutation and p53 abnormal have specific recommendations ► <i>High-intermediate risk cN0/pNx (lymph node staging not performed)</i>: adjuvant external beam radiation therapy is recommended, especially for substantial lymphovascular space involvement and/or for stage II. Additional adjuvant chemotherapy can be considered, especially for high-grade and/or substantial lymphovascular space involvement. Adjuvant brachytherapy alone can be considered for high-grade lymphovascular space involvement negative and for stage II grade 1 endometrioid carcinomas. When molecular classification is known, <i>POLE</i> mutation and p53 abnormal have specific recommendations ► <i>High risk</i>: external beam radiation therapy with concurrent and adjuvant chemotherapy or, alternatively, sequential chemotherapy and radiotherapy is recommended. Chemotherapy alone is an alternative option. Carcinosarcomas should be treated as high-risk carcinomas (not as sarcomas). When the molecular classification is known, p53 abnormal carcinomas without myometrial invasion and <i>POLE</i> mutation have specific recommendations
Specifications	<i>Numerator</i> : number of patients with early-stage endometrial carcinoma receiving adjuvant treatment according to the ESGO/ESTRO/ESP guidelines <i>Denominator</i> : all patients with endometrial carcinoma who underwent surgery
Target	$\geq 90\%$

Society statement

Table 6 Recording pertinent information

QI 25 - Minimum required elements in surgical reports

Type	Process indicator
Description	According to the ESGO/ESTRO/ESP guidelines, the surgical report requires inclusion of at least the following elements: ▶ Abdominal findings status at start and at end of surgery ▶ Description of tumor spread (if any) ▶ Lymph node evaluation ▶ Complications ▶ Total blood loss ▶ Tracer used for the sentinel lymph node procedure ▶ Number of sentinel lymph nodes removed (if any) ▶ Location of sentinel lymph nodes (if any) ▶ Residual post-operative disease; location of residual disease (if any) ▶ Kind of procedure (sentinel lymph node procedure, debulking, etc) ▶ Adhesiolysis (yes vs no) ▶ Aim of surgery (palliative vs curative) ▶ Stage of the disease ▶ Rupture of uterus
Specifications	Numerator: number of patients who have a complete surgical report that contains all required elements as defined above Denominator: all patients with endometrial carcinoma who underwent surgery
Target	≥99%

QI 26 - Minimum required elements in pathology reports

Type	Process indicator
Description	According to the ESGO/ESTRO/ESP guidelines, the minimum required elements in pathology reports include at least the following elements: ▶ Description of the specimen(s) submitted for histologic evaluation ▶ Attached anatomic structures ▶ Accompanying specimens ▶ Tumor type (WHO Classification of Tumors (fifth edition)) ▶ Tumor grade (FIGO and WHO Classification of Tumors (fifth edition)) ▶ Absence or presence and depth of myometrial invasion ▶ Lymphovascular space involvement should be unequivocal and reported as focal and extensive/substantial (five vessels or more) ▶ Presence of cervical stromal invasion should be described ▶ Presence or absence of vaginal involvement ▶ Presence or absence of uterine serosal involvement ▶ Presence or absence of parametrial involvement ▶ Presence or absence of adnexal involvement ▶ Presence or absence of omental involvement ▶ Presence or absence of peritoneal involvement ▶ Lymph node status, including sentinel lymph node status, reports the total number of nodes found and the number of positive lymph nodes, and the presence of extranodal extension (list for all separates sites). Micrometastasis (>0.2 mm and up to 2 mm) are reported as pN1(mi). Isolated tumor cells no greater than 0.2 mm in regional nodes should be reported as pN0 (i+) ▶ Presence or absence of pathologically proven distant metastases ▶ Required ancillary techniques ▶ Tumor site ▶ Tumor size ▶ Percentages of different components of mixed carcinoma and in carcinosarcoma ▶ Presence or absence of myometrial invasion. Depth of myometrial invasion (none or less than half, or half or more) Measurement should be performed from the adjacent endometrial–myometrial interface ▶ Microcystic, elongated, fragmented pattern of invasion ▶ Peritoneal cytology (if available).
Specifications	Numerator: number of patients in whom all minimum required elements as defined above are included in the pathology report Denominator: all patients with endometrial carcinoma who underwent surgery
Target	≥99%

QI 27 - Structured morbidity and mortality conference per year for quality assurance of surgical care

Type	Outcome indicator
Description	Structured morbidity and mortality conferences are crucial for quality assurance of surgical care. Complications, reoperations, readmissions, secondary transfers to intermediate or intensive care units, and deaths should be discussed

Continued

Table 6 Continued

Specifications	Numerator: number of structured morbidity and mortality conferences per year Denominator: not applicable
Targets	Optimal target: 4 Minimum required target: 2
QI 28 - Proportion of reoperations within 30 days for complications after primary minimally invasive surgery	
Type	Outcome indicator
Description	Reoperation due to complications related to surgery
Specifications	Numerator: number of reoperations for complications after primary minimally invasive surgery Denominator: all patients with endometrial carcinoma who underwent primary minimally invasive surgery.
Target	≤2%
QI 29 - Structured prospective reporting of recurrences/deaths	
Type	Outcome indicator
Description	This applies for the first 5 years after diagnosis. Thereafter, patients will be offered to a survivorship program
Specifications	Numerator: number of audits for recurrences/deaths for all treated patients with endometrial carcinoma per year Denominator: not applicable.
Target	≥once a year

cancer (accounting for more than 80% of his or her practice or having completed an ESGO-accredited fellowship)), a radiologist, a radiation oncologist, a physician certified to deliver chemotherapy (a gynecologic oncologist and/or a physician with special interest to gynecologic oncology (medical or clinical oncologist)), and a pathologist. A structured program for multi-disciplinary diagnostic work-up, treatment, and follow-up must be present in centers responsible for the treatment. Institutions participating in clinical research can contribute to improvement of quality of care.^{130–159} Patients treated in study hospitals have a higher chance of receiving standard treatment according to guidelines than patients treated in hospitals not participating in cooperative clinical studies. Study hospitals might participate more often in quality assurance programs.

Adequate Pre-operative Investigations

Recording of histopathological tumor type and grade is required in endometrial biopsies. According to the ESGO/ESTRO/ESP guidelines, the mandatory pre-operative work-up includes: family history; general assessment and inventory of co-morbidities; geriatric assessment, if appropriate; clinical examination, including pelvic examination; expert vaginal or transrectal ultrasound or pelvic MRI.^{4–6} Depending on clinical and pathologic risk, additional imaging modalities (thoracic, abdominal and pelvic CT scan, MRI, positron emission tomography scan, or ultrasound) should be considered to assess ovarian nodal, peritoneal, and other sites of metastatic disease.

Multiple studies have reported high specificity of MRI techniques in the assessment of deep myometrial invasion, cervical stromal involvement, and lymph node metastasis.^{160–207} Similarly, high diagnostic performance of transvaginal ultrasound for the assessment of deep myometrial and cervical stromal invasions has also been described.^{164 169 181 208–213} In centers routinely performing a sentinel lymph node procedure in all patients with endometrial carcinoma,

the need for pre-operative risk grouping based on myometrial invasion estimates is less pronounced.

Compliance of the Peri-operative Management with the Standards of Care

Many studies including two randomized prospective studies and pooled analyses support the use of minimally invasive surgery for patients with early-stage endometrial carcinoma, including those with high-risk carcinomas.^{214–281} Patients with high body mass index benefit from a minimally invasive approach most.²⁸² According to the ESGO/ESTRO/ESP guidelines, minimally invasive surgery is the preferred surgical approach, including patients with high-risk endometrial carcinoma, in stage I and II disease.^{4–6} Any intra-peritoneal tumor spillage, including tumor rupture or morcellation (including in a bag), should be avoided. If vaginal extraction risks uterine rupture, other measures should be taken (eg, mini-laparotomy, use of endobag). Tumors with metastases outside the uterus and cervix (excluding lymph node metastases) are relative contraindications for minimally invasive surgery. Staging infracolic omentectomy should be performed in clinical stage I serous endometrial carcinoma, carcinosarcoma, and undifferentiated carcinoma, due to the high risk of microscopic omental metastases.²⁸³ The low rate of omental metastases in apparent clinical stage I endometrioid and clear cell carcinoma does not justify the procedure.^{284–298}

A large amount of evidence supports the importance of sentinel lymph node biopsy in the surgical staging of patients with early-stage endometrial carcinoma and in the decision process on adjuvant therapies.^{299–361} Applying a sentinel lymph node algorithm in high-risk/high-grade endometrial carcinomas in the hands of experienced surgeons appears accurate to detect pelvic lymph node metastases.^{301 302 357 362} The use of indocyanine green increases sentinel lymph node detection rates per hemipelvis as compared with methylene blue dye in women with endometrial carcinoma

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undergoing minimally invasive surgery.^{363 364} High bilateral pelvic sentinel lymph node detection can be achieved when the tracer is injected into the cervix.^{300 365} Ultrastaging and pathologic review of negative pelvic lymph nodes of patients with presumed isolated para-aortic metastasis can identify occult pelvic dissemination.^{334 352} According to the ESGO/ESTRO/ESP guidelines, sentinel lymph node biopsy can be considered for staging purposes in patients with low-risk/intermediate-risk disease.⁴⁻⁶ Surgical lymph node staging should be performed in patients with high-intermediate-risk/high-risk disease. Sentinel lymph node biopsy is an acceptable alternative to systematic lymphadenectomy for lymph node staging in stage I–II. If sentinel lymph node biopsy is performed:

- ▶ Indocyanine green with cervical injection is the preferred detection technique.
- ▶ Tracer re-injection is an option if sentinel lymph node is not visualized upfront.
- ▶ Side-specific systematic lymphadenectomy should be performed in high-intermediate-risk/high-risk patients if sentinel lymph node is not detected on either pelvic side.
- ▶ Pathologic ultrastaging of sentinel lymph nodes is recommended.

A meta-analysis published in the beginning of the 2010s has quantified the association of complete cytoreduction with a statistically significant improvement in survival in patients with advanced/metastatic endometrial cancer.³⁶⁶ More recently, several retrospective studies have confirmed the prognostic importance of complete cytoreductive surgery.^{367–370} According to the ESGO/ESTRO/ESP guidelines, surgical tumor debulking including enlarged lymph nodes should be considered in stage III and IV endometrial carcinoma (including carcinosarcoma) when complete macroscopic resection is feasible with an acceptable morbidity and quality of life profile.⁴⁻⁶

Treatment of patients with recurrent endometrial carcinoma involves a multi-disciplinary approach with surgery, radiotherapy, and/or systemic therapy depending on the fitness and wishes of the patient, the tumor dissemination patterns, and prior treatment. In radiotherapy naïve patients, a decision about surgery needs to take account of patient morbidity and wishes, available non-surgical treatments, and resources. The interval between primary treatment and recurrences should also be taken into consideration. According to the ESGO/ESTRO/ESP guidelines, radiotherapy naïve patients with recurrent disease (including peritoneal and lymph node relapse) should be considered for surgery only if it is anticipated that complete removal of macroscopic disease can be achieved with acceptable morbidity.⁴⁻⁶ In radiotherapy pre-treated patients (external beam radiotherapy ± brachytherapy) with loco-regional recurrence, radical surgery, including exenteration, should be considered when the intention is complete resection with clear margins. Patients with oligometastatic disease should be considered for radical local therapy, including surgery, radiation therapy, and local ablating techniques.

Molecular Classification and Adjuvant Treatment

Four molecular subgroups of endometrial carcinoma and their determination by surrogate marker analyses have undergone extensive studies in recent years (*POLE* mutated, mismatch repair-deficient, p53 abnormal and endometrial carcinoma lacking any of these alterations, referred to as non-specific molecular profile).

A diagnostic algorithm using immunohistochemical markers and one molecular test has been applied. The prognostic impact of the molecular classification has repeatedly been shown by independent groups and is of particular relevance in high-grade and high-risk tumours.^{371–376} All diagnostic tests should be performed in conjunction due to the occurrence of ‘double classifiers’.³⁷⁷ Other biomarkers such as L1 cell adhesion molecule expression or mutations in CTNNB1 may be potentially useful for low-grade endometrioid carcinomas with non-specific molecular profile, but further investigations are required.^{378–381} According to the ESGO/ESTRO/ESP guidelines, adjuvant treatment recommendations for endometrial carcinoma strongly depend on the prognostic risk group, as follows⁴⁻⁶:

- ▶ *Low risk*: no adjuvant treatment is recommended. When molecular classification is known, omission of adjuvant treatment should be considered for patients with endometrial carcinoma stage I–II, low risk based on pathogenic *POLE* mutation. For the rare cases of patients with endometrial carcinoma stage III–IVA and pathogenic *POLE* mutation, there are no outcome data with the omission of the adjuvant treatment. Prospective registration is recommended.
- ▶ *Intermediate risk*: adjuvant brachytherapy can be recommended to decrease vaginal recurrence. Omission of adjuvant brachytherapy can be considered, especially for patients aged <60 years. When molecular classification is known, *POLE* mutation and p53 abnormal with myometrial invasion have specific recommendations.
- ▶ *High-intermediate risk (pN0 after lymph node staging)*: adjuvant brachytherapy can be recommended to decrease vaginal recurrence. External beam radiation therapy can be considered for substantial lymphovascular space involvement and for stage II. Adjuvant chemotherapy can be considered, especially for high-grade and/or substantial lymphovascular space involvement. Omission of any adjuvant treatment is an option. When molecular classification is known, *POLE* mutation and p53 abnormal have specific recommendations.
- ▶ *High-intermediate risk cN0/pNx (lymph node staging not performed)*: adjuvant external beam radiation therapy is recommended, especially for substantial lymphovascular space involvement and/or for stage II. Additional adjuvant chemotherapy can be considered, especially for high-grade and/or substantial lymphovascular space involvement. Adjuvant brachytherapy alone can be considered for high-grade lymphovascular space involvement negative and for stage II grade 1 endometrioid carcinomas. When molecular classification is known, *POLE* mutation and p53 abnormal have specific recommendations.
- ▶ *High risk*: external beam radiation therapy with concurrent and adjuvant chemotherapy, or alternatively, sequential chemotherapy and radiotherapy is recommended. Chemotherapy alone is an alternative option. Carcinosarcomas should be treated as high-risk carcinomas (not as sarcomas). When the molecular classification is known, p53 abnormal carcinomas without myometrial invasion and *POLE* mutation have specific recommendations.

The definition of prognostic risk groups is presented in Online supplemental appendix 3 for both situations when molecular classification is known or unknown.

Recording Pertinent Information to Improve Quality of Care

Proper documentation is crucial for the quality of surgical care. Several studies highlighted the association of the use of standardized operative reports and the acquisition of more complete and interpretable operative data compared with the use of non-standardized operative reports.^{382–385} Synoptic reporting methods were developed as a result of the lack of essential informations in the narrative operative reports in other surgical disciplines.^{386–402} The synoptic operative report generally improves completeness and consistency in surgical documentation compared with the traditional narrative operative report, suggesting its incorporation into surgical practice. ESGO has approved a template for ovarian cancer operative reports.⁴⁰³ In the absence of an international validated standardized surgical report for endometrial carcinoma, the international development group considers that the surgical report must be structured and should include at least the following minimum requirements: status of abdominal findings at the start and end of surgery, description of tumor spread (if any), lymph node evaluation, complications, total blood loss, tracer used for the sentinel lymph node procedure, number of sentinel lymph nodes removed (if any), location of sentinel lymph nodes (if any), residual post-operative disease, location of residual disease (if any), kind of procedure (sentinel lymph node procedure, debulking, etc), adhesiolysis (yes vs no), aim of surgery (palliative vs curative), stage of the disease, and rupture of uterus.

The pathology report is a major component of patient management and its accuracy depends on several factors. Pre-analytical steps must be carried out in an optimal way to allow for adequate pathological evaluation. The inclusions of informative clinical and surgical data on the pathology request form, and accurate sampling and processing of the specimens, are the basis for a correct histological diagnosis and the provision of information on tumor staging. The pathology report should comprehensively include all the features that enable a patient with endometrial carcinoma to be placed into a risk group, which ensures the appropriate management. It should include all the parameters affecting tumor staging and patient management.

Structured morbidity and mortality conferences are required for quality assurance of surgical care. Complications, reoperations, readmissions, secondary transfers to intermediate or intensive care units, and deaths should be discussed. The use of a validated surgical complications scoring system is encouraged. Several surgical complications reporting systems have been proposed in the 1990s.^{404–410} The therapy needed to manage a specific complication remains the cornerstone for ranking a complication. The most commonly used scoring system for post-operative complications is the Clavien-Dindo classification. It consists of five severity grades and focuses on the interventions needed, with a major emphasis on the risk and invasiveness of the therapy used, to correct a complication.^{404 405} A 5-year evaluation demonstrated its validation, reproducibility, and applicability worldwide, irrespective of the cultural background and in many fields of surgery.⁴¹¹ Several indexes based on the Clavien-Dindo classification and modifications of this classification have been proposed and used in large multi-centric studies.^{412–422} Proactive reporting of the recurrences/deaths in institutions/centers is also needed.

Box 1 Center criteria for ESGO accreditation for endometrial carcinoma surgery: (A) Standard Accreditation and (B) Center of Excellence

(A) Entry criteria for standard ESGO accreditation for endometrial carcinoma surgery

- Sum of the individual scores ≥ 115 ($>80\%$ of the score)
- All the following criteria must apply (minimum required targets should be met): 1, 2

(B) Requirements for ESGO accreditation for endometrial carcinoma surgery as a Center of Excellence

- Sum of the individual scores ≥ 115 ($>80\%$ of the score)
- All the following criteria must apply (optimal targets should be met (if any)): 1, 2, 3, 5, 10, 15, 17, 20, 21, 22, 29
- Publication of three articles on endometrial carcinoma authored by a gynecological surgical oncology member of the team over the last 3 years, including at least one article as first or last author

SCORING SYSTEM/ESGO ACCREDITATION

The ESGO accreditation of centers for endometrial carcinoma surgery is an award to institutions that offer patients the specific skills, experience, organization, and dedication that are required to achieve optimal levels of surgical care. The ESGO accreditation is based on the completion of these QIs and a scoring system that has been developed and internally validated by the international development group. To do so, each QI was associated with a score, and an assessment form was built (Online supplemental appendix 4). The form can also be used to support the self-assessment, quality assurance programs, or the external assessment of an institution.

The sum of the individual scores being 143, it was decided that an institution that meets at least 80% of the score (score ≥ 115) provides satisfactory surgical management of patients with endometrial carcinoma. Centers interested to become accredited are also required to meet the minimum required targets of QIs 1 and 2. Centers receiving the ESGO accreditation will be entitled to use the subtitle 'ESGO accredited center in endometrial carcinoma surgery', to use the ESGO logo in its endometrial carcinoma related communication, and be listed on the ESGO website as accredited center for patients' and physicians' reference.

ESGO has also developed criteria that distinguish centers with accreditation for endometrial carcinoma surgery into two categories, either 'Standard Accreditation' or 'Center of Excellence'. These criteria are outlined in Box 1. Centers accredited as a Center of Excellence may then build a network for education, training, and research. The system will have to be refined in the future with the feedback provided by the scoring of candidate centers, and by prospective research on the multivariate correlation between survival outcome, characteristics of the patient, and indicators.

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