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Position Paper

Quality performance measures in upper gastrointestinal endoscopy for lesion detection: Italian AIGO-SIED-SIGE joint position statement☆,☆☆,⋆

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ABSTRACT

Esophagogastroduodenoscopy (EGD) plays a crucial role in the management of gastroduodenal diseases by allowing a direct and accurate evaluation of the mucosa and the execution of several operative maneuvers. Despite a constant development of new imaging tools and operative devices, the widespread use of EGD has not resulted in a significant reduction of mortality for patients affected by esophageal/gastric cancer during the last three decades in Western countries.

Evidence indicates that this disheartening scenario derives from a high variability of execution of EGD which determines its quality and diagnostic yield, delaying the diagnosis of neoplastic diseases.

Based on this evidence, in recent years many scientific societies have produced different position papers aimed at defining quality performance measures in EGD.

Thus, the Italian Association of Gastroenterologists and Endoscopists, the Italian Society of Digestive Endoscopy and the Italian Society of Gastroenterology have produced this joint document based on the review of ASGE, ACG, BSG, ESGE and Asian Consensus EGD position papers with the aim of indicating the quality standards of EGD (pre-, intra- and post-procedure) focused on lesion detection to be adopted in the Italian context.

1. Introduction

Esophagogastroduodenoscopy (EGD) represents the diagnostic and therapeutic gold standard for various diseases of the upper gastrointestinal tract, allowing direct visualization of the mucosa, biopsy sampling for histopathological evaluation and therapeutic maneuvers. The importance of EGD in clinical practice is demonstrated by data available on its use in various countries: in the U.S., more than seven million EGD were performed in 2019 for a total cost of 13 billion dollars. From 2002 to 2013, the use of EGD increased in subjects aged 18–64 and showed a slow decreasing trend over the age of 65 [1]. In the United Kingdom, an annual increase of 3000 EGD *per* 250,000 inhabitants has been reported [2]. It has been estimated that about 3 million EGD were performed in Italy in 2009 [3].

However, despite responding to multiple indications, the wide implementation of EGD does not seem to have significantly influenced the survival of patients with gastric adenocarcinoma, the fifth most common cancer and the third leading cause of cancer

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death in the world. Although the incidence of this neoplasm is decreasing in developed countries as a consequence of the reduction in the prevalence of *H. pylori* infection [4,5], approximately 80,000 new cases are reported each year in Europe, with an estimate of 16 cases per 100,000 inhabitants per year, with an overall 5-year survival of 24% across Europe and 32% in southern European countries. In Italy, in 2020 about 14,500 new diagnoses of gastric cancer and 8700 deaths were recorded, with a 5-year survival of 31% in males and 34% in females [6].

There is consolidated evidence that failure to increase survival of patients with gastric cancer is due the diagnosis of the disease in its late stages, even though it is recognized that screening and early diagnosis of pre-neoplastic lesions can reduce mortality by about 30% [7,8]. Currently, screening shows a favorable cost-effectiveness profile only in Asian countries due to the high incidence of disease. In European countries with intermediate incidence (e.g. Portugal, Eastern Europe), potential efficacy has been reported only by combining EGD with screening colonoscopy [9]. Screening and surveillance for individuals at increased risk of gastric cancer has already been recommended by the European Society of Gastrointestinal Endoscopy (ESGE) in order to decrease mortality through early diagnosis and endoscopic treatment of superficial lesions, i.e., early gastric cancer [10,11].

A high-quality EGD plays a crucial role also in the setting of esophageal cancer. In a recent Northern European study that included about one million patients with GERD enrolled between 1979 and 2018, a 55% reduction in the risk of neoplasia and a 66% reduction in cancer-specific mortality was demonstrated in subjects undergoing the examination as compared with those not [12]. In a large study carried out in Poland between 2012 and 2018 and involving about four million people, the performance of EGD in first-level endoscopic centers markedly increased the risk of missing a diagnosis of esophageal adenocarcinoma compared with second- and third-level centers [13]. Thus, it is emphasized the need to perform EGD of high and standardized quality, according to precise and recognized criteria.

Although technological development is translating into a progressive improvement both in the visualization quality of the mucosa (imaging) and in the ancillary devices, the diffusion and validation of quality criteria for EGD in endoscopy practice are more controversial than those for colonoscopy. This has a negative impact in terms of both diagnostic and therapeutic performance, as shown by data on missed diagnoses of gastric cancer, which have been estimated at around 11%, with a range between 4 and 26% [7, 8.14].

Based on this evidence, in recent years many scientific societies such as the American Society of Gastrointestinal Endoscopy (ASGE), the American College of Gastroenterology (ACG) [15–16], the ESGE [17], the British Society of Gastroenterology (BSG) [18] and a group of Asian endoscopy experts (Asian Consensus) [19] have produced different position papers aimed at defining quality performance measures in EGD.

Sharing this need, the Italian Association of Gastroenterologists and Endoscopists (AIGO) has requested a review of the literature by producing this document with the aim of indicating the minimum quality standards of EGD to be adopted in the national context.

2. Methods and terminology

In September 2020, the AIGO Governing Board asked two of its members (FM, RV) to commission this document to the AIGO Endoscopy Committee, composed of seven members (AA, SA, SC, VDF, LF, GL, SS). The panel members identified three settings (Pre-, Intra- and Post-procedure) for which 20 specific key questions were formulated (9 for the first setting, 5 for the second setting and 6 for the third setting). These questions are reported in Table 1. Data extracted from the position papers of ASGE, ACG, ESGE, BSG and Asian Consensus provided the evidence to answer each question and allowed to formulate recommendations, which were not assigned a degree of evidence and recommendation, as they are already reported in the relative position papers.

Two panel members (VDF and SA) reviewed the position papers, building the recommendations based on the available evidence; the other experts (AA, SC, LF, GL, GM, SS, FM, RV) made a critical review of the manuscript. In case of disagreement, the conflict was resolved through a joint discussion until unanimous consensus was reached. The draft was then reviewed by an AIGO expert external to the Committee (GM) and endorsed by the Italian Society of Digestive Endoscopy (SIED) and the Italian Society of Gastroenterology (SIGE).

The included position papers introduced performance indicators that suggest how to do a high-quality procedure [15–19]. The choice of these indicators was based on relevance and implementability within the Italian healthcare system, due to their widespread use in clinical practice, their significant impact on the management and outcomes of pre-neoplastic and neoplastic diseases as reported in clinical studies, and their validation.

3. Results

3.1. Answers to the clinically relevant questions and quality criteria pertaining to the different phases of the EGD

The performance of an EGD entails three phases: the preparatory phase (pre-procedure, i.e., from the patient's entry into the Endoscopic Unit up to the insertion of the endoscope or to the sedation), the technical phase (intra-procedure, i.e., from the insertion of the endoscope until extubation) and the discharge (post-procedure, i.e., from patient's extubation to follow-up). Each of these phases requires compliance with quality performance measures.

3.2. Pre-procedure quality criteria

1. Ensure that the EGD procedure is correctly indicated.

Endoscopic examinations performed for correct indications are associated with a higher frequency of diagnosis of significant lesions compared with examinations done for inappropriate indications (OR: 1.34, 95% CI: 1.04–1.74) [20], especially surveillance endoscopies for very elderly / frail patients.

Therefore, the indication to the procedure must be reported in the endoscopy report, remarking when it was not included in a specific list of appropriate indications according to the recent provisions of RAO-Agenas manual (Management of Waiting Lists - National Agency for Regional Health Services) [21], Table 2.

3.3. Quality indicator for ASGE, ACG [15–16]

2. Assess the patient's fitness to undergo EGD.

a. Assessing fitness for EGD, in the form of a short written medical history, is important to acquire knowledge about any comorbidities, ongoing therapies and allergies to ensure safety from an anesthesia perspective in accordance with the American Society of Anesthesiology (ASA) score [22], and whether procedures can be performed in deep sedation or intubation.

It is also important to obtain data about previous examinations to avoid incurring in prior complications (e.g. adverse events due to sedation or technical difficulties); furthermore, the pre-procedure evaluation should consider other data, such as radiolog-

Table 1
Key questions that guided the literature review for quality EGD.

Pre-procedure questions
1. Is it important that the EGD procedure is correctly indicated?
2. How to assess the patient's fitness to undergo the examination?
3. Should time allocation for procedures be tailored according to the indication for endoscopy and the characteristics of the patient and endoscopist?
4. Are there any risk factors for neoplastic lesions to be evaluated before the examination?
5. How long is it necessary to avoid ingesting food and drinks before the examination?
6. How to obtain a written informed consent from the patient?
7. Do pre-procedural adjuncts improve mucosal visualization?
8. What is the correct antithrombotic management before and after the endoscopic examination?
9. Does the use of sedation affect the diagnostic yield?
Intra-procedure questions
1. How to obtain an adequate visualization of the mucosa?
2. How to prove that a comprehensive examination was performed?
3. Which is the amount of time needed to perform a high-quality examination?
4. How to improve the detection of relevant findings?
5. How to perform adequate biopsy sampling?
Post-procedure questions
1. When is it advisable to insert patients' data into a dedicated register?
2. How to verify the complications related to EGD?
3. What are the elements to include in a high-quality report?
4. What is the role of the pathology report in the context of a high-quality EGD?
5. How to avoid that patients miss surveillance or repeat useless examinations?
6. How to monitor the rates of undiagnosed upper gastrointestinal cancer?

Table 2
Indications to EGD adapted from the RAO-Agenas manual (Management of Waiting Lists - National Agency for Regional Health Services).

Newly diagnosed normo- or microcytic anemia (Hb <10 g/dL)
Iron-deficiency or macrocytic anemia
Significant weight loss with digestive symptoms
Dysphagia, present for at least 5–7 days
Suspected malignancy at clinical examination and/or imaging
Recurrent vomiting (present for at least 5–7 days) with the exclusion of infectious, metabolic, neurological and psychogenic causes
Confirmation of celiac disease in patients with positive serology
Celiac disease with persistent serological positivity despite adherence to gluten-free diet
Patients >50 years with uninvestigated gastroesophageal reflux or dyspeptic symptoms of recent onset (<6 months), persistent (>4 weeks) or unresponsive to therapy
Patients <50 years with uninvestigated gastroesophageal reflux or dyspeptic symptoms persisting after PPI trial or test-and-treat for *H.pylori* infection
Screening before organ transplantation
Screening of esophageal or gastric varices in patient with portal hypertension

ical and laboratory data if available, that can help in the correct assessment of a lesion.

b. In case of need for narcosis, the determination of a score III/IV according to the Mallampati scale by the anesthesiologist is a predictor of difficult intubation [23].

3.4. Quality standard for BSG [18]

3. Time allocation for procedures should be tailored according to the indication for endoscopy and the characteristics of the patient and endoscopist.

a. The time required to perform an EGD depends on the clinical indication. According to BSG guidelines [18], a slot of at least 20 min is recommended for performing a simple diagnostic and routine EGD. In this regard, the Italian Society of Digestive Endoscopy (SIED) proposes a total time of 30 min per diagnostic/standard/routine EGD, divided into a fixed time of 20 min, and an additional time of 10 min in the case of execution of biopsies. According to the ESGE guidelines, at least 7 min must be spent to examine the entire upper gastrointestinal mucosa [17], in order to reduce rates of missed pathology [24].
b. The need for surveillance of precancerous lesions or a first-degree family history of gastric cancer should require the use of advanced endoscopic imaging techniques (chromoendoscopy, magnification) that lengthen the duration of the examination.

3.5. Quality standard for BSG [18]

3.5.1. Minor performance measure for ESGE [17]

4. Stratify the risk of neoplastic lesions of the upper digestive tract before the examination.

The habit of cigarette smoking, alcohol consumption and first-degree family history of gastric cancer are simple information to obtain, but effective in improving the stratification of the risk of precancerous lesions [25,26]. In patients identified as high risk, it is even more important to ensure that procedures are performed with the right endoscopist and assistant, with the right sedation and the right equipment (e.g. NBI, HD with Zoom/Near focus scopes, use of adjuncts such as acetic acid chromoendoscopy/methylene blue/simethicone). Even more time shall be allocated, e.g. for long segment Barrett's.

3.5.2. Quality standard for Asian consensus [19]

5. Inform patients to avoid ingesting solid food 6 h before and liquids 2 h before the examination.

The duration of fasting must reconcile various needs. On one hand, it should prevent the risk of aspiration during the examination; on the other hand, it should avoid the sense of hunger or thirst and ensure normal blood glucose and electrolytes levels during the investigation. The risk of aspiration is conditioned by the pH and volume of the ingested material. In accordance with the recommendations of the American Society of Anesthesiology

[27] avoiding ingestion of clear liquids, milk or a light meal of 2, 4 and 6 h, respectively before the examination, is implemented by current endoscopy guidelines.

3.6. Key performance measure for ESGE [17]

3.6.1. Quality standard for BSG [18]

6. Obtain written informed consent from the patient before the examination.

Consent should always be taken where possible, unless the patient lacks capacity to provide consent, and the procedure is required in their best interest. The patient must be thoroughly informed about the procedure and its possible complications. The consent must contain information about the risks and benefits of the examination and alternative diagnostic or therapeutic approaches. Such information must comply with the most recent and up-to-date recommendations [28]. In the case of patients with cognitive impairment such as dementia, procedures can be performed in the best interest of the patient, with support from the patient's advocate. Only in emergency conditions can informed consent be waived in consideration of the state of necessity.

3.7. Quality indicator for ASGE, ACG [15–16]

3.7.1. Quality standard for bsg [18]

7. Pre-procedural adjuncts to improve mucosal visualization.

Several studies have shown that patient's intake of an oral preparation containing mucolytic agents and surfactants (i.e., N-acetylcysteine and simethicone) decreases the time needed to cleanse the mucosa and improves its visualization [29]. This preparation consists of 2 ml of simethicone and 600 mg of N-acetylcysteine dissolved in 50 ml of water. It can be prepared by the nursing staff and taken by the patient at the endoscopy center 20–30 min before the examination.

3.7.2. Quality standard for BSG and Asian consensus [18,19]

8. Ensure correct antithrombotic management before and after the endoscopic examination.

EGD with biopsies is a low-risk bleeding procedure, therefore antiplatelet agents and vitamin K antagonists can be maintained. For diagnostic procedures, direct coagulation anticoagulants (DOACs) must be temporarily discontinued/paused on the morning of the day of the examination. This applies to both once daily and twice daily regimens. Dabigatran and Apixaban should be resumed in the evening; Rivaroxaban and Edoxaban must be resumed the following day [30–32].

3.8. Quality indicator for ASGE, ACG [15–16]

3.8.1. Key performance measure for ESGE [17]

3.8.1.1. Quality standard for BSG [18].

9. It is recommended to use sedation to increase the diagnostic yield of the examination.

The use of midazolam and meperidine is associated with greater collaboration by the patient, higher satisfaction with the procedure and willingness to repeat it in the future, and higher diagnostic yield. This is demonstrated by various randomized studies and meta-analyses, and was recently acknowledged by a document of the SIED [33–35]. In this regard, it should be emphasized that sedation during EGD must be considered a continuous induced condition, ranging from the simple use of anxiolytics with the patient in a state of consciousness to deep narcosis requiring respiratory assistance. It is necessary for the endoscopist to choose the degree of sedation to be adopted on the basis of his abilities, or the possibility of managing the patient in terms of restoring consciousness and respiratory activity at the end of the examination, with the help of anesthesiologist when deep or and long-lasting sedation is necessary.

Table 3
Photographic anatomical landmarks for EGD.

Upper part of the esophagus
Gastroesophageal junction
Gastric fundus in retroversion
Gastric body
Incisura angularis
Gastric antrum
Duodenal bulb
Second duodenal portion, preferably visualizing the papilla of Vater

3.9. Quality standard for BSG and Asian consensus [18,19]

3.9.1. Intra-procedure quality criteria

1. Obtain adequate visualization of the mucosa.

a. Washing the mucosal surface with water, a more efficient process by using an infusion pump, allows to remove debris and residues. As mentioned above, the addition of mucolytics (i.e., N-acetylcysteine) and anti-foam substances (i.e., simethicone) allows the dispersion of bubbles and mucus, significantly improving the diagnostic yield of the procedure [29].

3.9.2. Quality standard for BSG and for Asian consensus [18,19]

b. Adequate insufflation with air or carbon dioxide (CO_2) allows to stretch and flatten the gastric folds, increasing the visible surface area.

3.9.3. Quality standard for Asian consensus [19]

2. Ensure adequate photo documentation as evidence of a comprehensive examination.

The landmarks to be photographically documented with the purpose of demonstrating the completeness of the examination are shown in Table 3.

There is no scientific data that demonstrates a direct correlation between accurate photo-documentation and diagnostic yield of the examination; however, it is intuitive that the use of a systematic method can encourage the endoscopist to obtain a better visualization of the mucosa and to perform a more complete procedure. All the scientific societies agree in recommending a minimum number of 8 photographs of the anatomical landmarks listed in Table 3; this number increases when lesions are found.

3.10. Quality indicator for ASGE, ACG [15–16]

3.10.1. Key performance measure for ESGE [17]

3.10.1.2. Quality standard for BSG and for Asian consensus [18,19].

3. Take the time needed to perform a quality examination.

a. As already reported, the slot allocated to a high-quality EGD with biopsies must be around 30 min, as well as in the surveillance of precancerous conditions and if no endoscopic control has been performed in the last 3 years. The probability of detecting gastric and esophageal pre-neoplastic or neoplastic lesions is time-dependent and increases respectively by two- and three-fold as compared to faster examinations, a minimum of 7 min is recommended [17,24,36]. During this period, the investigation must include the inspection of the entire esophageal mucosa, the squamous-columnar junction, the gastric fundus, the gastric body along the small and large curve, the *incisura*

angularis, the antral mucosa, the bulb and the second duodenal portion. The examination must also include the retroflexed view of the fundus. In case of a hiatal hernia, its size must be reported according to a precise scale (small <3 cm, medium: 3–5 cm, large> 5 cm). Reflux esophagitis and Cameron lesions should be reported as well [37].

b. In the surveillance of Barrett's esophagus (BE) it is recommended to take at least one minute to explore every centimeter of extension of BE in order to increase the detection of dysplastic lesions [38].

3.11. Key performance measure for ESGE [17]

3.11.1. Quality standard for BSG and for Asian consensus [18,19]

4. Improve the detection of important elements.

a. **High-definition endoscopic systems** High-definition (HD) endoscopy systems, which allow the capture of high-quality images, should be a minimum requirement for a high-quality examination.

3.11.2. Quality standard for BSG and for Asian consensus [18,19]

b. **Use of advanced imaging (e.g., NBI, LCI, others).** Advanced imaging, i.e., virtual chromoendoscopy, allows to increase the detection and delimitation of lesions and to characterize the glandular and vascular pattern (e.g., intrapapillary capillary loop class) for endoscopic lesion characterization and therapy.

3.11.3. Quality standard for BSG and for Asian consensus [18,19]

c. **c. Use of dyes or particular agents.** When the presence of neoplasia is suspected, it is recommended the combined use of virtual chromoendoscopy with specific vital stains such as Lugol for suspected esophageal squamous-cell neoplasm, acetic acid for suspected esophageal adenocarcinoma in Barrett's esophagus, and indigo carmine for gastric neoplastic lesions [39–42].

3.12. Key performance measure for ESGE [17]

3.12.1. Quality standard for BSG and for Asian consensus [18,19]

5. Perform adequate biopsy sampling.

a. According to the most recent ESGE guideline on the management of precancerous conditions and gastric lesions (MAPS II) [10,11] mucosal biopsy sampling should be performed. In Europe a first diagnostic endoscopy of the upper GI tract should consistently include gastric biopsies [43]. A minimum number of biopsies should allow the pathologist to investigate and stage gastritis according to the OLGA or OLGIM classifications [44–46]. For this purpose, the biopsy sampling protocol according to Sydney classification can be used:

-2 biopsies in the antrum, on the large and small curve, 3 cm from the pylorus;

-2 biopsies in the body, on the small curve and about 4 cm proximal to the angulus and on the central part of the large curve;

-1 biopsy at the *incisura angularis,* especially for procedures done without enhanced imaging technology that would have allowed the execution of targeted biopsies.

3.13. Key performance measure for ESGE [17]

3.13.1. Quality standard for BSG [18]

b. In patients with Barrett's esophagus, it is recommended to perform biopsies according to the Seattle protocol [38,47]:

-targeted biopsies on visible lesions;

-one biopsy per quadrant, for a total of 4 biopsies, every 2 cm of extension of the metaplasia.

3.14. Quality indicator for ASGE, ACG [15,16]

3.14.1. Key performance measure for, ESGE [17]

3.14.1.3. Quality standard for BSG [18].

c. Biopsies of non-bleeding gastric ulcers are recommended to rule out neoplasia. A Spanish study showed that performing eight biopsies on the suspected lesion reached an accuracy of 99% for the diagnosis of neoplasm. A recent Portuguese study confirmed the need for this number of biopsies, underlining that the sampling must involve the base and the margins of the ulcer in a caudo-cranial direction in order not to obscure the field with blood. For lesions which are technically inaccessible, the use of a lateral-viewing duodenoscope should be considered to aid visualization and biopsies [48,49]. In the presence of stigmata of hemorrhage, biopsies can be postponed to a second endoscopic examination.

In the presence of *H. pylori* infection, the gastric lesion must be re-evaluated with biopsy sampling 4–6 weeks after the end of the eradication treatment [50].

3.15. Quality indicator for ASGE, ACG [15–16]

3.15.1. Quality standard for BSG [18]

d. In case of suspected celiac disease with positive antibodies, it is recommended to perform at least four biopsies in the second portion of the duodenum and two in the duodenal bulb [43].

3.16. Quality standard for BSG [18]

3.16.1. Quality indicator for ASGE, ACG [15–16]

3.16.1.4. Post-procedure quality criteria.

1. Patients with a confirmed diagnosis of Barrett's esophagus should be included in a dedicated registry.

ESGE reports this performance measure on the assumption that in a surveillance program the incidence of cases with Barrett's esophagus dysplasia should be monitored, the incidence of high-grade dysplasia should not be less than 0.1% per year. The systematic entry of data in monitoring registers could allow to obtain more accurate epidemiological data in the future.

3.16.2. Key performance measure for ESGE [17]

2. Establish a system for recording EGD adverse events.

Adverse events related to the procedure or associated with the use of sedation should be checked annually. Endoscopy centers should record the readmission rate at 8 days and mortality at 30 days after the endoscopic examination. After the procedure, verbal and written instructions should be given to patients advising when, where and how to seek medical attention, if necessary.

3.17. Key performance measure for ESGE [17]

3.17.1. Quality standard for BSG [18]

3. Provide a comprehensive and detailed report.

A high-quality report should indicate the level of completeness of the procedure and the evaluation of the cleanliness of the mucosa. There are validated scores, useful for clinical practice, to assess the degree of mucosal visibility, for instance, the Crema Stomach Cleaning Score (CSCS) [29], which follows the same principle of the Boston Bowel Preparation Score, may allow to standardize the scoring of gastric cleansing.

Detailed description of the procedure findings, the interpretation of the pathology report in case of biopsy sampling and recommendations on eventual endoscopic surveillance should be stated

in a high-quality report. The description and reporting of each specific finding should be done following a standardized terminology according to updated and validated classifications. It is recommended to use the Los Angeles Classification for the description and reporting of esophagitis [51], the Prague classification for Barrett's Esophagus [47], the Forrest classification for peptic ulcer [52], the Zargar classification for esophageal caustic injury [53], the Paris and Spigelman classification for gastroduodenal polypoid lesions [54,55], and the Sarin classification for esophageal and gastric varices [56,57].

3.18. Quality indicator for ASGE, ACG [15,16]

3.18.1. Key performance measure for ESGE [17]

3.18.1.5. Quality standard for BSG [18].

4. Review the histopathological report.

A standardized procedure should be applied so that the endoscopist who performed the procedure reviews and endorses the pathology report in order to inform the patient and colleagues about due surveillance or therapy.

In detail, a collaboration should be established between the Pathology Department and the Endoscopy Unit to ensure that the pathology report of the lesions biopsied and/or removed can be reviewed by both, as necessary. Cases with histological suspicion of high-grade dysplasia should be reviewed as a multidisciplinary meeting and correlated with the endoscopic photo documentation. All the above-mentioned measures should be also considered a legal requirement of the endoscopist who performed the procedure.

3.19. Quality standard for BSG [18]

5. Indicate in a final report the need and timing of endoscopic follow up.

When endoscopic/histological follow-up are required, written indications regarding the timing of successive follow up can lower the rate of patients escaping regular surveillance, avoiding the repetition of useless examinations or performing them at too close intervals.

3.20. Quality standard for BSG [18]

6. Monitor the rate of 3-year post-endoscopy upper gastrointestinal cancer (PEUGIC).

The finding of gastric cancer within three years from a previous EGD should be considered a missed diagnosis, similar to post-colonoscopy colorectal cancer. Retrospective studies have reported that the percentage of unrecognized gastric cancer over a three-year period varies between 4.6%-14% [14]. In a recent meta-analysis that included 25 studies with 81,184 upper gastrointestinal cancers, 7926 cases were considered PEUGIC, with a previous negative endoscopy at a mean interval of 17 months. Normal mucosal features at EGD were reported in 24.9% and 17% of the preceding cancer-negative procedures for gastric and esophageal post-endoscopy cancer, respectively, being intestinal metaplasia, erosions, gastric ulcer and esophagitis were the most commonly reported abnormalities [58].

These results stress the need to adopt and share rigid surveillance protocols for precancerous gastric lesions [10,11,25].

It is therefore advised to schedule an audit every three-year to ensure that the rate of missed diagnoses does not exceed 10%.

3.21. Quality standard for BSG [18]

Finally, further measures to improve EGD practice should be considered. First, the implementation of scheduled audits as a further quality measure. In detail, there should be a monitoring of lesions detection rate and inter-observer agreement of endoscopists through shared photographic and video material. Second, collegial discussion on the management of patients based on endoscopic and histopathological reports should be encouraged, especially regarding epithelial precancerous lesions of the stomach and early gastric cancer. Third, different imaging techniques (e.g., white light, chromoendoscopy with magnification) and the adoption of validated terminologies and classifications should be used for this purpose [18].

4. Conclusion

In the context of aggressive epithelial malignancies such as esophageal or gastric cancer, the lack of adherence to uniform quality standards in performing EGD and a delayed diagnosis lead to serious implications in terms overall survival, treatment and health care costs.

Notwithstanding the erroneous opinion of "a relative simplicity in performing EGD", the disappointing results in terms of missed rate of cancers after the examination underline the importance of dedicated training programs and of constant monitoring of endoscopic performance.

Scientific societies can play a significant role in implementing the uniformity and adherence to quality standards for EGDS by the means of position papers, meetings, webinars and hands-on training to promote continuous education among endoscopic staff. A particular effective approach would be to run dedicated Train-EGD-Leaders courses (assessment, hands-on training, post-training feedback), implementing an AIGO-SIED-SIGE certificate program. The Train-EGD-Leaders courses, changing the leaders' approach to quality EGD, can have also significant effect on disseminating quality measures in EGD throughout the Italian gastroenterology and endoscopy units.

Conflict of interest

None declared.

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References

[1] Peery AF, Crockett SD, Murphy CC, et al. Burden and cost of gastrointestinal, liver, and pancreatic diseases in the United States: update 2021. Gastroenterology 2022;162:621–44.
[2] Barrison I, Bramble M, Wilkinson M. Provision of endoscopy related services in district general hospitals: British Society of Gastroenterology. Endoscopy Committee 2001.
[3] Bazzoli F, Buscarini E, Cannizzaro R, et al. AIGO Italian Gastroenterology White Book; 2011. https://webaigo.it/download/20180806175738.pdfLast accessed February 24, 2022.
[4] Alakkari A, Zullo A, O'Connor HJ. Helicobacter pylori and nonmalignant diseases. Helicobacter 2011;6(Suppl 1):33–7.
[5] Rokkas T, Rokka A, Portincasa P. A systematic review and meta-analysis of the role of Helicobacter pylori eradication in preventing gastric cancer. Ann Gastroenterol 2017;30:414–23.
[6] Cancer numbers in Italy 2020 Italian Association of Medical Oncology AIOM, Intermedia Editore 2021.https://www.aiom.it/wp-content/uploads/2021/11/2021_NDC.pdf. Last accessed February 24, 2022.
[7] Chadwick G, Groene O, Hoare J, et al. A population-based, retrospective, cohort study of esophageal cancer missed at endoscopy. Endoscopy 2014;46:553–60.

[8] Chadwick G, Groene O, Riley S, et al. Gastric cancers missed during Endoscopy in England. Clin Gastroenterol Hepatol 2015;13:1264–70.
[9] Areia M, Spaander MC, Kuipers EJ, et al. Endoscopic screening for gastric cancer: a cost-utility analysis for countries with an intermediate gastric cancer risk. United European Gastroenterol J 2018;6:192–202.
[10] Dinis-Ribeiro M, Areia M, de Vries AC, et al. Management of precancerous conditions and lesions in the stomach (MAPS): guideline from the European Society of Gastrointestinal Endoscopy (ESGE), European Helicobacter Study Group (EHSG), European Society of Pathology (ESP), and the Sociedade Portuguesa de EndoscopiaDigestiva (SPED). Virchows Arch 2012;460:19–46.
[11] Pimentel-Nunes P, Libânio D, Marcos-Pinto R, et al. Management of epithelial precancerous conditions and lesions in the stomach (MAPS II): european Society of Gastrointestinal Endoscopy (ESGE), European Helicobacter and Microbiota Study Group (EHMSG), European Society of Pathology (ESP), and Sociedade Portuguesa de EndoscopiaDigestiva (SPED) guideline update 2019. Endoscopy 2019;51:365–88.
[12] Holmberg D, Santoni G, von Euler-Chelpin MC, et al. Incidence and mortality in upper gastrointestinal cancer after negative endoscopy for gastroesophageal reflux disease. Gastroenterology 2021 Oct 8: S0016-5085 (21) 03617-9.
[13] Januszewicz W, Witczak K, Wieszczy P, et al. Prevalence and risk factors of upper gastrointestinal cancers missed during endoscopy: a nationwide registry-based study. Endoscopy 2021 Oct 21 Online ahead of print. doi:10.1055/a-1675-4136.
[14] Raftopoulos SC, Segarajasingam DS, Burke V, et al. A cohort study of missed and new cancers after esophagogastroduodenoscopy. Am J Gastroenterol 2010;105:1292–7. doi:10.1038/ajg.2009.736.
[15] Cohen J, Safdi MA, Deal SE, et al. ASGE /ACG Task force on Quality in Endoscopy. Quality indicators for esophagogastroduodenoscopy. GastrointestEndosc 2006;63(4 Suppl):S10–15.
[16] Park WG, Shaheen NJ, Cohen J, et al. Quality indicators for EGD. GastrointestEndosc 2015;81:17–30.
[17] Bisschops R, Areia M, Coron E, et al. Performance measures for upper gastrointestinal endoscopy: a European Society of Gastrointestinal Endoscopy (ESGE). Quality Improvement Initiative. Endoscopy 2016;48:843–64.
[18] Beg S, Ragunath K, Wyman A, et al. Quality standards in upper gastrointestinal endoscopy: a position statement of the British Society of Gastroenterology (BSG) and Association of Upper Gastrointestinal Surgeons of Great Britain and Ireland (AUGIS). Gut 2017;66:1886–99.
[19] Chiu PWY, Uedo N, Singh R, et al. An Asian consensus on standards of diagnostic upper endoscopy for neoplasia. Gut 2019;68:186–97.
[20] Froehlich F, Repond C, Mullhaupt B, et al. Is the diagnostic yield of upper GI endoscopy improved by the use of explicit panel-based appropriateness criteria? GastrointestEndosc 2000;52:333–41.
[21] RAO Manual for access to outpatient specialist services. https://www.agenas.gov.it/comunicazione/primo-piano/1798-manuale-rao. Last accessed February 24, 2022.
[22] Riphaus A, Wehrmann T, Weber B, et al. S3 guideline: sedation for gastrointestinal endoscopy 2008. Endoscopy 2009;41:787–815.
[23] Chatterjee A, Maheshwari VS, Mahanty PR, et al. A prospective, comparative study to evaluate the diagnostic accuracy of mallampati grading in supine and sitting positions for prediction of difficult airway. Cureus 2021;13(10):e18465.
[24] Teh JL, Tan JR, Lau LJ, et al. Longer examination time improves detection of gastric cancer during diagnostic upper gastrointestinal endoscopy. ClinGastroenterolHepatol 2015;13:480–7.
[25] Zullo A, Manta R, De Francesco V, et al. Management of precancerous stomach conditions and lesions (MAPSII). Update of ESGE, EHMSG, ESP and SPED guidelines of 2019. Italian J. Dig Endosc. March 2020:53–6.
[26] Zullo A, Hassan C, Repici A, et al. Intestinal metaplasia surveillance: searching for the road-map. World J Gastroenterol 2013;19:1523–6.
[27] Practice Guidelines for Preoperative Fasting and the Use of Pharmacologic Agents to Reduce the Risk of Pulmonary Aspiration: application to Healthy Patients Undergoing Elective Procedures: an Updated Report by the American Society of Anesthesiologists Task Force on Preoperative Fasting and the Use of Pharmacologic Agents to Reduce the Risk of Pulmonary Aspiration. Anesthesiology 2017;126:376–93.
[28] Standards of Practice Committee ASGE, Storm AC, Fishman DS, Buxbaum JL, et al. American Society for Gastrointestinal Endoscopy guideline on informed consent for GI endoscopic procedures. GastrointestEndosc 2022;95 207-215.e2.
[29] Manfredi G, Bertè R, Iiritano E, et al. Premedication with simethicone and N-acetylcysteine for improving mucosal visibility during upper gastrointestinal endoscopy in a Western population. Endosc Int Open 2021;09:E190–4.
[30] Abrignani MG, Gatta L, Gabrielli D, et al. Gastroprotection in patients on antiplatelet and /or anticoagulant therapy: a position paper of National Association of Hospital Cardiologists (ANMCO) and the Italian Association of Hospital Gastroenterologists and Endoscopists (AIGO). Eur J Intern Med 2021;85:1–13.
[31] Veitch AM, Vanbiervliet G, Gershlick AH, et al. Endoscopy in patients on antiplatelet or anticoagulant therapy, including direct oral anticoagulants: british Society of Gastroenterology (BSG) and European Society of Gastrointestinal Endoscopy (ESGE) guidelines. Gut 2016;65:374–89.
[32] Veitch AM, Radaelli F, Alikhan R, et al. Endoscopy in patients on antiplatelet or anticoagulant therapy: british Society of Gastroenterology (BSG) and European Society of Gastrointestinal Endoscopy (ESGE) guideline update. Gut 2021;70:1611–28.
[33] Lee MG, Hanna W, Harding H. Sedation for upper gastrointestinal endoscopy: a comparative study of midazolam and diazepam. GastrointestEndosc 1989;35:82–4.
[34] McQuaid KR, Laine L. A systematic review and meta-analysis of randomized, controlled trials of moderate sedation for routine endoscopic procedures. GastrointestEndosc 2008;67:910–23.
[35] SIAARTI-SIED: analgo-sedation in digestive endoscopy. Towards a multidisciplinary approach for quality and safety: the SIAARTI-SIED intercompany position for a path of Good Clinical Practice. 19.10.2020. www.siaarti.it/standardclinici. Last accessed Feb 14th 2022.
[36] Gupta N, Gaddam S, Wani SB, et al. Longer inspection time is associated with increased detection of high-grade dysplasia and esophageal adenocarcinoma in Barrett's esophagus. GastrointestEndosc 2012;76:531–8.
[37] De Francesco V, Manta R, Ridola L, et al. Cameron's lesions: clinical impact, endoscopic diagnosis and therapy. Italian J Dig Endosc September 2019:16–21.
[38] Sharma P, Hawes RH, Bansal A, et al. Standard endoscopy with random biopsies versus narrow band imaging targeted biopsies in Barrett's oesophagus: a prospective, international, randomized controlled trial. Gut 2013;62:15–21.
[39] Mori M, Adachi Y, Matsushima T, et al. Lugol staining pattern and histology of esophageal lesions. Am J Gastroenterol 1993;88:701–5.
[40] Shimizu Y, Omori T, Yokoyama A, et al. Endoscopic diagnosis of early squamous neoplasia of the esophagus with iodine staining: high-grade intra-epithelial neoplasia turns pink within a few minutes. J Gastroenterol Hepato l 2008;23:546–50.
[41] Zhao Z, Yin Z, Wang S, et al. Meta-analysis: the diagnostic efficacy of chromoendoscopy for early gastric cancer and premalignant gastric lesions. J Gastroenterol Hepatol 2016;31 1539–45.94.
[42] Nagahama T, Yao K, Uedo N, et al. Delineation of the extent of early gastric cancer by magnifying narrow-band imaging and chromoendoscopy: a multicenter randomized controlled trial. Endoscopy 2018;50:566–76.
[43] Pouw RE, Barret M, Biermann K, et al. Endoscopic tissue sampling - Part 1: upper gastrointestinal and hepatopancreatobiliary tracts. European Society of Gastrointestinal Endoscopy (ESGE) Guideline. Endoscopy 2021;53:1174–88.
[44] Rugge M, Sugano K, Scarpignato C, et al. Gastric cancer prevention targeted on risk assessment. Gastritis OLGA staging Helicobacter 2019;24:e12571.
[45] Lahner E, Zagari RM, Zullo A, et al. Chronic atrophic gastritis: natural history, diagnosis and therapeutic management. A position paper by the Italian Society of Hospital Gastroenterologists and Digestive Endoscopists [AIGO], the Italian Society of Digestive Endoscopy [SIED], the Italian Society of Gastroenterology [SIGE], and the Italian Society of Internal Medicine [SIMI]. Dig Liver Dis 2019;51:1621–32.
[46] Rugge M, Fassan M, Pizzi M, et al. Operative link for gastritis assessment vs operative link on intestinal metaplasia assessment. World J Gastroenterol 2011;17:4596–601.
[47] Vahabzadeh B, Seetharam AB, Cook MB, et al. Validation of the Prague C&M criteria for the endoscopic grading of Barrett's esophagus by gastroenterology trainees: a multicenter study. GastrointestEndosc 2012;75:236–41.
[48] Peixoto A, Silva M, Pereira P, et al. Biopsies in gastrointestinal endoscopy: when and how. GE Port J Gastroenterol 2015;23:19–27.
[49] Sancho-Poch FJ, Balanzó J, Ocaña J, et al. An evaluation of gastric biopsy in the diagnosis of gastric cancer. GastrointestEndosc 1978;24:281–2.
[50] Malfertheiner P, Megraud F, O'Morain CA, et al. European Helicobacter and Microbiota study group and consensus panel. European Helicobacter and Microbiota study group and consensus panel. management of helicobacter pylori infection-the maastricht v /florence consensus report. Gut 2017;66:6–30.
[51] Genta RM, Spechler SJ, Kielhorn AF. The Los Angeles and Savary-Miller systems for grading esophagitis: utilization and correlation with histology. Dis Esophagus 2011;24:10–17.
[52] Forrest JA, Finlayson ND, Shearman DJ. Endoscopy in gastrointestinal bleeding. Lancet 1974;2:394–7.
[53] Zargar SA, Kochhar R, Mehta S, et al. The role of fiberoptic endoscopy in the management of corrosive ingestion and modified endoscopic classification of burns. GastrointestEndosc 1991;37:165–9.
[54] The Paris endoscopic classification of superficial neoplastic lesions: esophagus, stomach, and colon: november 30 to December 1, 2002. GastrointestEndosc 2003;58(6 Suppl):S3–43.
[55] Spigelman AD, Williams CB, Talbot IC, et al. Upper gastrointestinal cancer in patients with familial adenomatous polyposis. Lancet 1989;2:783–5.
[56] Sarin SK, Lahoti D, Saxena SP, et al. Prevalence, classification and natural history of gastric varices: a long-term follow-up study in 568 portal hypertension patients. Hepatology 1992;16:1343–9.
[57] De Franchis R, Bosch J, Garcia-Tsao G, et al. Baveno VII Faculty. Baveno VII - Renewing consensus in portal hypertension. J Hepatol 2021 Dec 30: S0168-8278 (21) 02299-6.
[58] Alexandre L, Tsilegeridis-Legeris T, Lam S. Clinical and endoscopic characteristics associated with post-endoscopy upper gastrointestinal cancers: a systematic review and meta-analysis. Gastroenterology 2022;162:1123–35.