Quality Indicators for EGD

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EGD is used widely for the diagnosis and treatment of esophageal, gastric, and small-bowel disorders. When properly performed, it is generally safe and well-tolerated for the examination of the upper GI tract. Included among the many accepted indications for EGD are evaluation of dysphagia, GI bleeding, peptic ulcer disease, medically refractory GERD, esophageal strictures, celiac disease, and unexplained diarrhea. During EGD evaluation, diagnostic biopsies can be performed as well as therapies to achieve hemostasis and dilation or stenting for significant strictures. In 2009, an estimated 6.9 million EGD procedures were performed in the United States at an estimated cost of $12.3 billion dollars. From 2000 to 2010, a 50% increase in EGD utilization was observed among Medicare recipients (1).

The quality of health care can be measured by comparing the performance of an individual or a group of individuals with an ideal or benchmark (2). The particular parameter that is being used for comparison is termed a quality indicator. Quality indicators may be reported as a ratio between the incidence of correct performance and the opportunity for correct performance or as the proportion of interventions that achieve a predefined goal (3). Quality indicators can be divided into 3 categories: (1) structural measures—these assess characteristics of the entire health care environment (e.g., participation by a physician or other clinician in a systematic clinical database registry that includes consensus endorsed quality measures), (2) process mea-sures—these assess performance during the delivery of care (e.g., frequency with which appropriate prophylactic antibiotics are given before placement of a PEG tube), and (3) outcome measures—these assess the results of the care that was provided (e.g., rates of adverse events after EGD).

METHODOLOGY

In 2006, the American Society for Gastrointestinal Endoscopy (ASGE)/American College of Gastroenterology (ACG) Task Force on Quality in Endoscopy published the first version of quality indicators for EGD (4). The present update integrates new data pertaining to previously proposed quality indicators and new quality indicators for performing EGD. Indicators that had wide-ranging clinical application, were associated with variation in practice and outcomes, and were validated in clinical studies were prioritized. Clinical studies were identified through a computerized search of Medline followed by review of the bibliographies of all relevant articles. When such studies were absent, indicators were chosen by expert consensus. Although feasibility of measurement was a consideration, it is hoped that inclusion of highly relevant, but not yet easily measurable, indicators would promote their eventual adoption. Although a comprehensive list of quality indicators is proposed, ultimately, only a small subset might be widely used for continuous quality improvement, benchmarking, or quality reporting. As in 2006, the current task force concentrated its attention on parameters related solely to endoscopic procedures. Although the quality of care delivered to patients is clearly influenced by many factors related to the facilities in which endoscopy is performed, characterization of unit-related quality indicators was not included in the scope of this effort.

The resultant quality indicators were graded on the strength of the supporting evidence (**Table 1**). Each quality indicator was classified as an outcome or a process measure. Although outcome quality indicators are preferred, some can be difficult to measure in routine clinical practice, because they need analysis of large amounts of data and long-term follow-up and may be confounded by other factors. In such cases, the task force deemed it reasonable to use process indicators as surrogate measures of high-quality endoscopy. The relative value of a process indicator hinges on the evidence that supports its association with a clinically relevant outcome, and such process measures were emphasized.

The quality indicators for this update were written in a manner that lends them to be developed as measures. Although they remain quality indicators and not measures, this document also contains a list of performance targets for each quality indicator. The task force selected performance targets from benchmarking data in the

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Table 1. Grades of recommendation[a]

Grade of recommendation	Clarity of benefit	Methodologic strength supporting evidence	Implications
1A	Clear	Randomized trials without important limitations	Strong recommendation; can be applied to most clinical settings
1B	Clear	Randomized trials with important limitations (inconsistent results, nonfatal methodologic flaws)	Strong recommendation, likely to apply to most practice settings
1C+	Clear	Overwhelming evidence from observational studies	Strong recommendation; can apply to most practice settings in most situations
1C	Clear	Observational studies	Intermediate-strength recommendation; may change when stronger evidence is available
2A	Unclear	Randomized trials without important limitations	Intermediate-strength recommendation; best action may differ depending on circumstances or patients' or societal values
2B	Unclear	Randomized trials with important limitations (inconsistent results, nonfatal methodologic flaws)	Weak recommendation; alternative approaches may be better under some circumstances
2C	Unclear	Observational studies	Very weak recommendation; alternative approaches likely to be better under some circumstances
3	Unclear	Expert opinion only	Weak recommendation, likely to change as data become available

[a]Adapted from Guyatt G, Sinclair J, Cook D, *et al.* Moving from evidence to action. Grading recommendations—a qualitative approach. In: Guyatt G, Rennie D, editors. Users' guides to the medical literature. Chicago: AMA Press; 2002. p. 599–608.

literature when available. When data were unavailable to support establishing a performance target level, "N/A" (not available) was listed. However, when expert consensus considered failure to perform a given quality indicator a "never event," such as monitoring vital signs during sedation, then the performance target was listed as >98%. It is important to emphasize that the performance targets listed do not necessarily reflect the standard of care but rather serve as specific goals to direct quality improvement efforts.

Quality indicators were divided into 3 time periods: pre-procedure, intraprocedure, and postprocedure. For each category, key relevant research questions were identified.

In order to guide continuous quality improvement efforts, the task force also recommended a high-priority subset of the indicators described, based on their clinical relevance and importance, on evidence that performance of the indicator varies significantly in clinical practice, and feasibility of measurement (a function of the number of procedures needed to obtain an accurate measurement with narrow confidence intervals [CI] and the ease of measurement). A useful approach for individual endoscopists is to first measure their performances with regard to these priority indicators. Quality improvement efforts would then move to different quality indicators if endoscopists are performing above recommended thresholds, or the employer and/or teaching center could institute corrective measures and remeasure performance of low-level performers.

Recognizing that certain quality indicators are common to all GI endoscopic procedures, such items are presented in detail in a separate document, similar to the process in 2006 (5). The preprocedure, intraprocedure, and postpro-cedure indicators common to all endoscopy are listed in **Table 2**. Those common factors will be discussed only in this document insofar as the discussion needs to be modified specifically to relate to EGD.

Preprocedure quality indicators

The preprocedure period includes all contact between members of the endoscopy team and the patient before the administration of sedation or insertion of the endo-scope. Common issues for all endoscopic procedures during this period include: appropriate indication, informed consent, risk assessment, formulation of a sedation plan, management of prophylactic antibiotics and antithrom-botic drugs, and timeliness of the procedure (5). Preproce-dure quality indicators specific to EGD include the following:

1. Frequency with which EGD is performed for an indication that is included in a published standard list of appropriate indications, and the indication is documented

Level of evidence: 1C+

Performance target: >80%

Type of measure: process

Discussion: The accepted indications for EGD are reviewed in detail in a recently updated document by the ASGE Standards of Practice Committee (**Table 3**) (6). The indications for EGD have expanded to include endoscopic therapy for Barrett's esophagus (BE), intra-operative evaluation of reconstructed anatomic reconstructions typical of modern foregut surgery, and management of operative adverse events. Performing EGD for an accepted indication is associated with a statistically higher rate of clinically relevant findings (7,8). In one study, the odds ratio (OR) for finding a clinically relevant lesion by using an appropriate indication was 1.34 (95% CI, 1.04–1.74) (7). This process measure requires documentation in the procedure report. When a procedure is performed for a reason that is not listed in **Table 3**, justification for the procedure should be documented.

Table 2. Summary of proposed quality indicators common to all endoscopic procedures[a] (23)

Quality indicator	Grade of recommendation	Measure type	Performance target (%)
Preprocedure			
1. Frequency with which endoscopy is performed for an indication that is included in a published standard list of appropriate indications, and the indication is documented (priority indicator)	1C+	Process	>80
2. Frequency with which informed consent is obtained and fully documented	3	Process	>98
3. Frequency with which preprocedure history and directed physical examination are performed and documented	3	Process	>98
4. Frequency with which risk for adverse events is assessed and documented before sedation is started	3	Process	>98
5. Frequency with which prophylactic antibiotics are administered only for selected settings in which they are indicated (priority indicator)	Varies	Process	>98
6. Frequency with which a sedation plan is documented	Varies	Process	>98
7. Frequency with which management of antithrombotic therapy is formulated and documented before the procedure (priority indicator)	3	Process	N/A
8. Frequency with which a team pause is conducted and documented	3	Process	>98
9. Frequency with which endoscopy is performed by an individual who is fully trained and credentialed to perform that particular procedure	3	Process	>98
Intraprocedure			
10. Frequency with which photodocumentation is performed	3	Process	N/A
11. Frequency with which patient monitoring among patients receiving sedation is performed and documented	3	Process	>98
12. Frequency with which the doses and routes of administration of all medications used during the procedure are documented	3	Process	>98
13. Frequency with which use of reversal agents is documented	3	Process	>98
14. Frequency with which procedure interruption and premature termination because of oversedation or airway management issues is documented	3	Process	>98
Postprocedure			
15. Frequency with which discharge from the endoscopy unit according to predetermined discharge criteria is documented	3	Process	>98
16. Frequency with which patient instructions are provided	3	Process	>98
17. Frequency with which the plan for pathology follow-up is specified and documented	3	Process	>98
18. Frequency with which a complete procedure report is created	3	Process	>98
19. Frequency with which immediate adverse events requiring interventions are documented	3	Process	>98
20. Frequency with which immediate adverse events requiring interventions including hospitalization occur	3	Outcome	N/A
21. Frequency with which delayed adverse events leading to hospitalization or additional procedures or medical interventions occur within 14 days	3	Outcome	N/A
22. Frequency with which patient satisfaction data are obtained	3	Process	N/A
23. Frequency with which communication with referring providers is documented	3	Process	N/A

N/A, Not available.

[a]This list of potential quality indicators is meant to be a comprehensive list of measurable endpoints. It is not the intention of the task force that all endpoints be measures in every practice setting. In most cases, validation may be required before a given endpoint may be adopted universally.

2. Frequency with which informed consent is obtained, including specific discussions of risks associated with EGD, and fully documented

Level of evidence: 3

Performance target: >98%

Type of measure: process

In addition to the risks associated with all endoscopic procedures, the consent should address the relevant and substantial adverse events pertaining to each specific EGD procedure.

Discussion: As with any procedure that abides by the accepted biomedical ethical principle of patient autonomy, consent must be obtained from the patient or guardian before EGD on the same

Table 3. Indications and contraindications for EGD (6)

1. EGD is generally indicated for evaluating:
A. Upper abdominal symptoms, which persist despite an appropriate trial of therapy
B. Upper abdominal symptoms associated with other symptoms or signs suggesting serious organic disease (e.g., anorexia and weight loss) or in patients aged >45 years
C. Dysphagia or odynophagia
D. Esophageal reflux symptoms, which are persistent or recurrent despite appropriate therapy
E. Persistent vomiting of unknown cause
F. Other diseases in which the presence of upper GI pathology might modify other planned management. Examples include patients who have a history of ulcer or GI bleeding who are scheduled for organ transplantation, long-term anticoagulation, or chronic nonsteroidal anti-inflammatory drug therapy for arthritis and those with cancer of the head and neck
G. Familial adenomatous polyposis syndromes
H. For confirmation and specific histologic diagnosis of radiologically demonstrated lesions:
1. Suspected neoplastic lesion
2. Gastric or esophageal ulcer
3. Upper tract stricture or obstruction
I. GI bleeding:
1. In patients with active or recent bleeding
2. For presumed chronic blood loss and for iron deficiency anemia when the clinical situation suggests an upper GI source or when colonoscopy result is negative
J. When sampling of tissue or fluid is indicated
K. In patients with suspected portal hypertension to document or treat esophageal varices
L. To assess acute injury after caustic ingestion
M. Treatment of bleeding lesions such as ulcers, tumors, vascular abnormalities (e.g., electrocoagulation, heater probe, laser photocoagulation, or injection therapy)
N. Banding or sclerotherapy of varices
O. Removal of foreign bodies
P. Removal of selected polypoid lesions
Q. Placement of feeding or drainage tubes (peroral, PEG, or percutaneous endoscopic jejunostomy)
R. Dilation of stenotic lesions (e.g., with transendoscopic balloon dilators or dilation systems by using guidewires)
S. Management of achalasia (e.g., botulinum toxin, balloon dilation)
T. Palliative treatment of stenosing neoplasms (e.g., laser, multipolar electrocoagulation, stent placement)
U. Endoscopic therapy for intestinal metaplasia
V. Intraoperative evaluation of anatomic reconstructions typical of modern foregut surgery (e.g., evaluation of anastomotic leak and patency, fundoplication formation, pouch configuration during bariatric surgery)
W. Management of operative adverse events (e.g., dilation of anastomotic strictures, stenting of anastomotic disruption, fistula, or leak in selected circumstances)
2. EGD is generally not indicated for evaluating:
A. Symptoms that are considered functional in origin (there are exceptions in which an endoscopic examination may be done once to rule out organic disease, especially if symptoms are unresponsive to therapy)
B. Metastatic adenocarcinoma of unknown primary site when the results will not alter management
C. Radiographic findings of:
1. Asymptomatic or uncomplicated sliding hiatal hernia
2. Uncomplicated duodenal ulcer that has responded to therapy
3. Deformed duodenal bulb when symptoms are absent or respond adequately to ulcer therapy
3. Sequential or periodic EGD may be indicated:
A. Surveillance for malignancy in patients with premalignant conditions (ie, Barrett's esophagus)
4. Sequential or periodic EGD is generally not indicated for:
A. Surveillance for malignancy in patients with gastric atrophy, pernicious anemia, or prior gastric operations for benign disease
B. Surveillance of healed benign disease such as esophagitis or gastric or duodenal ulcer
C. Surveillance during repeated dilations of benign strictures unless there is a change in status

day as the procedure (or as required by local law or institutional policy). Adequate time must be allotted to discuss the risks, benefits, and alternatives to the procedure for the patient to voluntarily make a fully informed decision. In rare exceptions, such as in a life-threatening emergency, informed consent can be abridged or omitted. Further guidance on informed consent can be found in a position statement by the ASGE Standards of Practice of Committee (9). The particular risks associated with EGD include bleeding, perforation, infection, cardiopulmonary adverse events, missed diagnosis, missed lesions, intravenous site adverse events, chest pain, sore throat, aspiration, and reaction to local anesthetic spray (10–12). As a quality indicator, informed consent is a process measure based on expert opinion and supported by principles of biomedical ethics. A clinical study that correlates the presence or absence of informed consent with clinical outcomes has not been, and is not likely to be, performed.

3. Frequency with which appropriate prophylactic antibiotics are given in patients with cirrhosis with acute upper GI bleeding before EGD (priority indicator)

Level of evidence: 1B

Performance target: >98%

Type of measure: process

Discussion: A Cochrane systematic review of 12 studies showed a relative risk (RR) reduction of death (RR 0.79; 95% CI, 0.63–0.98), bacterial infections (RR 0.36; 95% CI, 0.27–0.49), and rebleeding (RR 0.53; 95% CI, 0.38–0.74) with antibiotic prophylaxis for patients with cirrhosis and acute upper GI bleeding (13). Independent of performing EGD, antibiotic prophylaxis should be administered in this population (14). Oral fluoroquino-lones can be recommended safely for most patients, but intravenous ceftriaxone may be preferred in advanced cirrhosis and in areas of high fluoroquino-lone resistance (15–17). Antibiotic selection may change over time as new agents become available and drug resistance patterns change. This is a process measure for which an evidence-based correlation of a clinically beneficial outcome exists.

4. Frequency with which appropriate prophylactic antibiotics are given before placement of a PEG tube

Level of evidence: 1A

Performance target: >98%

Type of measure: process

Discussion: A Cochrane systematic review incorporating over 1000 patients in 10 clinical trials showed a decreased peristomal infection rate with antibiotic pro-phylaxis (18). Antibiotics that cover cutaneous sources of bacterial infection such as intravenous cefazolin should be administered 30 min before the procedure (19). Where methicillin-resistant *Staphylococcus aureus* is highly prevalent, screening with decontamination should be performed (20).

5. Frequency with which a proton pump inhibitor (PPI) is used for suspected peptic ulcer bleeding (priority indicator)

Level of evidence: 1B

Performance target: >98%

Type of measure: process

Discussion: When possible, the intravenous PPI should be started on presentation with bleeding and before EGD. Intravenous PPI treatment before EGD reduces the proportion of high-risk stigmata seen at index endoscopy (OR 0.67; 95% CI, 0.54–0.84) and need for endo-scopic therapy (OR 0.68; 95% CI, 0.50–0.93) when compared with controls. In a Cochrane review of 6 randomized clinical trials, however, no statistically significant difference in mortality (OR 1.12; 95% CI, 0.72–1.73) between PPI and control treatment was observed (21).

6. Frequency with which vasoactive drugs are initiated before EGD for suspected variceal bleeding

Level of evidence: 1B

Performance target: >98%

Type of measure: process

Discussion: In a meta-analysis of 30 clinical trials involving over 3000 patients, the use of vasoactive medications and their analogues, such as terlipressin and oc-treotide, was associated with a lower risk of 7-day mortality (RR 0.74; 95% CI, 0.57–0.95) and a significant improvement in hemostasis (RR 1.21; 95% CI, 1.13–1.30) (22). There was no difference in efficacy among the different vasoactive medications.

Preprocedure research questions

1. What is the optimal antithrombotic management before therapeutic EGD procedures?
2. What are the adverse event rates of physicians relative to recently updated antibiotic prophylaxis recommendations for cardiac conditions, synthetic vascular grafts, nonvalvular cardiac devices, and orthopedic prostheses?
3. Is there sufficient interoperator and intraoperator variability in risk stratification to explain sedation-related adverse events?
4. What is the optimal sedation regimen and setting for EGD in patients with obesity and sleep apnea?
5. What are barriers to wider use of EGD without patient sedation?
6. How often do endoscopists in the community comply with surveillance guidelines for nondysplastic BE?
7. How often is endoscopy performed for other than an appropriate indication in the community, and what are the barriers to wider adherence to recommendations regarding indications?

Intraprocedure quality indicators

The intraprocedure period extends from the administration of sedation, or insertion of the endoscope when no sedation is given, to the removal of the endoscope. This period includes all the technical aspects of the procedure including completion of the examination and therapeutic maneuvers. Common to most endoscopic procedures is the provision of sedation and need for patient monitoring (23). Intraprocedure quality indicators specific to performance of EGD include the following:

7. Frequency with which a complete examination of the esophagus, stomach, and duodenum, including retroflexion in the stomach, is conducted and documented

Level of evidence: 3

Performance target: >98%

Type of measure: process

Discussion: Except in cases of esophageal or gastric outlet obstruction, every EGD should include complete visualization of all the organs of interest from the upper esophageal sphincter to the second portion of the duodenum. Complete examination may require efforts to clear material from the stomach or esophagus, as in assessment for the source of upper GI hemorrhage. Written documentation should confirm the extent of the examination. If a clinically significant abnormality is encountered, photodocumentation is indicated. In studies of the learning curve of EGD, over 90% of trainees successfully perform technically complete EGD after 100 cases, and technical proficiency may be accelerated through the use of simulators (24,25). It is reasonable to expect that any practicing endoscopist be capable of visualizing the organs of interest with rare exception. Given the recent increase in gastric cardia cancers, this should include retroflexion in the stomach in all cases (26).

8. Among those with nonbleeding gastric ulcers, frequency with which gastric biopsy specimens are taken to exclude malignancy

Level of evidence: 2C

Performance target: >80%

Type of measure: process

Discussion: Careful attention to the presence of mucosal abnormalities during EGD is crucial. The acquisition of adequate and appropriate samples demonstrates an understanding of the importance of a complete and thorough examination. Biopsy specimens from gastric ulcers are required to assess for the possibility of malignancy. The optimal number and type (maximum-capacity vs. standard) has not been determined; however, a single biopsy may not detect malignancy in as many as 30% of those with gastric cancer. Four or more biopsies detect >95% of malignancies (27). In the setting of acute GI bleeding, the endoscopist may choose to defer biopsy of the ulcer, provided that a subsequent endoscopy is planned.

9. Frequency with which BE is appropriately measured when present

Level of evidence: 2C

Performance target: >98%

Type of measure: process

Discussion: BE may be present in up to 5 to 15% of high-risk patients (e.g., older white men with GERD symptoms) undergoing upper endoscopy (28). The risk of progression to dysplasia or cancer may be related to the length of Barrett's epithelium (29,30). In addition, in patients eventually needing endoscopic therapy for BE, the amount of involved tissue may influence both the endoscopic approach and the choice of sedation modality. Therefore, it is important to characterize and document the length and location of the salmon-colored mucosa during EGD. Although a single measurement may describe the total length of the BE in the tubular esophagus, the Prague classification is a validated, widely used, more descriptive system that describes both the circumferential and maximal extent of the BE (31,32). This system defines the distance from the top of the gastric folds to the most proximal extent of the BE as the maximal (M) extent of the BE. The distance from the top of the gastric folds to the most proximal extent of the circumferential involvement of the BE is the circumferential (C) measurement. Assessment of the endo-scopic involvement of columnar tissue is essential because intestinal metaplasia of the Z line may occur in up to 18% of individuals with GERD symptoms and does not, without accompanying endoscopic findings, constitute BE (33). Intestinal metaplasia of the Z line is not known to carry sufficient cancer risk to warrant surveillance programs when this is diagnosed. Accordingly, it is important that when the presence of BE tissue is suspected, these landmarks are clearly documented.

10. Frequency with which biopsy specimens are obtained in cases of suspected BE

Level of evidence: 2C

Performance target: >90%

Type of measure: process

Discussion: Criteria for the diagnosis of BE are debated. Although some professional societies in other countries consider any columnar epithelium in the tubular esophagus consistent with the diagnosis of BE (34), professional societies in the United States have traditionally required specialized or intestinal epithelium with goblet cells to fulfill the diagnosis (35,36), and only such patients to be candidates for surveillance protocols. Recent data suggest that patients with intestinalized metaplasia of the esophagus are at 5-fold increased risk of progression to high-grade dysplasia or cancer compared with those with columnar-lined esophagus without goblet cells (37). Although the endoscopic appearance may suggest BE, a definitive diagnosis cannot be made without pathology confirmation. For patients with known BE undergoing EGD with no contraindication to endoscopic biopsy, an adequate number of biopsy specimens should be obtained to exclude dys-plasia. Although the optimal number of biopsy specimens has not been defined, 4-quadrant biopsies every 1 to 2 centimeters throughout the length of the BE tissue are recommended (28,36). Acquisition of fewer biopsy specimens than those suggested by this protocol is associated with a reduced likelihood of detecting dysplasia, after controlling for segment length (38).

Recent evidence has suggested that the time that the endoscopist spends inspecting the BE may be an important determinant of the yield of an endoscopic surveillance examination (39). Longer inspection times may be associated with increased detection of either high-grade dysplasia or the detection of suspicious lesions. Confirmation of this finding and prospective validation that increased inspection time leads to the identification of lesions (and not that the identification of lesions leads to longer inspection) may allow the future use of this metric as a quality indicator.

Most advanced neoplasia found on endoscopic examinations is found not on random biopsy but on targeted biopsy of lesions

that are suspicious for neoplasia, because of nodularity, ulceration, depression, changes in vascularity, or other findings. Previous work suggests that use of advanced imaging modalities, such as narrowband imaging, might allow for identification of areas suspicious for neoplasia. This would lead to a decreased number of esophageal biopsies necessary to survey the patient (40). If so, this quality metric may require future alteration to reflect best practices.

11. Frequency with which the type of upper GI bleeding lesion is described, and the location is documented

Level of evidence: 3
Performance target: >80%
Type of measure: process

12. Frequency with which, during EGD examination revealing peptic ulcers, at least one of the following stigmata is noted: active bleeding, nonbleeding visible vessels (pigmented protuberance), adherent clot, flat spot, and clean-based

Level of evidence: 1A
Performance target: >98%
Type of measure: process

13. Frequency with which, unless contraindicated, endo-scopic treatment is given for ulcers with active bleeding or with nonbleeding visible vessels (priority indicator)

Level of evidence: 1A
Performance target: >98%
Type of measure: process

Discussion: The completion of therapeutic procedures is a logical and obvious target for quality metrics in upper endoscopy. It is impossible prospectively to define and create metrics for all potential therapeutic maneuvers in upper endoscopy for the purpose of quality monitoring. Nonetheless, given the clinical importance and commonplace nature of the management of GI bleeding, monitoring processes and outcomes related to these conditions will likely reflect the quality of overall clinical care. Practitioners performing EGD in the setting of upper GI bleeding should be trained, equipped, and prepared to therapeutically manage the bleeding source when found.

The first task of the therapeutic endoscopist is to find and define the location of the bleeding site. In the majority of patients, a bleeding site can be determined after careful examination (41–43). However, because of impaired visualization because of blood, or occasionally because of intermittent bleeding from a lesion without obvious endoscopic stigmata, such as a Dieulafoy's lesion, the cause of bleeding may not be identified. For situations in which a bleeding site is not initially identified because of copious amounts of blood, the use of intravenous erythromycin or meto-clopramide, as well as repositioning the patient, may aid in identification of a site (44,45). The bleeding site's description should be detailed enough to allow a subsequent endoscopist to find the site. A detailed description of the lesion also is necessary, including documentation of stigmata associated with different risks of rebleeding (46).

Ulcers should be classified as actively bleeding (with spurting lesions having a more ominous prognosis than oozing lesions), nonbleeding visible vessel, adherent clot, flat spot, and clean-based ulcer. These stigmata provide prognostic information on rebleeding rates and need for subsequent intervention. They dictate management strategies including level of care and need for endoscopic therapy. In general, endo-scopic attempts at hemostasis should be performed in those with spurting or oozing ulcers as well as in those with nonbleeding visible vessels. In patients with adherent clots, vigorous irrigation with or without suctioning may allow identification of underlying stigmata of hemorrhage. If irrigation does not dislodge the clots, these lesions should be considered for endo-scopic therapy. Meta-analysis of multiple trials demonstrates that endoscopic therapy markedly decreases the risk of further bleeding and also decreases the need for surgery (47). Appropriate risk stratification in peptic ulcer bleeding requires knowledge of not only the stigmata but also of their different rates of rebleed-ing in various clinical scenarios. For practices with a low volume of EGD for bleeding, it may be appropriate to measure on a unit basis rather than per endoscopist.

14. Frequency with which achievement of primary hemo-stasis in cases of attempted hemostasis of upper GI bleeding lesions is documented

Level of evidence: 3
Performance target: >98%
Type of measure: process

Discussion: Prognosis in the patient with active GI bleeding depends in part on the success of initial intervention. Patients in whom hemostasis is not achieved are more likely to require subsequent interventional radiology or surgery and are at increased risk of mortality compared with those undergoing successful inter-vention (48–50). In many prospective series evaluating various modalities for managing actively bleeding upper GI lesions, primary hemostasis rates from 90 to 100% have been achieved (46). In order to gauge and track successful hemostasis, it will be necessary for endoscopists to clearly record whether or not their efforts to achieve primary hemostasis in high-risk endoscopic stigmata are successful. At present, there are no currently accepted standards of hemostasis attainment in community practice from which to assign an evidenced-based performance target. However, by tracking the rate of primary hemostasis and comparing to benchmark data, endoscopists will be able to engage in quality improvement in the area of GI bleeding management.

15. Frequency with which a second treatment modality is used (e.g., coagulation or clipping) when epinephrine injection is used to treat actively bleeding or nonbleeding visible vessels in patients with bleedingpeptic ulcers

Level of evidence: 1A
Performance target: >98%
Type of measure: process

Discussion: Multiple modalities may be used in the treatment of peptic ulcer bleeding. Current practices include the use of injec-

tion in conjunction with a second modality, such as multipolar coagulation, heater probe thermal coagulation, endoscopic clipping, argon plasma coagulation, or various other therapies (46). The success or failure of such treatments should be documented when practical and clearly described. Epineph-rine injection alone should not be considered adequate because multiple studies have documented the superiority of combined modality therapy over epinephrine alone (51,52).

Treating peptic ulcers with active bleeding or non-bleeding visible vessels is associated with significantly reduced rebleeding rates and should therefore be attempted in most instances. Additionally, there are supportive data for the endoscopic removal of adherent clots and subsequent treatment of underlying stig-mata,(53–55) and this practice should be considered for all patients with adherent clots.

16. Frequency with which variceal ligation is used as the first modality of treatment for the endoscopic treatment of esophageal varices

Level of evidence: 1A

Performance target: >98%

Type of measure: process

Discussion: In bleeding from esophageal varices, banding is preferred over sclerotherapy for safety and efficacy (56,57). Octreotide infusion should be instituted in patients with acute variceal bleeding who do not have a contraindication to the medication (58,59). After the initial treatment, follow-up plans should include repeat endoscopy with repeat treatment until varices are eradicated. Postprocedure plans also should include some recommendation concerning the use of beta blockers for prevention of recurrent bleeding or a statement about why they are contraindicated (60,61).

17. Frequency with which at least 4 intestinal biopsy specimens are taken from patients in whom celiac disease is suspected

Level of evidence: 1C

Performance target: >90%

Type of measure: process

Discussion: In patients with clinical signs, symptoms, and suspected celiac disease, small-intestine biopsies often are instrumental in ascertaining the diagnosis. Similarly, biopsies may help elucidate the response to therapy. Because of the potentially patchy nature of the disease, in patients in whom celiac disease is suspected, at least 4 biopsy specimens should be taken to maximize accuracy of diagnosis, and some should include the duodenal bulb (62). Biopsies of the duodenal bulb may improve diagnostic yield by detecting the most severe villous atrophy within the duodenum (63).

Intraprocedure research questions

1. The structures of the oropharynx can be observed during EGD, and examination of this area may be of particular importance in patients at high risk for squamous cell cancers of the esophagus and head and neck (64). Should complete visualization of a routine EGD include the oropharynx?
2. Do patients with endoscopic stigmata of BE, but no specialized metaplasia on biopsy, suffer from an increased risk of neoplasia, and if so, what is the magnitude of that risk?
3. Which patients with BE benefit from endoscopic ablative therapies?
4. Does increasing the time duration of the inspection of BE result in an improvement in the yield of BE surveillance examinations, and if so, what is the minimum inspection time necessary for optimal diagnostic yield?
5. What are the most effective therapies for patients with recurrent strictures or those resistant to therapy?
6. What is the rate of successful primary hemostasis for major stigmata of nonvariceal bleeding in community practice? What is the utility of newer endoscopic modalities in treating acute upper GI bleeding?
7. What are the variations in practice in the community with regard to performance of duodenal biopsies to rule out celiac disease and from what sites in the duodenum?
8. How often is dual therapy used when epinephrine is used? Is there variation in rates of surgery among community endoscopists?
9. Does case volume affect primary hemostasis or delayed rebleeding rates? Is there variation in rates of interventional radiology and surgery use among community endoscopists?
10. How often is surveillance recommended among patients with abnormalities confined to the Z line?
11. Are recommendations to measure and perform biopsies in suspected BE followed in clinical practice?

Postprocedure quality indicators

The postprocedure period extends from the time the endoscope is removed to subsequent follow-up. Postprocedure activities include providing instructions to the patient, documentation of the procedure, recognition and documentation of adverse events, pathology follow-up, communication with referring physicians, and assessing patient satisfaction (23). Postprocedure quality indicators specific to performance of EGD include the following:

18. Frequency with which PPI therapy is recommended for patients who underwent dilation for peptic esoph-ageal strictures

Level of evidence: 1A

Performance target: >98%

Type of measure: process

19. Frequency with which patients diagnosed with gastric or duodenal ulcers are instructed to take PPI medication or an H2 antagonist

Level of evidence: 1A

Performance target: >98%

Type of measure: process

Discussion: PPIs, when used in patients who have had peptic strictures, reduce the need for future dilations (65,66). Treatment with antisecretory therapy is indicated for patients with newly identified gastric or duodenalulcers (67,68).

20. Frequency with which plans to test for* Helicobacter pylori *infection for patients diagnosed with gastric or duodenal ulcers are documented (priority indicator)

Level of evidence: 1A

Performance target: >98%

Type of measure: process

Discussion: *H pylori* is a common cause of gastric and duodenal ulcer disease. Successful eradication of this organism results in dramatically reduced rates of ulcer recurrence (69). ASGE guidelines pertaining to the role of endoscopy for peptic ulcer disease recommends that all patients with gastric or duodenal ulcers should be assessed for this infection (70).

21. Frequency with which patients with evidence of recurrent bleeding from peptic ulcer disease after endoscopic treatment undergo repeat upper endoscopy

Level of evidence: 1B

Performance target: >98%

Type of measure: process

Discussion: Despite adequate endoscopic therapy for a bleeding peptic ulcer, rebleeding can occur in up to one third of patients. Repeat endoscopy for recurrent bleeding is effective and should be done unless contra-indicated (71,72). This should be documented and communicated with the primary providers. Routine second-look endoscopy in the absence of rebleeding is not recommended (26,72,73).

22. Frequency that patients are contacted to document the occurrence of adverse events after EGD

Level of evidence: 3

Performance target: N/A

Type of measure: process

Discussion: As more therapeutic EGD procedures occur (EMR, endoscopic submucosal dissection [ESD]), endo-scopists should develop a mechanism to capture and track not only immediate but also delayed endoscopic adverse events (from 14 days to 1 month). Such a practice would promote patient safety—a principle supported by the ASGE, ACG, American Gastroentero-logical Association, and the Institute of Medicine (11,74,75). Tracked adverse events should include cardiopulmo-nary events, infections, perforation, bleeding, and abdominal pain requiring medical attention or intervention. In the future, individual adverse events could be developed into separate quality indicators once further data are obtained for benchmarking. For EGD, these might include specific adverse event rates such as skin infections after PEG tube placement, aspiration pneumonia after EGD with hemostasis, and stricture formation after esophageal mucosal resection or ablation.

Postprocedure research questions

1. What is the long-term outcome from following surveillance recommendations for BE, and how will targeted biopsy techniques that use new technology affect the yield and efficacy of surveillance?
2. Are there variations in rebleeding rates from peptic ulcer disease after endoscopic therapy, and can this be used to identify high performers of quality upper endoscopy?
3. What are the sources of variability in adverse event rates after endoscopic intervention for upper GI bleeding, and how can they be diminished?
4. What is the optimal management of anticoagulation regimens in patients undergoing EGD with hemostasis of upper GI bleeding requiring chronic anticoagulation in the periprocedure and postprocedure bleeding periods?
5. What is the incidence of incomplete mucosal resection by using advanced imaging techniques to identify margins?
6. What are the best strategies to minimize adverse events after EMR and ESD?
7. What are the rates in the community of aspiration pneumonia after endoscopic hemostasis of acute upper GI bleeding, stricture formation after esophageal ablation or mucosal resection, and post-PEG wound infections?
8. Is actively tracking patients for the occurrence of adverse events after endoscopy cost effective?

Priority indicators for EGD

A summary of discussed quality indicators for EGD is listed in **Table 4**. Among these for EGD, recommended priority indicators are (1) frequency with which, unless contraindicated, ulcers with active bleeding or with non-bleeding visible vessels are treated endoscopically, (2) frequency with which plans for assessing *H pylori* infection for patients diagnosed with gastric or duodenal ulcers are documented, (3) frequency with which appropriate prophylactic antibiotics are given in patients with cirrhosis with acute upper GI bleeding before EGD, and (4) frequency with which a PPI is used for suspected peptic ulcer bleeding (**Table 5**). Among all indicators, these were chosen based on combined availability of strength of supporting evidence, measurement feasibility, and evidence of substantial variation in performance (76–78). There are very limited data on practice variation for the majority of these EGD indicators, representing an important research area.

Simple educational and corrective measures can improve performance. The primary purpose of measuring quality indicators is to improve patient care by identifying poor performers and retraining them or removing privileges to perform EGD if performance cannot be improved.

CONCLUSION

This update on quality indicators for EGD incorporates new information to provide a relevant list for endoscopists who want to perform high-quality upper endoscopy. Similar to those from the original version published in 2006, the indicators are classified as preprocedure, intra-procedure, and postprocedure indicators, and this is summarized in **Table 4**. The proposed indicators vary in the level of supporting evidence, and several are based solely on expert opinion. For practical and ethical reasons, some indicators may be impossible to validate, such as performing and documenting informed consent and patient monitoring during moderate sedation. The absence of evidence does not equate to evidence of no benefit.

Table 4. Summary of proposed quality indicators for EGD[a]

Quality indicator	Grade of recommendation	Type of measure	Performance target (%)
Preprocedure			
1. Frequency with which EGD is performed for an indication that is included in a published standard list of appropriate indications, and the indication is documented	1C+	Process	>80
2. Frequency with which informed consent is obtained, including specific discussions of risks associated with EGD, and fully documented	3	Process	>98
3. Frequency with which appropriate prophylactic antibiotics are given in patients with cirrhosis with acute upper GI bleeding before EGD (priority indicator)	1B	Process	>98
4. Frequency with which appropriate prophylactic antibiotics are given before placement of a PEG tube	1A	Process	>98
5. Frequency with which a PPI is used for suspected peptic ulcer bleeding (priority indicator)	1B	Process	>98
6. Frequency with which vasoactive drugs are initiated before EGD for suspected variceal bleeding	1B	Process	>98
Intraprocedure			
7. Frequency with which a complete examination of the esophagus, stomach, and duodenum, including retroflexion in the stomach, is conducted and documented	3	Process	>98
8. Among those with nonbleeding gastric ulcers, frequency with which gastric biopsies are done to exclude malignancy	2C	Process	>80
9. Frequency with which Barrett's esophagus is appropriately measured when present	2C	Process	>98
10. Frequency with which biopsies are obtained in cases of suspected Barrett's esophagus	2C	Process	>90
11. Frequency with which type of upper GI bleeding lesion is described, and the location is documented	3	Process	>80
12. Frequency with which, during EGD examination revealing peptic ulcers, at least one of the following stigmata is noted: active bleeding, nonbleeding visible vessels (pigmented protuberance), adherent clot, flat spot, and clean-based	1A	Process	>98
13. Frequency with which, unless contraindicated, endoscopic treatment is given to ulcers with active bleeding or with nonbleeding visible vessels (priority indicator)	1A	Process	>98
14. Frequency with which achievement of primary hemostasis in cases of attempted hemostasis of upper GI bleeding lesions is documented	3	Process	>98
15. Frequency with which a second treatment modality is used (e.g., coagulation or clipping) when epinephrine injection is used to treat actively bleeding or nonbleeding visible vessels in patients with bleeding peptic ulcers	1A	Process	>98
16. Frequency with which variceal ligation is used as the first modality of treatment for the endoscopic treatment of esophageal varices	1A	Process	>98
17. Frequency with which at least 4 intestinal biopsies are done from patients in whom celiac disease is suspected	1C	Process	>90
Postprocedure			
18. Frequency with which PPI therapy is recommended for patients who underwent dilation for peptic esophageal strictures	1A	Process	>98
19. Frequency with which patients diagnosed with gastric or duodenal ulcers are instructed to take PPI medication or an H2 antagonist	1A	Process	>98
20. Frequency with which plans to test for *H pylori* infection are documented for patients diagnosed with gastric or duodenal ulcers (priority indicator)	1A	Process	>98
21. Frequency with which patients with evidence of rebleeding from peptic ulcer disease after endoscopic treatment undergo repeat upper endoscopy	1B	Process	>98
22. Frequency with which patients are contacted to document the occurrence of adverse events after EGD	3	Process	N/A

PPI, proton pump inhibitor.

[a]This list of potential quality indicators was meant to be a comprehensive listing of measurable endpoints. It is not the intention of the task force that all endpoints be measured in every practice setting. In most cases, validation may be required before a given endpoint may be universally adopted.

Table 5. Priority quality indicators for EGD[a]

Frequency with which, unless contraindicated, endoscopic treatment is performed for ulcers with active bleeding or with nonbleeding visible vessels.
Frequency with which plans to test for *Helicobacter pylori* infection are documented for patients diagnosed with gastric or duodenal ulcers.
Frequency with which appropriate prophylactic antibiotics are given in patients with cirrhosis with acute upper GI bleeding who undergo EGD.
Frequency with which a proton pump inhibitor is used for suspected peptic ulcer bleeding.

[a]See text for specific targets and discussion.

For EGD, the proposed quality measures are predominantly process measures. Many of these process measures are good surrogates of outcomes, based on evidence that links them to clinically recognized outcomes. The future direction of quality indicator development will include relevant outcome measures and a more robust evidence base to support proposed performance targets. The proposed research questions address this deficit of evidence.

ABBREVIATIONS

ACG, American College of Gastroenterology; ASGE, American Society for Gastrointestinal Endoscopy; BE, Barrett's esophagus; ESD, endoscopic submucosal dissection; PPI, proton pump inhibitor.

CONFLICT OF INTEREST

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