Quality Metrics in Endoscopy

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Abstract: Endoscopy has evolved in the past 4 decades to become an important tool in the diagnosis and management of many digestive diseases. Greater focus on endoscopic quality has highlighted the need to ensure competency among endoscopists. A joint task force of the American College of Gastroenterology and the American Society for Gastrointestinal Endoscopy has proposed several quality metrics to establish competence and help define areas of continuous quality improvement. These metrics represent quality in endoscopy pertinent to pre-, intra-, and postprocedural periods. Quality in endoscopy is a dynamic and multidimensional process that requires continuous monitoring of several indicators and benchmarking with local and national standards. Institutions and practices should have a process in place for credentialing endoscopists and for the assessment of competence regarding individual endoscopic procedures.

Keywords
Competence, endoscopy, quality improvement, quality metrics

Endoscopy is an important tool in the diagnosis and management of digestive diseases. Dedication to high quality ensures that patients receive an appropriately indicated procedure and clinically relevant diagnoses and that therapy is properly and effectively delivered. The goals of high-quality endoscopy—receipt of an appropriately indicated procedure, a correct diagnosis, and appropriate care—should be achieved with minimal risk to the patient and take place in a well-equipped facility staffed by properly trained and competent endoscopists.[1] The ultimate goals are improved health and patient satisfaction.[2,3] Competency is an important element of quality endoscopy and is defined as "the minimum level of skill, knowledge, and/or experience required to safely and proficiently perform a task or procedure."[4] In a constantly changing environment and with the introduction of new techniques and technologies, competency is crucial to endoscopy practice.

In the past decade, there has been an increased focus on measuring quality and implementing methods that would improve the quality performance of all endoscopic procedures in general and colonoscopy in particular. Based on the available literature and expert consensus, a joint task force of the American College of Gastroenterology (ACG) and the American Society for Gastrointestinal Endoscopy (ASGE) has proposed several quality metrics to establish competence and help define areas of continuous quality improvement.[5] These quality metrics, although many are not yet validated, are divided to cover assessment of pre-, intra-, and postprocedural periods. Most of these metrics are applicable to all rather than individual procedures.

Preprocedural Period Quality Metrics

Except for a few specific indicators (such as the use of preprocedural antibiotics in specific procedures), most preprocedural quality metrics apply to all endoscopic procedures (Table). The preprocedural period starts when a patient's endoscopy is planned and ends at the time of the administration of sedation or insertion of the endoscope. During this period, patients are interviewed and examined by healthcare professionals to identify potential risk factors (ie, cardiopulmonary, renal, and other comorbid conditions) that would increase the risk of adverse events of endoscopy and to document the use of anticoagulants and how anticoagulant use will be addressed in relation to high-risk procedures. A preprocedural assessment using the American Society of Anesthesiologists classification is commonly used to identify patients at higher risk for development of adverse events from endoscopy and to provide guidance regarding optimization of sedation.[6]

Informed consent should be obtained routinely for every endoscopic procedure and should outline the potential benefits and alternatives as well as risks that are specific to a procedure, including potential adverse events that may arise from sedation. For endoscopic retrograde cholangiopancreatography (ERCP)—particularly high-risk procedures (eg, needle-knife papillotomy and sphincter of Oddi manometry)—it is recommended that consent be obtained at least 1 day in advance to allow the patient and his or her family adequate time to fully consider the pros and cons and to formulate and have questions addressed.[7] If death is stated as a risk of ERCP on the consent form, the patient should be advised that the risk is very small but not nil.

Appropriately indicated endoscopic procedures result in a higher yield; therefore, judicial use of endoscopy in the proper setting can increase the diagnostic and therapeutic benefits and reduce healthcare costs. A list of accepted indications for all core endoscopic procedures has been published and recently updated by the ASGE.[8,9]

Intraprocedural Period Quality Metrics

The intraprocedural period extends from the time of the administration of sedation or insertion of the endoscope to its removal. This period includes all technical aspects of the procedure, such as complete diagnostic examination and therapeutic maneuvers. Intraprocedural quality indicators common to all endoscopic procedures are listed in the Table. Quality metrics for specific endoscopic procedures are discussed below.

Esophagogastroduodenoscopy

Esophagogastroduodenoscopy (EGD) is one of the most commonly performed endoscopic procedures for a wide variety of diagnostic and therapeutic indications. The set of quality metrics that the ACG-ASGE task force identified as pertinent to the diagnostic and therapeutic components of EGD include documentation of a complete examination of the esophagus, stomach, and duodenum with retroflexion at the cardia of the stomach; procurement of biopsies from gastric ulcers to exclude malignancy and from the small bowel in unexplained diarrhea; documentation of esophageal landmarks; and measurement and biopsies of any suspected or established Barrett segments.[10] In the case of gastrointestinal bleeding, the source should be described, including its location. In the case of an ulcer with an active bleeding or a nonbleeding visible vessel, epinephrine should not be used alone but in combination with either clipping or electrocoagulation.[11] In the case of variceal bleeding, endoscopic variceal ligation is the preferred therapeutic endoscopic modality.[12]

Colonoscopy

Among all quality metrics, those for colonoscopy are the most studied and validated. The main goals of colonoscopy are to consistently reach the cecum in most cases and to perform a thorough examination of the colonic mucosa to identify all lesions—polyps in particular—and remove them safely. The following are the colonoscopy metrics that have been proposed as quality metrics of the procedure.

Bowel Preparation Complete examination of the colon with adequate bowel preparation is essential for the identification of all possible lesions and to provide a proper surveillance interval between colonoscopies. Colonoscopy without adequate visualization due to poor bowel preparation has been shown to be associated with increased healthcare costs, at a rate of 12–22%, secondary to the need for repeat colonoscopies.[13]

It is recommended that bowel preparation be monitored and a process for improvement be implemented, whereby factors leading to poor preparation are identified and corrected.[5] A bowel preparation scale that is validated and reliable, such as the Boston Bowel Preparation Scale,[14] is available to consistently rate bowel preparation. Currently, there is evidence to support the adoption of split-dose bowel preparation as the standard of care.[15] Findings suggest that split-dose bowel preparation achieves the best possible results and allows for an improved lesion detection rate.

Cecal Intubation Rate Visualization of the cecum by notation of landmarks (ileocecal valve and appendiceal orifice) with photo documentation should be part of every colonoscopy report. It is expected that endoscopists intubate the cecum in 90% or more of all cases and in 95% or more patients undergoing screening colonoscopy.[16,17] This ensures the examination of the proximal colon, where a substantial number of colorectal neoplasms are located.[18,19]

Table. Metrics to Be Addressed and Documented (Common to All Endoscopic Procedures)[1]

Preprocedural metrics
1. Proper indication 2. Proper consent addressing the most common complications (eg, bleeding, perforation, missed diagnosis, and sedation-related complications) 3. Preprocedural history and directed physical examination 4. An American Society of Anesthesiologists risk assessment prior to sedation and the intended level of sedation (minimal, moderate, deep, and general anesthesia) 5. Administration of prophylactic antibiotics to patients at high risk for complications who are undergoing high-risk procedures[52] (eg, stricture dilation, variceal sclerotherapy, and endoscopic retrograde cholangiopancreatography in patients with an obstructed bile duct; percutaneous endoscopic gastrostomy; and endoscopy in patients with acute gastrointestinal bleeding and cirrhosis) 6. Use of anticoagulants or antiplatelet medication 7. Documentation of a team pause, during which the correct procedure and patient are confirmed before the institution of sedation 8. Performance of endoscopic procedures in a timely manner
Intraprocedural metrics
1. Photographic documentation of landmarks and major pathology 2. Oxygen saturation, pulse, and blood pressure monitoring 3. Drugs and drug doses used for sedation 4. Reversal agents and their doses if used
Postprocedural metrics
1. Completed procedure report 2. Patient receipt of written instructions that outline the signs and symptoms that may be indicative of procedure-related complications 3. Documentation of pathology follow-up 4. Patient receipt of instructions regarding the avoidance or resumption of medications, including nonsteroidal anti-inflammatory drugs, anticoagulant drugs, or antiplatelet drugs 5. Communication with referring providers 6. Monitoring of immediate and delayed complications that are related to sedation, the procedure, and interventions (eg, postpolypectomy bleeding, perforation, infection, pancreatitis, and recurrent bleeding after treatment for bleeding)

Adenoma Detection Rate This is perhaps the most important quality metric of colonoscopy and a measurement of excellence in the performance of the procedure.[20] The main goal of screening colonoscopy is detection and removal of all neoplastic colonic polyps. Incomplete colonoscopies are one of the most important factors associated with missed lesions and reduced protection against interval cancers.[21]

Missed lesions at colonoscopy have been considered to be a key factor in increased incidence of colorectal cancer (CRC).[22] Factors such as incomplete colonoscopy, failed detection of flat or depressed lesions, and aggressive biologic behavior of lesions have all been considered to be possible reasons for missed detection of cancers. Other factors, such as the endoscopist's specialty, the practice setting, and the endoscopist's polypectomy rate, can have a role in missing these interval cancers.[19,23]

It has been shown that the rate of interval cancers is inversely related to the adenoma detection rate (ADR). Endoscopists who have an ADR of below 20% have a significantly higher associated rate of interval cancers.[24] The proposed benchmarks for the ADR in screening colonoscopy for patients age 50 years or older are at least 15% for women and 25% for men.[5,25,26]

However, the ADR is time consuming and cumbersome to obtain, which has resulted in the search for reliable surrogates. One of these proposed surrogates is the polyp detection rate (PDR). Studies have shown that the PDR is not only reliable but that it correlates well even with administrative data.[27,28] The proposed benchmarks for the PDR are 40% for men and 30% for women.[29] There has been some concern about "gaming" of this measure, which involves the removal of diminutive polyps from the rectosigmoid area, where hyperplastic or non-neoplastic lesions are more likely to occur in an effort, deliberate or not, to increase the PDR. To prevent potential gaming, it has been proposed that the PDR of the proximal colon, rather than the entire colon, has a better correlation with the ADR.[30]

Withdrawal Time Withdrawal time is the time elapsed between reaching the cecum and removing the endoscope

from the patient. Most endoscopists carry out detailed inspection of the colonic mucosa during the withdrawal phase of colonoscopy.[31] It is during this phase that adenomas and cancers are most likely detected and removed. The US Multi-Society Task Force on Colorectal Cancer recommends that withdrawal should average at least 6–10 minutes, excluding time for biopsy and polypectomy.[5] Because a mandatory withdrawal time has not been shown to have a positive impact on the ADR,[32] measurement of withdrawal time may be appropriate as a quality metric only in instances of low detection rates of adenomas.

Another colonoscopy quality metric that has been proposed by the US Multi-Society Task Force on Colorectal Cancer is collecting biopsy specimens in patients with chronic diarrhea, whereby at least 32 surveillance biopsy specimens per patient with pancolitis or Crohn's colitis (goal, 4 per 10-cm section) would be obtained. Another metric that endoscopists are expected to follow is to either resect or document unresectability at the index procedure of all mucosally based pedunculated polyps and sessile polyps of less than 2 cm. When a difficult polyp is encountered, the endoscopist should obtain adequate photographic documentation, tattoo the nearby area, and refer the patient to a more experienced endoscopist or a surgeon.

Endoscopic Retrograde Cholangiopancreatography ERCP is one of the most technically demanding and highest-risk–prone procedures performed by gastroenterologists. Proposed indicators of a high-quality ERCP procedure include a high success rate in cannulating the duct of interest (≥95% for experienced endoscopists and ≥80% at the end of training in ERCP); complete technical success, including traversing of strictures, extraction of stones, and successful stent placement (as the risk of complications such as cholangitis and pancreatitis is higher in technically failed ERCP, a high therapeutic success is essential); ductal clearance of common bile duct stones causing obstruction; and successful stent placement for biliary obstruction.[33]

Not only should success rates be regularly monitored but so should adverse events. Benchmarks for complication rates of ERCP include post-ERCP pancreatitis of less than 5% for patients at low risk and less than 15% for patients at high risk as well as rates of bleeding and infection of less than 2%, perforation of less than 1%, and an overall mortality of less than 0.5%.[7] A voluntary international and confidential reporting system was developed for the generation of "report cards" and benchmarking.[34] Unfortunately, the ERCP Quality Network is no longer in operation for registering and submitting data. However, it is expected that the GI Quality Improvement Consortium (www.giquic.org) will be able to expand its current registry for ERCP quality monitoring in the near future.

Endoscopic Ultrasound Endoscopic ultrasonound (EUS), with its ability to perform fine-needle aspiration, plays an important role in the diagnosis and staging of gastrointestinal lesions and cancers. The quality metrics pertinent to EUS include documentation of visualization of structures of interest; use of the American Joint Commission for Cancer/Union Internationale Contre le Cancer Tumor, Node, and Metastasis staging system for all gastrointestinal cancers; documentation and measurement of all pancreatic masses; documentation of wall layers with subepithelial mass involvement; appropriate use of biopsy and cytology procedures; and, in the case of esophageal cancer, performing biopsies of celiac axis lymph nodes.[35]

Postprocedural Period Quality Metrics

Because the risk of adverse events is inherent in all endoscopic procedures, monitoring these adverse events is an integral part of quality assessment and improvement programs. The postprocedural quality metrics common to all procedures are shown in the Table. Additional specific quality metrics that need to be monitored include rates of rebleeding in the setting of upper gastrointestinal bleeding and postpolypectomy bleeding rates and perforation rates. Institutions should have a process to review the techniques and routines of endoscopists in practices in which higher rates of adverse events are observed. This is best accomplished by regularly scheduled educational and transparent morbidity and mortality conferences. Surveillance interval guidelines following colonoscopy have been published by the US Multi-Society Task Force on Colorectal Cancer.[36] Monitoring the compliance of endoscopists at recommended intervals is a necessary measure, and the efficiency and cost-effectiveness of CRC screening programs is dependent on correct recommendations.

Quality Metrics in Endoscopic Training

To practice high-quality endoscopy, quality needs to be taught and practiced from the beginning (ie, during training). This may require a change in the culture of training programs and their sponsor institutions. Competence in endoscopy is assessed after a threshold number of procedures have been reached. After competence is reached, the specific goal of training has been achieved.

General guidelines for endoscopy training have been recently updated and emphasize that the amount of time and experience needed to learn to perform an endoscopic procedure in an effective and safe manner varies considerably, not only among trainees but from one procedure to another.[37] Suggested threshold numbers include 130 EGDs,[37] 200 colonoscopies,[38] 25–30 flexible sig-

moidoscopies,[39,40] 180–200 ERCPs,[41,42] and 100 EUS procedures (although more EUS procedures may be needed for examining the pancreatobiliary tree).[43,44]

However, the absolute or threshold numbers may be misleading. Most trainees will achieve competence much later than the completion of threshold numbers of endoscopic procedures.[37] Because the rate of acquiring skills for any given procedure differs among trainees, it must not be assumed that competency in one procedure implies competency in others.[45] Therefore, it is recommended that the suggested threshold numbers for each type of endoscopic procedure be used only as a guide in curricula planning.[37]

By virtue of embracing electronic endoscopy reporting, current training programs are in compliance with some quality aspects of endoscopy (eg, indication for the procedure, American Society of Anesthesiologists class, anatomic extent of examination, therapeutic intervention, disposition, and recommendations for subsequent care and repeat endoscopy). It is up to the institution and the training program to make sure that other performance measures, such as documentation of the proposed surveillance intervals after polyps are found and the follow-up interval after normal colonoscopy, are adopted and practiced by trainees. Better and easier ways to document the progress of a trainee in endoscopy are needed.

Quality metrics currently in use for colonoscopy should be adopted by trainees during their training. To date, data suggest that practices of physicians whose specialty is not gastroenterology but who perform endoscopies are associated with higher rates of postcolonoscopy colon cancer.[23] To achieve higher quality of care, physicians who belong to other specialties and perform endoscopy must reassess their competency thresholds, and hospitals should consider adopting more uniform and stricter privileging norms.

Quality Improvement in Endoscopy: Opportunities and Challenges

Quality improvement refers to monitoring performance, making continuous refinements, and assessing the outcomes of the interventions taken to achieve improvement. Most of the existing data on quality improvement are from experience with colonoscopy. Some of this modeling can be adapted to other forms of endoscopy. The use of tools—such as simulators to test core knowledge and technical performance, direct observation of procedures performed by experts using a visual analog scale, and video recording of the performance of colonoscopy that incorporates provision of feedback by tri-split video—have a sustained, positive impact on colonoscopy training.[46-48] There is no reason not to adopt the same principles for other endoscopic procedures.

Benchmarking is an essential element of quality improvement.[49] Practices should implement internal benchmarking through project development, data collection, and implementation of quality assurance programs.[50] External benchmarking entities, such as the GI Quality Improvement Consortium,[51] help design, develop, and use various measures of endoscopic techniques of practicing gastroenterologists. In Great Britain, the Joint Advisory Group on Gastrointestinal Endoscopy uses the global rating scale (GRS) and, thus, provides a framework for continuous improvement for endoscopy services to achieve and maintain accreditation. The GRS uses 4 domains (clinical quality, patient-centered care, workforce, and training) and assigns levels of achievement for each item within the domains from basic (level D) to excellent (level A). The census is published online at http://www.thejag.org.uk/AboutUs/DownloadCentre.aspx so that institutions and practices can compare themselves with each other.

Successful quality improvement programs need the vision of the institution, a strong leadership, and a motivated team. Continuous training and feedback and improvement in equipment and infrastructure are essential for high-quality endoscopy services. Institutions and practices must provide opportunities to critically assess newer technologies and adopt them when necessary.

Despite several advances, there are many challenges to improving quality of endoscopy. The majority of proposed quality metrics are not validated and may not apply to every practice setting. Monitoring quality metrics is time consuming and costly because it often requires data collection from multiple sources. For example, the ADR depends on the availability and documentation of the pathology report of the removed polyps. The ADR may be difficult to document and not so readily available as a quality metric. Although the PDR might provide useful information while retrospectively auditing colonoscopy reports, the PDR has not been validated in prospective studies and its use in this way carries the potential risk of gaming the system.

A controversial issue that needs resolution is the endoscopic training of nongastroenterologists. Unfortunately, the data on this issue are lacking and emotions run high when this important issue is brought up. There are notable differences regarding when, at what level, and how endoscopic competency is assessed in nongastroenterologic training programs. The argument rests on whether healthcare organizations and the lay public—and patients in particular—should settle for an endoscopist who has basic competence or an expert. This issue should be resolved through the collaboration of gastroenterologic and nongastroenterologic training programs to define uniformity in the competency granting process in gastrointestinal endoscopy.

Conclusion

Quality in endoscopy is a multidimensional and dynamic process that requires continuous monitoring of several indicators reflecting pre-, intra-, and postprocedural aspects of endoscopic care and benchmarking with local and national standards. Development and implementation of educational tools and improved endoscopic techniques are essential to enhancing the overall benefits of endoscopy.

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