



Core curriculum for endoluminal stent placement

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Developed by the American Society for Gastrointestinal Endoscopy Training Committee

This is one of a series of documents prepared by the American Society for Gastrointestinal Endoscopy Training Committee. This document contains recommendations for training curricula intended for use by endoscopy training directors, endoscopists involved in teaching endoscopy, and trainees in endoscopy. It was developed as an overview of techniques currently favored for the performance and training for enteral stent placement and to serve as a guide to published references, videos, and other resources available to the trainer. Specifics on quality metrics and competency assessment are separate topics that are beyond the focus of this curriculum.

Endoluminal stents play an important role in the management of patients with benign and malignant GI tract obstruction. They offer the ability to restore luminal patency without surgery. Current stents are self-expandable metal stents that can be deployed in the esophagus, small bowel, or colon. The basic technique for stent placement is similar among these stents and involves passage of the stent catheter, usually over a guidewire, and deployment under endoscopic and/or radiologic guidance. However, there are important differences in the design, available sizes, and indications for placement of stents among the different locations in the GI tract.

GOALS OF TRAINING

Trainee

The trainee should be proficient in upper and lower endoscopy and should have a basic understanding of the use and interpretation of fluoroscopy. Interpretation of cross-sectional imaging and contrast studies is also essential for the appropriate selection of patients and procedural planning.

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Faculty

The program should have at least 1 faculty member who is experienced in the area of enteral stent placement and is familiar with a variety of available stents. Lectures, books, online material, endoscopy, and hands-on training using ex vivo specimens are useful adjuncts to the trainees' clinical experience.¹⁻⁴ When possible, the trainee should work with a multidisciplinary team including an expert endoscopist, interventional radiologist, oncologist, and surgeon to learn optimal management of palliation of malignant luminal obstructions.

Facilities

The hospital or clinical site should have a procedure room capable of performing both endoscopy and fluoroscopy simultaneously, because both are commonly used in patients undergoing enteral stent placement. In many instances, however, esophageal stents may be placed with endoscopic guidance alone.

Endoscopic experience

The training program should ideally offer a range of esophageal, gastroduodenal, and colonic stent cases. Trainees should encounter both benign and malignant conditions in which enteral stent placement is contemplated.

Training process: principles applicable to all enteral stents

The trainee should understand that enteral stent placement is an advanced procedure that requires a thorough patient evaluation, review of relevant imaging, multidisciplinary approach to management, and shared decision-making with the patient and/or family. Trainees are expected to gain proficiency in all aspects of enteral stent placement, including patient evaluation, procedure preparation, deployment of stents, and postprocedure follow-up. The core technical, nontechnical, and cognitive skills for endoluminal stent placement are listed in [Table 1](#).

TABLE 1. Core technical, nontechnical, and cognitive skills for training in endoluminal stent placement

Technical skills	Nontechnical skills	Cognitive skills
<ul style="list-style-type: none"> Evaluate stricture size and location 	<ul style="list-style-type: none"> Communicate effectively with the patient and other consulting services (eg, surgery, oncology, palliative care) to manage the patient as part of a multidisciplinary team 	<ul style="list-style-type: none"> Understand the indications and contraindications for endoluminal stent placement in both malignant and benign conditions
<ul style="list-style-type: none"> Mark the stricture using external markers or endoscopic clips, if necessary 	<ul style="list-style-type: none"> Obtain consent by explaining the risks and benefits of the procedure and expected outcomes 	<ul style="list-style-type: none"> Know the available stent types, configurations, and attributes (diameter, length, deployment method, and design)
<ul style="list-style-type: none"> Successfully pass the guidewire through the endoluminal obstruction using various catheters and balloons as necessary 	<ul style="list-style-type: none"> Careful review of cross-sectional or radiographic imaging studies 	<ul style="list-style-type: none"> Understand appropriate patient positioning during stent placement and the benefits and limitations of the supine, prone, and left lateral decubitus positions
<ul style="list-style-type: none"> Deploy the stent in the appropriate location under endoscopic and/or radiologic guidance 	<ul style="list-style-type: none"> Evaluate the location and extent of the obstruction and its relation to important landmarks (eg, gastroesophageal junction, ampulla, anal verge) 	<ul style="list-style-type: none"> Know the appropriate postprocedure care of patients after endoluminal stent placement (pain control, diet considerations, and follow-up)
<ul style="list-style-type: none"> Recapture the stent and reposition if this is deemed necessary during/after initial deployment 	<ul style="list-style-type: none"> Evaluate the patient's cardiovascular risk and fitness for upper or lower endoscopy, in consultation with the anesthesia specialist in selected cases 	<ul style="list-style-type: none"> Know the signs and symptoms of stent dysfunction and the appropriate use of contrast or cross-sectional imaging studies for patient evaluation
<ul style="list-style-type: none"> Evaluate for optimal stent position after deployment 	<ul style="list-style-type: none"> Understand the mechanism of stent deployment and the ability to recapture and reposition the stent 	
<ul style="list-style-type: none"> Evaluate for immediate adverse events during the procedure 	<ul style="list-style-type: none"> Select the appropriate stent size and type during the procedure 	
<ul style="list-style-type: none"> Perform endoscopic suture fixation or clip placement to secure stents in selected cases 	<ul style="list-style-type: none"> Communicate effectively with the endoscopy assistant and fluoroscopy operator during the procedure 	
	<ul style="list-style-type: none"> Generate a detailed procedure report with accurate description of interventions and type of devices used 	

ESOPHAGEAL STENT PLACEMENT

Overview

Esophageal stents are generally indicated for the treatment of dysphagia in patients with esophageal malignancy. In addition, stents may be indicated in cases of malignant esophageal fistula without obstruction, benign esophageal strictures, and esophageal perforations. The trainee should understand the role of esophageal stents for both benign and malignant disease and should be able to select the appropriate stent design and size according to the procedure indication.

Preprocedure considerations

Patient selection. Before considering esophageal stent placement, the trainee should understand the importance of evaluating patient fitness for upper endoscopy and the need for anesthesia-assisted sedation. The trainee should recognize that some patients may have advanced malignancies, malnutrition, multiple comorbidities, and possible respiratory compromise because of esophagorespiratory fistulas. Expansion of the esophageal stents placed

in the proximal esophagus can lead to respiratory compromise because of compression of the trachea/main bronchus. The trainee must understand the appropriate roles of chest CT and pulmonary consultation for determining the need for elective bronchial stent placement in selected patients.

Preprocedure evaluation

Informed consent. Trainees should be able to discuss in lay terms the risks of stent placement (including stent migration, perforation, bleeding, chest pain, dysphagia, food impaction, need for repeat interventions), alternatives (surgery, chemoradiation therapy, dilation, tumor ablation, PEG, and/or percutaneous endoscopic jejunostomy placement), and the expected outcome of each option.

Patient preparation. The trainee should understand the potential for retention of food or liquid in the obstructed esophagus, with consideration of nothing by mouth for the patient as appropriate before the procedure. Airway protection may be warranted, especially if the procedure is performed in the supine position, which may offer better fluoroscopic visualization. The trainee should

routinely review all relevant imaging studies before the procedure.

Procedure considerations

Stricture/fistula evaluation. The trainee should evaluate the location and extent of the esophageal obstruction and its relation to the gastroesophageal junction before attempting placement of esophageal stent. This may be accomplished by reviewing radiology imaging studies, direct endoscopic evaluation, and/or fluoroscopic imaging.

Esophageal stents. The trainee should be familiar with available esophageal stents and develop a reasonable knowledge of stent characteristics including mechanical properties (shortening vs nonshortening), uncovered, fully covered versus partially covered, radiopacity, radial force, delivery catheter and deployment mechanisms (eg, through the scope deployment vs over a guidewire deployment), recapturing/repositioning features, removability/migration risks, and special features such as antimigration struts, antireflux valves, and so on. Knowledge of stent parameters should be used to select the optimal stent for the individual circumstances.

Stent deployment. Trainees should gain experience in deploying esophageal stents in all locations with fluoroscopic and endoscopic guidance. During deployment, trainees need to understand the importance of close communication with their assistants and fluoroscopy operators. In some circumstances, the upper and lower ends of the stricture need to be marked. Under fluoroscopic guidance, radiopaque material can be injected at the upper and lower end of the stricture, endoscopic clips can be applied, or external markers can be used. The trainee should also learn techniques to place a stent in tight strictures that can only be traversed with a guidewire. This generally requires accurate delineation of the stricture under fluoroscopy, followed by stricture measurement, selection of an appropriate length of the stent, and deployment under strict fluoroscopic and endoscopic control.

Once the stent is deployed, the trainee should be able to evaluate whether or not the stent is positioned correctly. The trainee should understand that it is not essential to pass an endoscope through the stent because this may result in unintended stent dislodgement. The trainee should also be able to reposition or remove the stent or place additional overlapping stents if the postdeployment position is unsatisfactory. The trainee should understand that migration is a common adverse event after esophageal stent placement, especially for nonmalignant indications. The trainee should understand the role of adjunctive techniques for esophageal stent fixation such as endoscopic clips and suturing to reduce the risk of stent migration.^{5,6} If sutures are placed to secure the stent, the trainee should learn techniques of stent extraction by cutting the sutures and retrieving the stent.

Postprocedure considerations

The trainee should be well aware of immediate, early, and late adverse events of esophageal stents and learn the interventions required to address these adverse events.^{7,8} These reinterventions include repositioning/removing stents, recovering migrated stents, placing additional stents in patients with previously placed stents, and addressing epithelial hyperplasia, tumor overgrowth, and tumor ingrowth in a previously placed stent.

Follow-up. The trainee should have an understanding of the postprocedure care of patients after esophageal stent placement, including pain management, management of gastroesophageal reflux and aspiration (for stents traversing the gastroesophageal junction), and dietary modifications. The trainee should recognize symptoms and signs of stent dysfunction and understand the role of contrast or plain film radiography and repeat endoscopy in the patient's workup and management. Trainees should be able to discuss dietary recommendations and restrictions for patients after stent placement.

SMALL-BOWEL STENT PLACEMENT

Overview

The placement of gastroduodenal stents is indicated for palliation of malignant gastric outlet obstruction. Patients in need of gastroduodenal stents usually have advanced malignancies, and the trainee should be able to appropriately select and counsel patients for gastroduodenal stent placement.

Preprocedure considerations

Patient selection. The trainee should be able to evaluate the patient for associated peritoneal carcinomatosis and/or multifocal intestinal obstruction. The trainee should understand the potential indication for prophylactic biliary stent placement in patients being considered for duodenal stent placement for obstructive pancreaticobiliary tumors. The trainee should understand the potential role of gastrojejunostomy as an alternative for patients with gastric outlet obstruction and long life expectancy.

Informed consent. Trainees should be well versed in the risks and adverse events of duodenal stent placement as well as alternatives such as jejunostomy tube placement and surgical bypass.⁹ Trainees should know the reasonable expectations for successful stent placement in regard to symptom relief, resumption of diet, and types of food the patient is likely to tolerate. The trainee should be able to communicate all the above to the patient and family before and during the informed consent process. Patients should understand that stent placement is intended as permanent.

Patient preparation. Patients with gastric outlet obstruction may be at increased risk for aspiration events during sedation and endoscopy because of retained gastric

contents. Trainees must recognize that preprocedure decompression of gastric contents via nasogastric tube may be necessary and should consider elective endotracheal intubation to facilitate the procedure.

Duodenal stents. Trainees must learn the design and construction of duodenal stents and available sizes. Currently available duodenal stents use a through-the-scope, over-the-wire introducer system, requiring a therapeutic endoscope with a large working channel (ie, 3.7 mm). Therapeutic gastroscopes, adult colonoscopes, and duodenoscopes are all suitable for delivering enteral stents. Trainees should learn to use the various types of endoscopes and be able to recognize when one type of endoscope would be favored over another.

Procedural considerations

Evaluation of stricture. Proper evaluation of gastric outlet obstruction or small-bowel obstruction is critical before attempting small-bowel stent placement. The trainee must be able to determine the stricture length. This may be done endoscopically (if the stricture can be traversed) or fluoroscopically using contrast injection or with contrast-filled balloons. Trainees must be able to select the appropriate length of the stent(s) sufficient to traverse the stricture.

Stent deployment. Trainees are expected to develop proficiency in positioning the undeployed stent catheter across the stricture and to deploy the stent under radiologic and endoscopic guidance. It is important to emphasize that it is preferable to place the enteral stent without covering the major papilla, if possible. Otherwise, it may be prudent to consider biliary stent placement before enteral stent placement if the site of obstruction necessitates placement of the enteral stent across the major papilla. Trainees should be able to recapture and reposition the stent if positioning is suboptimal during deployment. Once a duodenal stent has successfully been deployed, the trainee should be able to assess the stent for satisfactory positioning and to evaluate for any adverse events.

Immediate and delayed adverse events. Trainees are expected to be able to identify intraprocedural or immediate adverse events from enteral stent placement and apply appropriate management strategies as needed. These adverse events include acute stent migration, bleeding, and perforation.^{9,10}

Trainees should be taught to recognize and manage delayed stent-related adverse events including bleeding, perforation, stent migration, tumor ingrowth/overgrowth, and stent occlusion. Important endoscopic skills in this setting include the use of dilating balloons, ablation therapies (such as argon plasma coagulation), and placement of additional stents. Another important consideration to understand is potential biliary obstruction after duodenal stent placement.

COLONIC STENT PLACEMENT

Overview

Colonic stent placement may be indicated in the management of malignant colonic obstruction. This can result from colon cancer or from extracolonic malignancy.^{11,12} The decision to proceed with colonic stent placement should be made in conjunction with oncologists, colorectal surgeons, and gastroenterologists in a multidisciplinary team approach.

Preprocedure considerations

Patient selection and informed consent. The trainee should understand which patients are likely to benefit from colonic stent placement.^{13,14} Trainees should explain to the patient what reasonable expectations are for successful stent placement with regard to symptom relief, passage of stool and gas, resumption of diet, types of food the patient is likely to tolerate, and the need for any medications after the procedure.¹⁵ Trainees should be able to explain the risks of colonic stent placement to the patient and describe that perforation is a potential risk associated with colonic stent placement that could result in peritonitis, the need for emergency surgery, and death.¹⁶ Low-lying rectal stents can potentially lead to tenesmus and pain and, rarely, incontinence, and these adverse events should be discussed with patients with distal rectal obstruction. The trainee should also explain the alternatives to stent placement, such as colostomy with or without resection.

Patient preparation. Trainees must recognize that patients with large-bowel obstruction represent a high-risk patient subset. Patients may have severe pain and/or respiratory compromise from limited diaphragmatic excursion because of a tense abdomen. Patients with colonic obstruction are at risk for spontaneous perforation because of high intracolonic pressures. Trainees should recognize the urgency to relieve the obstruction and should be able to individualize sedation and airway protection.

Colonic stents. Trainees are expected to learn about the sizes, designs, and deployment of available colonic stents. Currently available colonic stents use a through-the-scope, over-the-wire introducer system. A therapeutic endoscope with a large working channel (ie, 3.7 mm) is required for placing through-the-scope stents. Therapeutic gastroscopes and adult colonoscopes are suitable for delivering colonic stents. Trainees should be proficient in selecting and using the appropriate types of endoscopes.

Procedural considerations

Evaluation of stricture. Trainees must be able to perform proper evaluation of large-bowel obstruction before attempting colonic stent placement. This includes review of appropriate imaging studies such as CTs to

evaluate the level of bowel obstruction and to exclude perforation (a contraindication to stent placement).

Determination of stricture length can be accomplished by a variety of means, similar to those used in esophageal and duodenal stents. Routine balloon dilation of malignant large-bowel stenoses is not advocated, although it may be considered in individualized circumstances. Insufflation should be minimized and should use carbon dioxide gas. The location of the stricture, traversability, and angulations are all factors the trainee must learn to assess in selecting the appropriate patient, endoscope, and stent.

Stent deployment. Trainees are expected to develop proficiency in advancing an undeployed stent over a guide-wire and across the stricture. Trainees should communicate effectively with their endoscopy assistant to gradually deploy the stent and maintain accurate positioning during placement. Once a colonic self-expandable metal stent has successfully been deployed, the trainee must be able to assess the stent both endoscopically and fluoroscopically to ensure it is positioned correctly to allow colonic decompression and to evaluate for any adverse events.

Immediate and delayed adverse events. Trainees must be able to identify and manage adverse events from colonic stent placement, most commonly bleeding and perforation.^{17,18} Trainees are expected to recognize these adverse events and apply appropriate management strategies as needed. Recurrent obstruction can occur because of tumor ingrowth/overgrowth, migration, or tissue hyperplasia. Perforation can develop as a late adverse event.¹⁹

Follow-up. The trainee should be able to describe appropriate poststent management to maintain soft stools with use of stool softeners and low residue diet.

SUMMARY

This endoluminal stent placement core curriculum was developed as an overview of the key components of the procedure and is meant to serve as a platform for education, training, and practice. Although all trainees should have exposure to these techniques, trainees interested in performing endoluminal stent placement for independent practice should seek additional focused training. By providing information to endoscopy trainers about the common practices used by experts in performing the procedure, the American Society for Gastrointestinal Endoscopy hopes to improve the teaching and performance of endoluminal stent placement.

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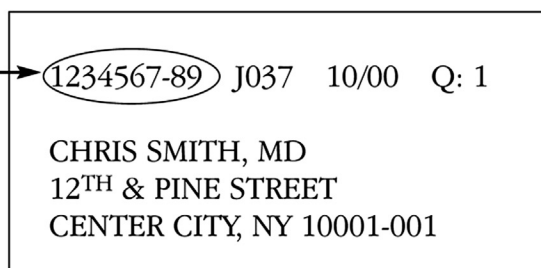
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