PRACTICE PARAMETERS

Clinical Practice Guidelines for Ostomy Surgery

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Prepared by the Clinical Practice Guidelines Committee of the American Society of Colon and Rectal Surgeons

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It should be recognized that these guidelines should not be deemed inclusive of all proper methods of care or exclusive of methods of care reasonably directed to obtaining the same results. The ultimate judgment regarding the propriety of any specific procedure must be made by the physician in light of all the circumstances presented by the individual patient.

STATEMENT OF THE PROBLEM

Approximately 100,000 people in the United States undergo operations that result in a colostomy or ileostomy each year.[1] Colostomies and ileostomies are created in the management of a variety of medical conditions, including cancer, diverticulitis, and inflammatory bowel disease. Unfortunately, operations in which ostomies are created have high rates of surgical complications in comparison with other types of common surgical procedures. One recent population-based study based on National Surgical Quality Improvement Program data showed a 37% unadjusted complication rate for elective cases involving an ostomy, and 55% for emergency operations.[2] Furthermore, risk-adjusted morbidity rates varied significantly among hospitals, indicating the potential to improve outcomes.[2]

However, the true morbidity of ostomy surgery includes significant negative effects on quality of life, plus longer-term morbidity related to ostomy care.[3–10] Up to half of ostomies are "problematic," presenting management problems including skin irritation and pouching difficulties that require prolonged medical care and result in increased health care costs (prolonged length of stay and/or increased need for outpatient care).[4,11,12] As with traditional complication rates, rates of problematic ostomies have also been shown to vary by hospital unit, suggesting the potential for quality improvement.[4,11] Postoperative management problems are exacerbated by poorly constructed or sited ostomies, complications following surgery, and inadequate perioperative care. The purpose of this clinical practice guideline is to give guidance to surgeons and other health care providers in an effort to improve the quality of care and outcomes for patients undergoing ostomy surgery.

METHODOLOGY

The focus of this clinical practice guideline is on the surgical care for patients requiring an ostomy, including the choice of ostomy type, technical aspects of ostomy creation and closure, prevention and management of ostomy complications, and perioperative care. The guideline is not designed to address whether or not an ostomy should be created in particular clinical circumstances, because that topic is addressed in clinical practice guidelines for specific diseases (eg, diverticulitis, rectal cancer, ulcerative colitis). In addition, the guideline focuses on colostomies and ileostomies in adult patients, rather than on urostomies, continent ileostomies, or pediatric ostomies. It also does not extensively review the nursing literature on ostomy care, such as skin care or the use of particular appliances or other management systems.

The systematic review began with a search (updated January 29, 2014) of the National Guideline Clearinghouse and PubMed for any existing clinical practice guidelines, using "ostomy," "stoma," "colostomy," "ileostomy,"

Dis Colon Rectum 2015; 58: 375–387
DOI: 10.1097/DCR.0000000000000347

and "parastomal" as search terms. Five guidelines were identified, all on the topic of ostomy care and/or patient education; the full text of each of these was reviewed.[13–17] References from existing guidelines relevant to this clinical practice guideline were also obtained in full text.

Next, Ovid Medline and the Cochrane Database of Collected Reviews were systematically searched through January 29, 2014, by using the following MeSH headings: ostomy (focus); colostomy (focus); and ileostomy (focus). The 3 searches were limited to English language, abstract available, and human studies. We identified 2394 references by this primary search, and the titles and abstracts of all of these were reviewed. After this initial screening, subtopics for the review were confirmed: 1) ostomy creation; 2) ostomy closure; 3) ostomy complications (prevention and management); and 4) evidence for the value of an ostomy nurse. For each of these 4 topics, all systematic reviews, trials, other comparative studies, noncomparative studies with ≥20 patients (although a few smaller studies were included), and selected review articles were obtained in full-text form. Selected searches of the reference lists from these articles revealed additional relevant articles, particularly in the area of the ostomy nurse, and these were also obtained in full-text form.

A separate Ovid Medline search for studies on the topic of parastomal hernia was performed through January 29, 2014, using keyword "parastomal hernia," because no MeSH heading was available (limits: English language, abstract available, human). Of the 228 references identified, title and abstract reviews were performed, and the full text was obtained for reports with primary patient data, with the exception of case reports and very small case series. The reference lists of these articles were also searched for additional studies, and those were obtained.

At the end of these searches, 263 relevant articles were reviewed in full-text form. The evidence from these articles was summarized in an evidence table for each topic. Although the overall quality of the evidence for this guideline is weak, the statements included were supported by higher-quality observational studies and limited experimental studies. The final grade of recommendation for each statement was selected by using the Grades of Recommendation, Assessment, Development, and Evaluation (GRADE) system (Table 1).[18]

OSTOMY CREATION

Gastrointestinal ostomies may be performed for benign or malignant diseases, created under elective or emergency conditions, fashioned from small or large bowel, considered temporary or permanent, and made during curative or palliative intent operations. Despite this heterogeneity, certain tenets of stoma creation are universal: the bowel for the ostomy should be well-vascularized and mobilized sufficiently to minimize tension. In this section, evidence-based recommendations for ostomy creation surgery are presented. Techniques for ostomy site selection are discussed in a separate section of this guideline (see "Evidence for the Value of an Ostomy Nurse").

1. When feasible, laparoscopic ostomy formation is preferred to ostomy formation via laparotomy. Grade of Recommendation: Strong recommendation based on low-quality evidence, 1C.

There are no randomized trials comparing ostomy creation via traditional open surgical approaches versus minimally invasive approaches. However, multiple observational studies have documented the safety and favorable short-term outcomes of laparoscopic ostomy creation in comparison with surgery requiring a laparotomy. Reported advantages to the laparoscopic approach include reduced pain and narcotic requirements, shorter hospitalization, earlier return of bowel function, and fewer overall complications relative to open surgery.[19–22] Laparoscopic ostomies also may be easier to reverse.[23] Most laparoscopic techniques use 2 to 3 trocars, including 1 positioned through the premarked ostomy site.[24,25] Conversion to open surgery is uncommon, ranging from 0% to 16%, with more recent series reporting rates in the single digits.[19–22,26–29] When creating an ostomy laparoscopically, particular attention should be paid to avoid twisting the exteriorized bowel (for a loop ostomy) or kinking the mesentery (for an end ostomy).[30] Marking proximal and distal ends and repeating peritoneal insufflation may be used to confirm the correct orientation of the bowel after it is passed through the fascia.[26,28,30]

In selected cases, a minimally invasive alternative to laparoscopic ostomy surgery is trephine ostomy creation, in which the ostomy is created through a small incision at the planned ostomy site. Trephine ostomy creation can be performed under regional anesthesia in most cases, with reported success rates at avoiding a laparotomy of 89% to 94%.[31,32] A prospective evaluation of laparoscopic versus trephine fecal diversion found acceptable short-term results by using either approach.[32]

2. Loop ileostomy is preferred over transverse loop colostomy for temporary fecal diversion in most cases. Grade of Recommendation: Weak recommendation based on moderate-quality evidence, 2B.

At least 5 small, randomized trials and many observational studies have been performed to attempt to resolve whether loop ileostomy or loop colostomy (usually transverse loop colostomy) is the preferred method for temporary fecal diversion.[33–44] Several meta-analyses have also been performed based on this evidence, and results are conflicting, in part, owing to significant heterogeneity among studies.[45–48] In summary, available evidence shows that loop ileostomy and transverse loop colostomy both effectively divert the fecal stream[48] and minimize the consequences

Table 1. The GRADE system-grading recommendations

	Description	*Benefit vs risk and burdens*	*Methodological quality of supporting evidence*	*Implications*
1A	Strong recommendation, High-quality evidence	Benefits clearly outweigh risk and burdens or vice versa	RCTs without important limitations or overwhelming evidence from observational studies	Strong recommendation, can apply to most patients in most circumstances without reservation
1B	Strong recommendation, Moderate-quality evidence	Benefits clearly outweigh risk and burdens or vice versa	RCTs with important limitations (inconsistent results, methodological flaws, indirect or imprecise) or exceptionally strong evidence from observational studies	Strong recommendation, can apply to most patients in most circumstances without reservation
1C	Strong recommendation, Low- or very-low-quality evidence	Benefits clearly outweigh risk and burdens or vice versa	Observational studies or case series	Strong recommendation but may change when higher-quality evidence becomes available
2A	Weak recommendation, High-quality evidence	Benefits closely balanced with risks and burdens	RCTs without important limitations or overwhelming evidence from observational studies	Weak recommendation, best action may differ depending on circumstances, or patient's or societal values
2B	Weak recommendations, Moderate-quality evidence	Benefits closely balanced with risks and burdens	RCTs with important limitations (inconsistent results, methodological flaws, indirect or imprecise) or exceptionally strong evidence from observational studies	Weak recommendation, best action may differ depending on circumstances, or patients' or societal values
2C	Weak recommendation, Low- or very-low-quality evidence	Uncertainty in the estimates of benefits, risks and burden; benefits, risk and burden may be closely balanced	Observational studies or case series	Very weak recommendations; other alternatives may be equally reasonable

GRADE = grades of recommendation, assessment, development, and evaluation; RCT = randomized, controlled trial.
Adapted from Guyatt G, Gutermen D, Baumann MH, et al. Grading strength of recommendations and quality of evidence in clinical guidelines: report from an American College of Chest Physicians Task Force. *Chest* 2006;129:174–181.[18] Used with permission.

of anastomotic dehiscence.[46] Furthermore, diverting loop ileostomy and loop colostomy appear to have similar overall complication *rates*, but different complication *profiles*. The following is a summary of these differing complication profiles.

Infectious complications appear to favor ileostomy for diversion. Wound infection rates following stoma reversal are significantly higher for diverting colostomies, ranging from 5% to 20% compared with approximately 3% for ileostomies.[33,34,39–41,44,45,47] Sepsis may be slightly more common following loop transverse colostomies (OR, 0.54; 95% CI, 0.30–0.99),[48] as is stomal prolapse, which occurs in up to 42% of patients with transverse loop colostomies.[38,46,48] Finally, patients undergoing loop ileostomy may have a better quality of life than patients undergoing colostomy, because of decreased odor, less need to adjust clothing secondary to prolapse, and greater ease of ostomy care.[33,38,49,50] However, 1 small, randomized trial did not show a difference in "social restriction" between patients randomly assigned to a diverting colostomy versus ileostomy.[51]

Conversely, obstructive complications after ostomy reversal favor diverting colostomy. Postileostomy closure bowel obstruction or ileus appears more common after ileostomy reversal (OR = 2.13 in the analysis by Rondelli and colleagues),[39,41,45,47,48] although this is not uniformly demonstrated.[46] The higher output of ileostomies has been associated with greater rates of dehydration, greater need for dietary alterations, and higher readmission rates in published trials.[38,44,47,48]

In summary, available evidence shows that loop ileostomy and transverse loop colostomy both effectively divert the fecal stream and minimize the consequences of anastomotic dehiscence; however, loop ileostomy is associated with less risk of prolapse and decreased infectious complications, and may result in improved patient experience. For these reasons, contemporary colorectal surgical practice typically favors diverting ileostomy. However, all diverting ostomies are associated with significant morbidity, and there might be particular clinical circumstances that favor a particular type of ostomy for diversion. For example, some authors have suggested that loop transverse

colostomies are easier to create in patients who are morbidly obese.[35,39] Also, some surgeons anecdotally advocate situating a diverting ostomy distal to the ileocecal valve in patients with a malignant large-bowel obstruction who are at risk for cecal perforation.

3. Whenever possible, both ileostomies and colostomies should be fashioned to protrude above the skin surface. Grade of Recommendation: Strong recommendation based on low-quality evidence, 1C.

Several prospective observational studies have reported wide disparities in the rates of "problematic" ostomies among medical centers, suggesting that surgical technique highly influences the incidence of stoma complications.[4,11,43] Although many factors contribute to poor ostomy function or appliance fitting, among those under the surgeon's control is the height or protrusion of the ostomy above the skin. A high-quality, multicenter observational study of ostomy functioning in which protrusion was carefully measured revealed a strong association between ostomy protrusion and the ability of the patient to successfully care for the ostomy.[4] Over a typical range, a near-linear inverse relationship exists between stoma protrusion height and the likelihood of having a problematic ostomy.[11] Other observational studies and expert surgical opinions confirm these findings.[52–55] In general, ileostomies should protrude at least 2 cm over the skin surface, while colostomies should protrude at least 1 cm. However, it is acknowledged that this is not possible in all clinical circumstances, such as in those patients with thick abdominal walls or who have foreshortened mesentery, as seen with obesity, Crohn's disease, carcinoid tumors, and desmoid tumors. Nevertheless, the surgeon should avoid ostomies that are flush with the skin whenever technically possible. Techniques that may be used to gain length for an ostomy include selective mesenteric vessel ligation, "end-loop" ostomies, and choosing upper abdominal sites in patients who are obese.

4. When using a support rod for a loop ostomy, a flexible or rigid ostomy rod may be used. Grade of Recommendation: Weak recommendation based on low-quality evidence, 2C.

There is little evidence to support or refute the use of a rod or bridge when creating a loop ostomy; some surgeons use them on all loop ostomy cases, some selectively, and some rarely if at all. A single, small randomized, controlled trial comparing ileostomies fashioned with a rigid bridge versus no bridge at all demonstrated no significant difference in early retraction rates.[56] There have been several studies on the topic of the *type* of supporting rod or bridge used. Although there are no randomized trials comparing rigid with flexible ostomy rods, there have been several small observational studies documenting the favorable characteristics of various flexible alternatives, such as a red rubber catheter.[57–59] Flexible supporting rods may permit easier fitting and changing of the ostomy appliance relative to rigid rods. There may be a role for rigid rods when there is significant tension on the ostomy, but this is controversial.

5. Use of antiadhesion materials may be considered to decrease adhesions at temporary ostomy sites. Grade of Recommendation: Weak recommendation based on moderate-quality evidence, 2B.

Although only 4% of patients with diverting loop ileostomies require laparotomy for closure, intra-abdominal adhesions frequently complicate or prolong these operations.[60] Three randomized trials have examined the use of antiadhesion materials during temporary ostomy creation and their impact on subsequent reversal.[61–63] Both trials that studied carboxymethylcellulose with hyaluronate (Seprafilm, Genzyme, Cambridge, MA) reported significantly fewer adhesions around the limbs of the ileostomy when this material was used at the initial operation, but no difference in the operative times for closure between groups.[61,62] Conversely, a study using a sprayable hydrogel barrier (SprayGel, Confluent Surgical Inc., Waltham, MA) demonstrated a reduction in adhesion score and a reduction in total operative time of approximately 6 minutes.[63] Whether this is clinically significant is debatable, and no cost-effectiveness studies exist supporting (or refuting) the routine use of antiadhesion materials in this capacity.

6. Lightweight polypropylene mesh may be placed at the time of permanent ostomy creation to decrease parastomal hernia rates. Grade of Recommendation: Strong recommendation based on moderate-quality evidence, 1B.

Four randomized, controlled trials have demonstrated significantly lower rates of parastomal hernia occurrence when synthetic mesh was placed at the time of ostomy creation.[64–67] The mesh used in these studies was a partially absorbable, lightweight polypropylene mesh with a large pore size. The follow-up period for most of these studies was relatively short (<12 months in 3 of the 4 studies); however, 1 study reported durable results 5 years after ostomy creation.[64] In this study, parastomal hernia was diagnosed in 17 of 21(81%) conventional ostomies and 2 of 15 (13%) ostomies created with prosthetic mesh reinforcement. Promising results have also been reported in smaller nonrandomized studies of prophylactic mesh reinforcement.[68,69]

Limited data have been published regarding the use of bioprosthetic material for prophylactic ostomy site reinforcement. One very small randomized, controlled trial reported parastomal hernia development in 0 of 10 patients when porcine-derived acellular dermis (Permacol, Covidien, Norwalk, CT) was placed at the time of ostomy creation, compared with 3 of 10 developing hernia

without reinforcement.[70] However, with a median follow-up of only 6.5 months, these results are difficult to interpret. An additional retrospective review of 16 patients who underwent ostomy creation with bioprosthetic reinforcement demonstrated no clinical incidence of hernia recurrence or mesh erosion (median follow-up 38 months).[71] A recently published randomized, controlled, multicenter trial of ostomy reinforcement with non–cross-linked porcine-derived acellular dermis (Strattice, Lifecell, Bridgewater, NJ) randomly selected 113 patients, and found no significant difference in hernia occurrence rates (6/58 vs 7/55) at a follow-up of 24 months.[72]

7. Extraperitoneal tunneling of end colostomies may decrease parastomal hernia rates. Grade of Recommendation: Weak recommendation based on low-quality evidence, 2C.

Extraperitoneal tunneling of end colostomies has been proposed as a technique to decrease rates of parastomal hernia formation. [68] Several studies have compared extraperitoneal tunneling versus transperitoneal techniques for end-colostomy formation. One trial showed parastomal hernia rates of 5 of 62 for traditional colostomy versus 0 of 66 for tunneled colostomy, with a follow-up of at least 6 months (up to 5 years).[73] A meta-analysis of 7 observational studies showed a significantly lower risk for parastomal hernia with extraperitoneal tunneling (6.4% vs 13.3%).[68] Unfortunately, the duration of follow-up was not reported in all of the included studies. More recently, 2 small observational studies compared extraperitoneal tunnel colostomy with traditional colostomy by using the laparoscopic technique. [69, 0] In 1 study, only 1 of 22 patients developed parastomal hernia at 2 years follow-up, but in the other study, 0 of 12 patients developed hernia at 22 months follow-up. These results require evidence from randomized trials with longer follow-up before a stronger recommendation can be made.

8. For patients with a new ileostomy, postoperative care pathways may prevent hospital readmission for dehydration. Grade of Recommendation: Strong recommendation based on low-quality evidence, 1C.

Dehydration is a major cause of morbidity after loop ileostomy creation, affecting up to 30% of patients, and it is the most common indication for hospital readmission after ileostomy surgery.[74–76] To address this problem, postoperative care pathways have been implemented in several centers that include some combination of patient education, patient self-care empowerment, standardized discharge criteria, tracking of input and output after discharge, visiting nurse education, and early follow-up. In published reports, these programs have been associated with low rates of readmission for dehydration, suggesting the promise of such programs.[77–79]

OSTOMY CLOSURE

In the case of temporary ileostomies and colostomies, a second operation is required to restore intestinal continuity. Hartmann reversal operations have traditionally been thought of as complicated surgery; however, even the relatively simple operation to close a loop ileostomy is associated with significant morbidity.[60,80–83] A systematic review of studies on the morbidity of loop ileostomy closure revealed a 17% morbidity and 0.4% mortality rate, with 4% of patients requiring laparotomy and 7% of patients developing bowel obstruction.[60] The goal of this section was to provide evidence-based guidance on the technical aspects of ostomy reversal surgery. The evidence was insufficient to achieve a second objective, to provide guidance on the timing of ostomy reversal surgery. However, available studies suggest the safety of selective early (within 3 weeks) and late strategies for closing diverting ostomies, depending on clinical circumstances.[84–88]

1. Stapled and hand-sutured techniques are both acceptable for loop ileostomy closure. Grade of Recommendation: Strong recommendation based on moderate-quality evidence, 1B.

There have been 4 randomized, controlled trials comparing stapled versus handsewn techniques for the closure of loop ileostomies.[89–92] In general, the results have been similar, with a trend toward higher risk of postoperative bowel obstruction and longer operative time in the handsewn group.[93] More recently, a multicenter randomized, controlled trial (the HASTA trial) enrolled 337 patients across 27 centers. Postoperatively, ileus developed in 13.4% of patients, whereas postoperative bowel obstruction developed in 10.3% of stapled and 16.6% of handsewn cases (p = not significant), and anastomotic leak developed in 3% of stapled and 1.8% of handsewn closures (p = not significant).[89] Operative time was significantly shorter in the stapled group, by about 15 minutes ($p < 0.001$).[89] Several observational studies have suggested shorter length of stay when the stapled technique is used; however, the possibility of bias in these studies must be considered.[94–96]

A recent, single-institution randomized trial of 74 patients tested the addition of laparoscopy to standard loop ileostomy closure, and showed a lower complication rate and shorter length of stay (4 vs 5 days) in the group that used laparoscopy.[97,98] Operative time was 15 minutes longer on average. This technique may address the risk for bowel obstruction with standard loop ileostomy closure, but the evidence is insufficient to recommend it at this time.

2. Ostomy-site skin reapproximation should be performed when feasible, and pursestring skin closure may have advantages compared with other techniques. Grade of Recommendation: Strong recommendation based on moderate-quality evidence, 1B.

Ostomy closure wounds were traditionally left open and allowed to heal by secondary intention. However, in modern practice, the skin at these wounds is typically closed, either partially or completely. The advantage of this practice is the avoidance of the open wound, with requirements for prolonged wound packing.

A variety of techniques are used to incise the skin and then to close the skin wound at the time of ostomy closure. At least 9 studies, including 5 randomized trials, have compared various techniques. Five studies (2 randomized, controlled trials (RCTs)) have compared a pursestring skin closure technique (which leaves a small opening at the center of the wound) with traditional, linear skin closure after ileostomy and/or colostomy reversal, and have shown significantly lower wound infection rates with pursestring closure (0% vs 37% and 7% vs 39% in the 2 RCTs).[99–103] Also, several studies have shown increased patient satisfaction with the pursestring technique.[99,100]

Other studies (including 2 RCTs) have compared primary closure of ostomy wounds with delayed primary closure, wound packing, and/or closure over a drain.[104–106] These studies revealed wound infection rates between 0% and 10% for primary closure, and between 8% and 20% with delayed primary closure.[104–106] One randomized trial studied an antibiotic implant, and this had no effect on wound infection rates (10% in both groups).[107]

3. Laparoscopic Hartmann reversal is a safe alternative to open reversal in experienced hands. Grade of Recommendation: Strong recommendation based on low-quality evidence, 1C.

Although no randomized trials have compared open versus laparoscopic Hartmann colostomy reversal, many observational studies have documented the safety of the laparoscopic technique.[80,108] A systematic review of comparative, nonrandomized studies pooled the data on 450 subjects who underwent laparoscopic or open Hartmann reversal.[80] Laparoscopic surgery was associated with a significantly lower complication rate, lower blood loss, and shorter hospital stay, whereas there was no difference in the rates of anastomotic leak or mortality.[80] Although these data suggest the safety and potential for favorable outcomes with the laparoscopic approach in specialty centers with surgeons experienced in this technique, it is important to note the potential for selection bias in these observational studies.

OSTOMY COMPLICATIONS

Ostomy surgery is associated with a variety of short-term and long-term complications, including parastomal hernia, prolapse, stenosis, retraction, parastomal varices,[109] skin conditions, and metabolic disturbances. The original intent of this section was to present evidence-based guidance for managing these conditions; however, only the complication of parastomal hernia proved to have sufficient evidence on which to base any recommendations.

1. Parastomal hernia repair should typically be performed by using mesh reinforcement or by relocating the stoma. Grade of Recommendation: Strong recommendation based on low-quality evidence, 1C.

There have been no RCTs comparing different methods for parastomal hernia repair. However, multiple retrospective observational studies have demonstrated very high rates of hernia recurrence (46%–78%) with primary suture repair at the hernia site.[110–116] A systematic review of observational studies concluded that primary suture results in a 69.4% risk of recurrent hernia.[117] Thus, mesh repair or relocation is generally preferred over primary suture repair for patients who are fit to undergo laparotomy or laparoscopy. Stoma relocation may be necessary for very large parastomal hernias because of the significant residual soft tissue defect that remains following operative hernia reduction, which may impair ostomy appliance adherence. Of course, in patients with an ostomy that can be reversed, symptomatic parastomal hernias may be an indication for ostomy closure.

2. Prosthetic mesh may be used during parastomal hernia repair with low short-term risk of intestinal erosion or mesh infection. Grade of Recommendation: Strong recommendation based on low-quality evidence, 1C.

Historically, the use of prosthetic mesh in the presence of open bowel has been discouraged owing to the fear of contamination and consequent mesh infection. However, the risk of mesh infection has proven to be low in published studies of parastomal hernia repair, with pooled rates of mesh infection ranging from 2.2% to 2.6%.[117] In a systematic review including 16 studies of open mesh parastomal hernia repair, only 1 case of mesh erosion into the adjacent bowel was reported.[117]

Various techniques for open, mesh parastomal hernia repair have been reported, including onlay mesh repairs, retromuscular mesh repairs, and intraperitoneal repairs using the Sugarbaker or keyhole/slit techniques.[117] There have been no experimental trials comparing these techniques, but pooled rates of hernia recurrence with the 4 techniques in a 2012 systematic review were 17.2% (95% CI, 11.9%–23.4%) for onlay repairs, 6.9% (1.1%–17.2%) for retromuscular repairs, 7.2% (1.7%–16.0%) for keyhole intraperitoneal repairs, and 15% (3.2%–37.9%) for Sugarbaker intraperitoneal repairs.[117] The limitations of these data include their retrospective nature and short follow-up in many included studies.

3. Bioprosthetic material may be used as an alternative to synthetic mesh for repair of parastomal hernias. Grade of Recommendation: Weak recommendation based on low-quality evidence, 2C.

Collagen-based bioprosthetic grafts are commonly used in place of prosthetic mesh for repair of hernias in the setting of gross contamination. Several small retrospective reviews of parastomal repairs using bioprosthetic materials for reinforcement have reported hernia recurrence rates between 7% and 27%.[118–122] However, follow-up in these studies was short (9–18 months). Further comparative studies with longer follow-up are needed to establish the efficacy and cost-effectiveness of bioprosthetic materials in this setting.

4. Laparoscopic parastomal hernia repair with mesh may be a safe alternative to open mesh repair. Grade of Recommendation: Strong recommendation based on low-quality evidence, 1C.

Although there are no RCTs comparing laparoscopic with open parastomal hernia repairs, a number of observational studies have established the feasibility of laparoscopic mesh repair procedures, with recurrence rates similar to published results after open mesh repairs.[123–134]

The 2 most commonly described techniques for laparoscopic parastomal hernia repair are the Sugarbaker mesh technique and the keyhole/slit mesh technique. In Sugarbaker-type repairs, an intact sheet of mesh is placed as an underlay, with the stoma limb exiting the mesh lateral to the abdominal wall defect. The keyhole/slit mesh technique uses 1 or 2 pieces of mesh with an aperture cut for the stoma limb to pass through as it exits the abdominal wall.

No RCTs comparing these 2 types of repair have been published. However, several retrospective comparative studies have reported significantly higher rates of hernia recurrence for hernias repaired using slit mesh (58%–72.7%) in contrast to those repaired by using a modified Sugarbaker technique (0%–15.4%).[124,125] However, the average duration of follow-up for patients in the slit mesh group was greater than twice that of the modified Sugarbaker group.

A meta-analysis examining pooled data from 11 retrospective studies demonstrated higher parastomal hernia recurrence rates with the keyhole/slit mesh technique (20.8% of 160 pooled repairs) compared with the recurrence rates reported using the Sugarbaker technique (11.6% of 110 pooled repairs).[117] Finally, a recent multicenter, prospective, noncomparative study of 61 patients who underwent the laparoscopic Sugarbaker repair with the use of a 2-layer synthetic mesh material had a 6.6% recurrence rate at 26 months follow-up, suggesting the promise of this technique.[131]

EVIDENCE FOR THE VALUE OF AN OSTOMY NURSE

All ostomy patients require education, training, and psychosocial support to successfully adapt to ostomy-related self-care.[1,135] Furthermore, ostomy-related problems such as skin irritation and leakage are common, and patients in the hospital and home setting require medical assistance to manage these problems.[3,53,136] The absence of adequate ostomy care may result in patients not developing self-care skills, which in turn may lead to depression and/or social isolation, as well as increased health care needs and expense.[3,137–139] In 1 large study of patients with cancer who have ostomies, 84% of patients reported that they experienced technical difficulties with managing their ostomies.[136] Moreover, the patient's perception that they received inadequate preparatory information was associated with technical difficulties—which, in turn, were associated with emotional, social and marital problems.[136]

Furthermore, there is evidence that health care providers *in general* are not comfortable in managing ostomy problems. Questionnaires of general practitioners and oncology nurses confirm that they do not have adequate training to provide complete care to patients with ostomies; they rely on ostomy nurse specialists to comanage the patients.[140,141] In addition, ostomy site selection has been shown to vary in quality among nonspecialist surgeons and specialist surgeons, with the standard being site selection by an ostomy nurse specialist.[142]

For all of these reasons, the American Society of Colon and Rectal Surgeons believes that the optimal care for patients undergoing ostomy surgery includes preoperative, perioperative, and postoperative care by an ostomy nurse specialist, such as a nurse certified by the Wound, Ostomy, and Continence Nurses Society (WOCN) Certification Board.[143] However, not all clinical circumstances allow for this optimal care, particularly in remote areas and in the setting of emergency operations. Nevertheless, whenever possible, patients who have an ostomy should have access to an ostomy nurse specialist. The goal of this section is to outline the evidence to support the value of an ostomy nurse in the care of patients who undergo ostomy surgery. Limitations of this literature include very few population-based studies and/or randomized trials, as well as the inclusion of patients with urostomy in many of the studies.

1. Ostomy education should have a preoperative and postoperative component, and should involve a specialized provider, such as a WOCN nurse when possible. Grade of Recommendation: Strong recommendation based on moderate-quality evidence, 1B.

Multiple observational and cross-sectional studies and 1 small RCTs support the benefit of perioperative education by an ostomy nurse.[138,139,144–147] Chaudhri and colleagues randomly assigned 42 patients to an intensive preoperative educational program before ostomy surgery and found that this intervention resulted in decreased length of stay (8 days vs 10 days), decreased the need for unplanned health care interventions postdischarge, decreased the time to ostomy care proficiency (5.5 days vs 9 days), and

a cost savings.[139] Several large retrospective studies have shown that preoperative education by an ostomy nurse was associated with fewer stoma-related complications (23% vs 32%), and significantly decreased postoperative skin and leakage problems.[144,147]

A number of studies have reported on questionnaires of patients with ostomies, showing that ostomy nurse teaching was highly valued by patients and was associated with better psychosocial adjustment.[136,146,148] Follick et al[136] found that inadequate ostomy education was a frequent concern among patients. Eighty-four percent of patients (surveyed a median of 4.5 years after surgery) reported that they had experienced technical difficulties with managing their ostomies. Furthermore, the patients' perception that they had received inadequate education was associated with these technical difficulties, which were, in turn, associated with emotional, social, and marital problems.[136] Conversely, preoperative education by a WOCN-certified nurse is associated with improved long-term adjustment to the ostomy.[146] Whereas the research above focuses on preoperative education, postoperative, in-hospital education is also important to patients.[149] Hedrick[150] studied the association between in-hospital ostomy nurse care and postoperative adjustment, using an ostomy adjustment scale scoring system. They found that patients who saw an ostomy nurse in-hospital had higher adjustment scores, and that the ostomy nurse was rated as the most important factor allowing them to adjust.[150]

Several published guidelines provide guidance on the components of preoperative and postoperative education for patients with ostomies.[1,16] The Best Practice Guideline for Clinicians published by WOCN outlines preoperative and postoperative educational topics.[1] Recommended preoperative topics include GI anatomy and physiology, planned surgical procedure, demonstration of ostomy appliances, description of lifestyle adjustment with an ostomy, and psychological preparation. Postoperative topics recommended include anatomy and function of the ostomy; pouching procedural training; nutrition; clothing; medications; body image; psychological issues (such as grief, depression, and anxiety); social and recreational issues; interpersonal relationships; sexual and intimacy issues; common complications such as leaking and dermatitis; and available resources, including support groups and on-line resources.[1] Although these guidelines are based on expert opinion rather than evidence, they provide helpful guidance to non-WOCN practitioners who may be called on to provide education to patients with new ostomies.

2. Preoperative ostomy site marking should be performed by a trained provider whenever possible. Grade of Recommendation: Strong recommendation based on low-quality evidence, 1C.

Several outcomes may be affected by ostomy site marking, including ostomy-related complications such as leakage and dermatitis, patients' ability to adapt to the ostomy and care for themselves independently, and health care services and costs. In terms of ostomy-related complications, multiple observational studies show an association between preoperative site marking and fewer postoperative problems.[4,144,145,147,151–153] Studies have suggested that a lack of site marking is a risk factor for having a "problematic ostomy," sometimes defined as one that requires extra care and equipment to maintain pouching for 24 hours.[4,144,151,152] Several studies have also shown that ostomy site marking is associated with fewer ostomies that patients cannot effectively care for, and better adaptation to the ostomy.[12,147,153] Although expert opinion holds that a lack of site marking leads to increased health care costs, there is a lack of evidence to prove this association. This is a topic that requires additional research.

Although site marking by a certified ostomy nurse is ideal (incorporated into the preoperative educational session), the trained provider preoperatively choosing the ostomy site will frequently be the surgeon, especially in emergency situations. Macdonald and colleagues studied the ability of surgeons and surgical trainees to choose an appropriate ostomy site, and found that surgeons chose sites different from the ostomy nurse (the standard), with most "badly sited" ostomies being placed too low on the abdominal wall.[142] Colorectal surgeons were found to choose sites more concordant to the ostomy nurse specialists. A survey of surgical trainees showed that their training in ostomy site selection was haphazard and infrequently provided by the ostomy nurse specialist.[142]

In 2007, the American Society of Colon and Rectal Surgeons and WOCN published a Joint Position Statement of the value of preoperative stoma marking for patients undergoing fecal ostomy surgery (available at the following Web site: http://www.fascrs.org/physicians/position_statements/stoma_siting/).[154] Surgeons who will be called on to choose ostomy sites should familiarize themselves with the principles of proper ostomy site selection. The site selection procedure recommended by WOCN includes the use of multiple positions to identify adequate sites (especially the sitting position), avoidance of folds and scars, consideration of the clothing/beltline, and siting the ostomy within the rectus abdominis muscle. Although this last recommendation (to site the ostomy within the rectus muscle) is common practice, it is based on expert opinion, because there is no evidence to support or refute it. Although preoperative site marking is strongly supported by the Society, it is acknowledged that intraoperative circumstances may not allow for the optimal skin site to be used in all situations.

3. Follow-up care for ostomy teaching, care, and support should be available to all patients. Grade of

Recommendation: Strong recommendation based on low-quality evidence, 1C.

There is ample evidence showing that ostomy-related technical problems and negative effects of the ostomy on quality of life are common.[3–12,155] Furthermore, modern hospital stays after ostomy surgery are shorter owing to enhanced recovery pathways, providing less opportunity for in-hospital ostomy education and training. These facts suggest that follow-up and long-term care by an ostomy nurse is important. Two randomized trials and several observational studies support the value of postdischarge ostomy nurse care, which can be provided in the home, outpatient, or telephone setting.[155–159] This follow-up care is associated with increased ability of patients to care for themselves independently, fewer ostomy-related problems, improved ostomy adjustment, increased satisfaction with care, and improved quality of life.[156–158]

Over time, patients with permanent ostomies may continue to have untreated ostomy-related complications and technical difficulties.[160–163] A recent study of 743 patients with long-term ostomies revealed that 61% of patients had objective evidence of peristomal skin problems, 28% were experiencing frequent leakage, and 87% were using various accessories to facilitate pouching their ostomy.[160] After care by an ostomy nurse, leakage, skin problems, and the use of accessories decreased significantly, and quality-of-life scores improved.[160] This study was limited by the fact that all patients were changed to a new pouching system, so the care of the ostomy nurse was not the only intervention.

Nevertheless, these data suggest that even patients with long-term ostomies have significant ostomy-related technical problems and require care. Because nonspecialist health care providers are not comfortable managing ostomy problems,[140,141] ostomy nurses provide an essential service to patients with ostomies beyond the perioperative period. Thus, all patients who have ostomies should have access to an ostomy nurse for follow-up care, as needed and wherever possible.

APPENDIX A

Contributing Members of the ASCRS Clinical Practice Guideline Committee

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