



NURSES SPECIALIZED IN
WOUND, OSTOMY AND CONTINENCE
CANADA

INFIRMIÈRES SPÉCIALISÉES EN
PLAIES, STOMIES ET CONTINENCE
CANADA

Parastomal Hernia Prevention, Assessment, and Management: Canadian Best Practice Recommendations

M A Y 2 0 2 3

NOTES

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PARASTOMAL HERNIA PREVENTION, ASSESSMENT, AND MANAGEMENT EXPERT PANEL

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CONFLICTS OF INTEREST

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INTRODUCTION

Those living with an abdominal ostomy are at risk of developing a parastomal hernia. Beyond the medical implications, parastomal hernias profoundly impact an individual's psychosocial well-being, activities of daily living, and quality of life, including financial implications. For many individuals living with an ostomy, the fear of developing a parastomal hernia may cause individuals to avoid physical activity, thus impacting their quality of life.¹

A parastomal hernia is a potentially avoidable, yet frequent complication, associated with the creation of a fecal or urinary ostomy. Several studies have shown that preventative measures may reduce the incidence of parastomal hernia development.^{1,2} This document provides recommendations for nurses and other health care professionals to support individuals who will have or already have an ostomy on the prevention, assessment, and management of parastomal hernias.

Despite parastomal hernias being considered common complications for those living with an ostomy, a variety of definitions exist. Therefore, adopting a consistent, validated definition for a parastomal hernia provides a foundation for a common language in clinical practice. For these recommendations and to establish standardization across Canada, the expert panel chose to adopt the definition proposed by the European Hernia Society (EHS). The EHS defined a parastomal hernia as “an abnormal protrusion of the contents of the abdominal cavity through the abdominal wall defect created during placement of a colostomy, ileostomy or ileal conduit stoma.”³

The incidence of developing a parastomal hernia has been reported to be as high as 81% and is frequently associated with other stoma-related complications. It affects the quality of life and increases financial costs in the health care system.⁴ The incidence of parastomal hernia varies widely in the literature, and the reported rate varies depending on the definition used, mode of diagnosis (self-reported, clinical examination, radiological), type of stoma and duration of follow-up.

A recent systematic review by Harries et al. (2021) concluded the incidence of symptomatic parastomal hernias to be as high as 58% and asymptomatic hernias 25.6%.⁵ While parastomal hernias will most often occur within 2 years following creation of a stoma the possibility of diagnosis may continue 20 years after surgery.⁶

In a recent study, Shiraishi et al. (2020) reported⁴ the incidence of parastomal hernia development to be 50.3% (n = 77). Parastomal hernia diagnosis was made by physical examination (25.5%, n = 39) or computerized tomography (CT; 24.8%, n = 38). On multivariate analysis, the only independent risk factor of significance was a stoma that did not pass through the rectus abdominis muscle ($p = .005$) during the median follow up of 245 days. On further analysis, the only independent factor related to stoma misplacement outside of the rectus abdominal muscle was the use of a laparoscopic approach ($p = .012$). It was also reported that peristomal skin complications were associated with parastomal hernia development ($p = .049$).⁴

Further complicating management, the incidence of parastomal hernias has been shown to differ by stoma type. McGrath et al. (2006) estimated incidence rates for various types of ostomies,⁷ and Osborne et al. (2018) updated the rates for urostomies (Table 1).⁸ In the literature there is evidence to support all individuals undergoing stoma creation are at risk for parastomal hernia development, especially within the first years after surgery, and many assert that some degree of parastomal hernia is inevitable in the individual's lifetime.^{9,10}

Table 1 *Incidence of Parastomal Hernia by Stoma Type*^{7,8}

Type of stoma	Incidence of parastomal hernia
Loop ileostomy	0 – 6.2%
Loop colostomy	0 – 30.8%
End ileostomy	1.8 – 28.3%
End colostomy	4 – 48.1%
Urostomy	5 – 28%

Parastomal hernias represent a serious complication, only second to anastomic leakage in terms of the need for early detection.^{11,12} In Canada, there are no recent nursing guidelines for preventing, assessing, identifying, and managing parastomal hernias. In the United Kingdom, the Association of Stoma Care Nurses (ASCN) produced national clinical guidelines for stoma care in 2019 which included chapters on parastomal hernia prevention and management.¹³ The best practice recommendations within this document are intended for use by Nurses Specialized in Wound, Ostomy, and Continence (NSWOCs), registered nurses, physicians, and other allied health care professionals. Thus, this expert panel included input from physiotherapists and colorectal surgeons.

METHODOLOGY

A structured virtual consensus meeting was held on September 14, 2022, and included fourteen expert panelists from across Canada, including NSWOCs, a colorectal surgeon and a physiotherapist (refer to page 5). The expert panel convened to discuss and vote on proposed consensus statements on the prevention, assessment, and management of parastomal hernias. This panel represented all sectors of the health care system. Their experience ranged from 5 to 35 years. The meeting was held virtually on the NSWOCC's Zoom platform. A doctoral-prepared NSWOC moderated the meeting with experience in facilitation and advanced knowledge of parastomal hernias. A smaller group (BS, DA, KL, KLB, NP & SM) wrote proposed consensus statements before the meeting to aid in an expert panel discussion and consensus voting.

After the proposed statements were reviewed, a Delphi methodology was implemented to achieve consensus. First, the expert panel was encouraged to propose additional statements. Then, individual statements were introduced by the moderator for discussion and voting. After discussion, the expert panel voted to accept the statement as written. The agreement was set at 80%. If the statement was accepted at 80% or greater, the statement was accepted as written. If the statement did not achieve 80% agreement, the moderator led a discussion to revise the statement to a form which would achieve 80% agreement. This process continued for up to three rounds; if agreement could not be achieved, the statement was removed from discussions and excluded in the final list of statements. At the end of voting, each statement was reviewed a final time to ensure that it was representative of the discussion and intent. The consensus was reached on fifteen statements (96% agreement or greater) related to the prevention, assessment, and management and further research related to parastomal hernias. The expert panel engaged in rich discussions, which informed and brought clarity to the consensus statements.

The fifteen recommendations were assigned a Registered Nurses' Association of Ontario (RNAO) level of interpretation of evidence.¹⁴ Refer to Appendix 1 for the references supporting each recommendation.

After voting was complete, the expert panel nominated peers with expertise on the subject of parastomal hernias to be external reviewers. They were invited via email to be external reviewers and if they agreed, were provided with a Survey Monkey link. The link allowed access to a survey where the reviewers could vote to accept or reject the consensus statement. If the statement was rejected, they were given an opportunity to comment. A total of 28 peer reviewers provided valuable input into the document. Overall, 96% of the reviewers reported they would recommend these best practice recommendations to colleagues and administrators to support parastomal hernia practices in Canada. Refinements were made to the document, and the overall results and insights were discussed with the expert panel. Finally, the completed best practice recommendation document was approved by the NSWOCC Board before publication.

Before consensus statement development, the expert panel established two research questions to guide a scoping review related to parastomal hernias. The expert panel members reviewed the 187 articles identified and retained 65 as relevant for the project. The scoping review results were used for the development of the recommendations and to provide evidence to support them. The scoping review identified gaps in understanding the role of exercise and parastomal hernia. Additional studies were handpicked and reviewed, which helped support the recommendations and supporting rationale. The research questions were:

1. What are the best practices for prevention of parastomal hernias for nurses and surgeons in Canada?
2. What are the best practices for parastomal hernia management for nurses and surgeons in Canada?

The expert panel agreed upon search terms with inclusion and exclusion criteria. A review of the literature was conducted in January 2022 through Queen's University. The search strategy employed focused on keywords related to *parastomal hernia / peristomal hernia AND epidemiology, risk factors, assessment, prevention, recurrence, management, treatment, definitions, prevalence, incidence, hernia belts, stoma, ostomy, diet, exercise, surgery, psychological, hernia, stomal complications*. All papers in English were considered within the last 10 years. Additional articles were identified in support of the Province of Québec. Databases searched encompassed organization websites and libraries: CINAHL; EMBASE; Google Scholar; MEDLINE, Nurses Specialized in Wound, Ostomy and Continence Canada; Nursing and Allied Health Source on ProQuest; Ordre des infirmiers et infirmières du Québec; PsycInfo; and PubMed RNAO; Wound, Ostomy, Continence Nurses Society library.

In parallel to this project, another expert panel consisting of NSWOCs updated a series of patient ostomy booklets (colostomy, ileal conduit, and ileostomy), which encompass guidance on preventing parastomal hernias. Booklets are available on the NSWOC website <https://www.nswoc.ca/patient-education>

PARASTOMAL HERNIA PREVENTION, ASSESSMENT, AND MANAGEMENT BEST PRACTICE RECOMMENDATIONS

RECOMMENDATION 1

An individual with an ostomy should be referred to an NSWOC or a qualified health care professional. (LOE V)

RECOMMENDATION 2

An individual undergoing ostomy surgery should receive a comprehensive parastomal hernia risk assessment. (LOE Ia-V)

RECOMMENDATION 3

An NSWOC or qualified health care professional should provide an individual with an ostomy lifelong risk assessment and ongoing education pertaining to parastomal hernia prevention. (LOE III-V)

RECOMMENDATION 4

An individual undergoing ostomy surgery should be referred to an NSWOC or a qualified health care professional for preoperative stoma site marking to reduce the risk of parastomal hernia. Refer to the preoperative stoma site marking position statement. (LOE Ib-V)

RECOMMENDATION 5

An individual undergoing ostomy surgery should be referred to an NSWOC or a qualified health care professional to receive preoperative and postoperative personalized education on parastomal hernia prevention. (LOE IV)

RECOMMENDATION 6

An individual with an ostomy must receive written and verbal information on the importance of regular exercise, movement, and core muscle exercise. (LOE IV-V)

RECOMMENDATION 7

An individual with a parastomal hernia should be referred to a physiotherapist, or other qualified health care professional to aid in the return to activities of daily living to optimize quality of life. (LOE IV-V)

RECOMMENDATION 8

An individual with an ostomy should be assessed to determine the type and level of support garment/belt required for prevention or management of parastomal hernia, taking into account the person's lifestyle, activities of daily living, and personal preference. (LOE III-V)

RECOMMENDATION 9

An individual with an ostomy who has a suspected parastomal hernia must have a diagnosis made in collaboration with their surgeon or primary care provider. (LOE Ib-V)

RECOMMENDATION 10

An individual with a parastomal hernia should be assessed at regular intervals in standing, sitting, and lying positions to determine the size and severity of the parastomal hernia. (LOE V)

RECOMMENDATION 11

An individual with a parastomal hernia should have their stoma size and peristomal skin assessed at regular intervals to ensure their pouching system is suitable. (LOE Ia-V)

RECOMMENDATION 12

An NSWOC or primary care provider should document the individual's stoma, hernia, and peristomal skin assessment in the medical record. (LOE Ia-V)

RECOMMENDATION 13

An individual with a parastomal hernia should be referred to a surgeon or primary care provider to explore the role and benefits of surgical repair. (LOE III-IV)

RECOMMENDATION 14

An individual living with a parastomal hernia must be assessed to determine the impact of the hernia on their health-related quality of life and body image and be provided with personalized follow up care to address their specific psychosocial needs. (LOE Ia-V)

RECOMMENDATION 15

Further research is required to gain a greater understanding of the risk factors associated with, prevention of, and management strategies for parastomal hernias. (LOE Ia-IV)

Note. Level of interpretation of evidence based on RNAO.¹⁴

SECTION 1 – RISK ASSESSMENT

RECOMMENDATION 1

An individual with an ostomy should be referred to an NSWOC or a qualified health care professional. (LOE V)

RECOMMENDATION 2

An individual undergoing ostomy surgery should receive a comprehensive parastomal hernia risk assessment. (LOE Ia-V)

RECOMMENDATION 3

An NSWOC or qualified health care professional should provide an individual with an ostomy lifelong risk assessment and ongoing education pertaining to parastomal hernia prevention. (LOE III-V)

Multiple risk factors contribute to parastomal hernia development (Table 2). No validated parastomal hernia risk assessment tool exists in the literature. Osborne, North, and Williams utilized a risk assessment tool for parastomal hernia prevention in a pilot.⁸ Their tool, included in Appendix 2, has been adopted in the UK and is widely utilized, particularly by family physicians as a risk assessment tool for hernia support. Several comorbidities are considered to be important risk factors for parastomal hernia development, including, increased age (over 60 years of age), history of abdominal hernia, increased body mass index, malnutrition, factors which increase intra-abdominal pressure (i.e., chronic cough, constipation, prostatism, and ascites), chronic obstructive pulmonary disease, diabetes, and long-term corticosteroid use.^{15,16} Individuals with stomal prolapse and parastomal hernia often share numerous risk factors that cause increased intra-abdominal pressure and abdominal wall fragility, including obesity, advanced age, constipation, ascites, and chronic pulmonary disease.¹⁷ However, these clinical parameters are insufficient for accurate prediction of parastomal hernia development.¹⁶

Harraz et al. (2020) reported¹⁸ that the incidence of parastomal hernia is associated with lower albumin level (45.8% vs 32.5%; $p = .02$), pathological confirmed organ confined disease (46.4% vs. 32.3%; $p = .009$), and negative lymph nodes (44.9% vs 23.7%; $p = .001$). On multivariate analysis, independent predictors of parastomal hernia occurrence included albumin < 3.5 g/dL (odds ratio [OR] 1.7; 95% Confidence interval [CI]: 1.1-2.7; $p = .02$), organ confined disease (OR 0.6; 95% CI: 0.3-0.9; $p = .04$) and negative lymphadenopathy (OR 0.4; 95% CI: 0.2-0.8; $p = .004$). The authors concluded that negative lymphadenopathy is associated with high-grade parastomal hernia.¹⁸ They maintain that individuals with clinically significant parastomal hernia are one and a half times more likely to present with hypoalbuminemia at the time of surgery ($p = .001$) and a previous history of abdominal hernia surgery ($p = .01$).

History of previous surgery for hernia repair is considered to be a significant predictor for parastomal hernia development. In a study evaluating the risk factors and incidence of parastomal hernia development in patients undergoing a radical

cystectomy and ileal conduit, previous laparotomy doubles the likelihood of and may be predictive of parastomal hernia development.¹⁹ Previous laparotomy results in scarring and compromised blood supply to the anterior abdominal wall which contribute to a weak musculature and increased liability for hernia development.^{18,20}

Myriad factors contribute to the development of parastomal hernia even after robotic surgery. Harraz et al. (2020) reported longer operative time, fascial defect more than 3 cm, and lower postoperative renal function as independent predictors.¹⁸ Other factors included female gender, severe obesity, chronic coughing, constipation, and radiation exposure. Higher BMI, reversal of colostomy in individuals with underlying malignancy, stoma prolapse, parastomal hernia and hypertension were identified as independent risk factors.²¹

Although laparoscopic extraperitoneal colostomy is well accepted and can significantly reduce the risk of parastomal hernia, the incidence of hernia remains 4.5-18.2%. The EHS guidelines on preventing and treating parastomal hernia state that there is insufficient evidence to suggest that the relative risk of parastomal hernia is decreased with extraperitoneal colostomy than that with transperitoneal colostomy because of the nonrandomized design of the included studies.¹⁵

Brook et al. (2018) concluded that intraoperative surgical decision making,²² including method of closure and type of suture material used is not a predictive factor for parastomal hernia development, however, a stoma not passed through the middle of the rectus abdominis muscle is associated with parastomal hernia formation.⁴

Identification of preoperative factors that can predict the development of a postoperative parastomal hernia could aid in the reduction of parastomal hernias by allowing implementation of preventative measures such as prophylactic mesh placement, enhanced education, and preoperative exercise plans when appropriate.^{16,23,24}

Table 2 Risk Factors for Parastomal Hernia

Modifiable/ Nonmodifiable	Individual/ surgical	Factor	Low risk	Moderate risk	High risk
Modifiable	Individual	BMI			Obesity; malnutrition
		Occupation/ lifestyle		Young family/ grandchildren	Manual labour
		Physical activity*	High level of prior fitness		Poor level of prior fitness or rushed return to strenuous physical activity
		Smoking			Smoker
		Raised intra-abdominal pressure		<ul style="list-style-type: none"> Acute/chronic constipation (colostomy/ urostomy) Abdominal distention 	COPD/ emphysema / ascites
	Surgical	Stoma site		Stoma out of rectus abdominis muscle**	Stoma out of rectus abdominis muscle**
		Fascial trephine		<ul style="list-style-type: none"> Aperture >25 mm Techniques that require more stretching will increase risk of hernia 	<ul style="list-style-type: none"> Aperture >34 mm Techniques that require more stretching will increase risk of hernia
Nonmodifiable	Individual	Age	15 years or under		Over 70 years
		Diagnosis	<ul style="list-style-type: none"> Abdominal aortic aneurysm Diabetes 	<ul style="list-style-type: none"> Malignancy Diverticular Diabetes up to 1 year after surgery 	<ul style="list-style-type: none"> Existing hernia (any) Previous hernia
		Medication		Steroids after 1 year	Steroids up to 1 year after surgery
	Surgical	Stoma factors		Colostomy	<ul style="list-style-type: none"> Transverse colostomy Previous parastomal hernia repair Aperture >34 mm Emergency stoma creation
		Surgical site infection		Postoperative wound infection	Postoperative wound infection

Note.

* physical activity can be both a preventative measure and a potential risk factor.

** based on expert opinion from NSWOCC preoperative stoma site marking position statement. Abbreviations COPD = chronic obstructive pulmonary disease.

Fascial trephine refers to a circular incision in the abdominal wall for placement of the stoma.

SECTION 2 – PREVENTION

RECOMMENDATION 4

An individual undergoing ostomy surgery should be referred to an NSWOC or a qualified health care professional for preoperative stoma site marking to reduce the risk of parastomal hernia. Refer to the preoperative stoma site marking position statement. (LOE Ib-V)

This expert panel considers a parastomal hernia avoidable through the modification of risk factors reducing the likelihood of its development. The prevention of complications arising from stoma creation can include a parastomal hernia.

Preoperative Stoma Site Marking

Pre-planned and purposeful preoperative stoma site marking is recognized as an important factor in reducing the likelihood of postoperative hernia development by ensuring the stoma is located in the rectus abdominis muscle. Preoperative stoma site marking was explored in depth in a collaborative [position statement between NSWOC and Canadian Society of Colon and Rectal Surgeons \(CSCRS\)](#).²⁵ A key recommendation in the preoperative stoma site marking position statement included the importance of having an NSWOC or other qualified health care professional perform stoma site marking preoperatively. Stoma site marking is believed to aid in the prevention of complications, including parastomal hernia prevention.

The preoperative stoma site marking position statement included nine steps and a practice enabler. For ease of reference these are reproduced here in Appendix 3. Figure 1 shows illustrations of preoperative stoma site marking.

Figure 1 Preoperative Stoma Site Marking on the Abdomen²⁵



Note. a) marking bilateral lower quadrants; marking four quadrants in b) sitting; c) standing; d) marking a challenging abdomen.
© NSWOC & CSCRS 2020.

Personalized Education

RECOMMENDATION 5

An individual undergoing ostomy surgery should be referred to an NSWOC or a qualified health care professional to receive preoperative and postoperative personalized education on parastomal hernia prevention. (LOE IV)

The creation of an ostomy leads to significant physical changes in an individual and may have a negative impact on emotional and psychosocial well-being.²⁶ For some people, ostomy surgery may have a positive impact on their emotional and physical well-being. Information pertaining to cancer and other diseases which result in a stoma, stomas, pouching systems, and related complications may seem overwhelming to many individuals. Individuals may not always be receptive to education and their culture may impact their sensitivity and retention. For this reason, all education must be individualized, repeated, and ongoing.

Personalized education has been highlighted as being one element for parastomal hernia prevention.¹ A patient with two ostomies may have a higher risk of complications. Many of the recommendations in this document are underpinned by the importance of the link between an individual's quality of life and individualized education.²⁷ Preoperative stoma site marking, counseling, and personalized education by an NSWOC or a qualified health care professional reduce postoperative risk of parastomal hernia.^{25,28,29} It is important to consider and develop individualized education to optimize a patient's quality of life.

As part of preparation for ostomy surgery an individual should be referred to an NSWOC or a qualified health care professional for personalized education that will introduce parastomal hernia risk factors and prevention strategies. At this juncture, postoperative complications may not seem pertinent to the patient. Therefore, an NSWOC or a qualified

health care professional should also provide ongoing postoperative education which will include lifelong parastomal hernia prevention and education. It is important to note that not all individuals will have received preoperative education, especially in emergent cases, thus increasing the need for comprehensive postoperative education.

Education pertaining to parastomal hernia prevention should focus on early adoption of hernia prevention strategies and hernia identification. Before hospital discharge, individuals with an ostomy should be educated on signs of a hernia and who to contact for advice and assessment if this occurs. The development of a small bulge may not impact their pouching system. Ideally, every person with an ostomy should receive early education and routine follow ups with an NSWOC or a qualified health care professional to receive ongoing assessment and review of prevention strategies.

Figure 2 *Suspected Parastomal Hernia*



Note. Reproduced with permission of Diane St-Cyr

Core Prevention Strategies

1. Smoking Cessation and Cough Reduction

Smoking is a significant risk factor for parastomal hernia, four times higher than non-smokers.³⁰ Consequently, all individuals who smoke should be strongly encouraged to quit 4 to 8 weeks before surgery.³⁰ Referral to the family physician or other health professional is critical for immediate smoking cessation support. Despite the general acceptance of smoking cessation, the evidence is expert opinion.³¹

Xie et al. (2021) also highlights that an acute or chronic cough, sneezing, or vomiting by other causes is a risk factor for parastomal hernia due to the extra, sudden intra-abdominal pressure.³⁰

2. Weight Management

McGrath et al. (2006) discussed the links between body mass index (BMI), wound infection, and development of parastomal hernia.⁷ Reductions in BMI appear to be beneficial in the prevention of parastomal hernia^{7,30}; the risk being lower below 30 kg/m² and further below 25 kg/m². Obesity may exert intra-abdominal pressure creating weakness in the abdominal wall muscles.

Obesity has been reported to be a strong risk factor for all types of incisional hernia including parastomal hernia. The strength of the abdominal wall is weakened through intra-abdominal pressure in those with higher BMI.²⁰ Liu et al. (2014) found that individuals with a BMI categorized by the World Health Organization as obese class III (BMI ≥ 40 kg/m²) were four times more likely to develop a parastomal hernia than those with a normal BMI.¹⁹

Obese individuals are likely to be in poorer physical condition and excess weight may limit their movement, physical activity, and ability to exercise (McGrath et al., 2006). Individuals with a higher BMI should be asked permission to educate them and encourage

them to reduce weight.³⁰ NSWOCs or a qualified health care professional should provide consistent education on the value of maintaining an optimal BMI and how this can help reduce the incidence of parastomal hernias.²³ Referrals to registered dietitians should be considered for individuals with high BMIs.

3. Dietary Recommendations

Creation of a stoma may necessitate adjustments to one's diet which can add to the anxiety of individuals. Individuals should meet with a registered dietitian prior to discharge from the hospital to assist them with dietary concerns and management. Depending on the setting and availability, a referral to a dietitian may be appropriate following hospital discharge or where other changes occur.

The series of NSWOC patient ostomy booklets (colostomy, ileal conduit, and ileostomy), explore optimal dietary management and can be a valuable resource to educating individuals with an ostomy. In addition, prescription and nonprescription medications may have an impact on ostomy drainage. Individuals with an ileostomy should not use stool softeners or laxatives.

Referral to a registered dietitian may be beneficial for providing education with regards to nutritional and weight management.³²

Special consideration may be beneficial for a person with a colostomy and a parastomal hernia that may encounter constipation. In a study of 331 patients with an ostomy, Krokowics et al. found that in patients with constipation who required surgical intervention, the most common cause was those with a parastomal hernia.³³ Expert opinion suggests that raised intra-abdominal pressure, obesity, malnutrition, and chronic constipation, may be a risk factor for parastomal hernia development, but scientific evidence to support these risk factors is lacking.

4. Physical Activity

RECOMMENDATION 6

An individual with an ostomy must receive written and verbal information on the importance of regular exercise, movement, and core muscle exercise. (LOE IV-V)

RECOMMENDATION 7

An individual with a parastomal hernia should be referred to a physiotherapist, or other qualified health care professional to aid in the return to activities of daily living to optimize quality of life. (LOE IV-V)

Appropriate physical activity has a pivotal role in the prevention of a parastomal hernia in those who have had a stoma created. It is also a fundamental component of rebuilding core muscle strength in those who have or have had a parastomal hernia. Exercise helps in the safe return of movement necessary for independence in daily living activities and has wider benefits on mental health, self-esteem, and in the prevention of other health-related concerns. Russell provides the most often cited guidance on the role of exercise.^{23,24} Table 3 examines the relationship between physical activity and the development of parastomal hernia. It provides recommendations based on low, moderate, or high levels of physical activity.

Table 3 Relationship Between Level of Activity and Parastomal Hernia

Low	Moderate	High
<ul style="list-style-type: none"> high level of fitness and muscle strength prior to surgery, with little loss of muscle in the perioperative period. 	<ul style="list-style-type: none"> lower levels of fitness and strength prior to surgery and/or significant muscle loss during perioperative period. low adherence to core exercise program. lack of supervision with exercise. rapid return to inappropriate exercise. 	<ul style="list-style-type: none"> weak and deconditioned state (either prior to surgery or because of surgery). rushed return to exercise, in particular heavy weight training, without completion of appropriate core rehabilitation program. higher risk activities include powerlifting, cross fit, heavy weight training, HIIT, circuit training—especially if done without appropriate progression and core training.
Recommendation	Recommendation	Recommendation
<ul style="list-style-type: none"> appropriate/gradual return to exercise, including core muscle rehabilitation / clinical Pilates. 	<ul style="list-style-type: none"> ongoing support from NSWOC and PT to support/ monitor client in gradual return to activity and exercise. focus on gentle/ appropriate core muscle strengthening and functional exercises 	<ul style="list-style-type: none"> ongoing support from NSWOC and PT to support/ monitor client in gradual return to activity and exercise. focus on gentle/appropriate core muscle strengthening and functional exercises.

Abbreviations. HIIT = high intensity interval training, PT = physiotherapist.

For an individual with an ostomy, physiotherapists recommend commencing gentle abdominal exercises 3 to 4 days after ostomy surgery.¹³ Core muscle exercises help reduce weakness in the rectus abdominis muscle.²³ Education in hospitals that focuses on the safe return to common activities of daily living such as moving in bed, transferring on and off a bed or toilet, lifting, sneezing, and coughing with minimal stress to the abdominal area is instrumental in parastomal hernia prevention. Gentle exercises that involve strengthening of posture, pelvic floor muscles, and proper lifting techniques will help minimize the risk of bowel squeezing between the stoma and abdominal wall creating a hernia. Other activities such as walking, and coordination exercises are also recommended in the early recovery phase. Exercises that increase intra-abdominal wall pressure need to be avoided. Education should focus on the importance of avoiding holding one's breath and to breathe out during any activities that require effort or exertion. All individuals at risk for a parastomal hernia or those who have a parastomal hernia must receive both written information and verbal education on the importance of regular exercise and core muscle strengthening for optimal recovery and building of confidence.³⁴

Prehabilitation is the process of optimizing physical function preoperatively to enable the individual to maintain a normal level of function during and after surgery.³⁴ Where suitable, NSWOCs or a qualified health care professional may collaborate with a physiotherapist in providing education on appropriate exercise and activities for individuals at risk for a parastomal hernia. For an individual with a parastomal hernia, a referral to a physiotherapist is advised. If a physiotherapist is not available in the person's location, then other qualified health care professionals such as an exercise therapist can aid in the return to activities of daily living.

Lack of physical activity and mobility causes a plethora of other health concerns, including poor weight management, poor glycemic control, dependence relating to daily living activities and poor quality of life. Additional fear of movement may further elevate a patient's risk of parastomal hernia.³⁴

A nationwide UK study in 2016 described the significant impact of a parastomal hernia on physical activity levels.²³ Surveys were conducted through a patient registry of 10,000 individuals living with an ostomy, of which 2,631 people responded. Twenty six percent of survey respondents reported having a medically diagnosed parastomal hernia. A third responded that they were 'much less active' with a postoperative parastomal hernia than before in comparison to nineteen percent with no hernia.

Russell (2020) emphasizes three ways in which nurse specialists can counteract a patient's fear of a hernia and avoidance of movement.²⁴

- using a person-centred approach based on patients' daily living activities;
- using positive strength-based language on what they can do (Table 3); and
- implementing an appropriate therapeutic rehabilitation exercise program.

It is critical to convey that ostomy surgery should not be interpreted as avoidance of any physical movement, see Table 4 for examples of strength-based language.

Table 4 *Examples of Strength-Based Language*²⁴

What you say ...	What the patient hears ...
You must avoid lifting	Lifting anything will damage me = FEAR
You have high risk of a hernia	That sounds bad (what's a hernia anyway?) = FEAR
Wear this support garment	I need to rely on something rather than my own body/muscles = DISABLEMENT
Be careful with exercise	I better not move (ever again) = FEAR and DISABLEMENT
INSTEAD SAY ...	
When lifting, do it like this ...	I can lift safely without hurting myself = ENABLEMENT
You can reduce your risk of a hernia by ...	I have skills and knowledge to help myself = EQUIPPED and ENABLED
Do abdominal exercises to strengthen your own muscles	I can rely on my own body/muscles to support me = EQUIPPED and ENABLED
It's really important to exercise and here's how ...	Exercise is important for my health and I know how to do it safely and appropriately = EMPOWERED

Note. Reproduced from Russell, 2020 used with the kind permission of WCET® Journal

Many ostomy manufacturers have produced written patient information, based largely on the work of Russell.³⁴ NSWOCC has updated their series of patient ostomy booklets (colostomy, ileal conduit, and ileostomy) to include information and pictorial instructions of proper exercise techniques to prevent a parastomal hernia through exercise. Refer to examples in Figure 3.

Figure 3 *Abdominal Exercises and Pelvic Tilts*



Note. © Hollister Inc. Reproduced with permission.

Physiotherapists in consultation with the surgeon and or an NSWOC can help individuals with an ostomy progress exercises as appropriate, for the safe return to an active lifestyle. Strong abdominal muscles and good core strength may help decrease the chance of an individual with an ostomy in developing a parastomal hernia.

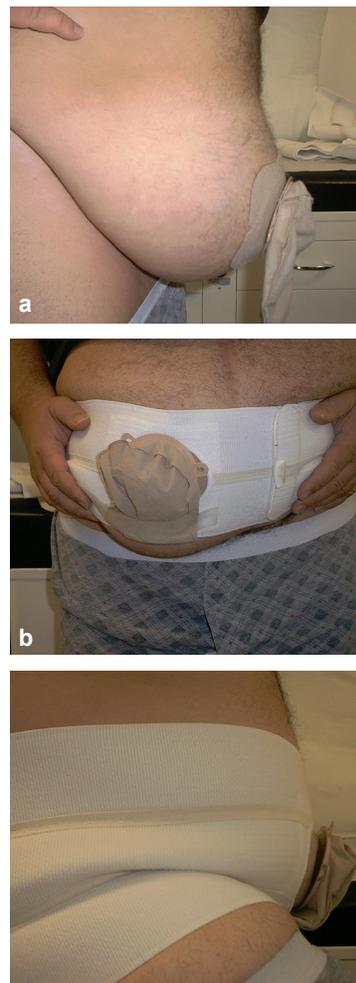
5. Support Garments/Belts

RECOMMENDATION 8

An individual with an ostomy should be assessed to determine the type and level of support garment/belt required for prevention or management of parastomal hernia, taking into account the person's lifestyle, activities of daily living, and personal preference. (LOE III-V)

The use of abdominal supports is one of the components reported to reduce the incidence of parastomal hernia.^{1,2} It is imperative to work collaboratively with at risk individuals to determine the best support garment which meets their personal needs, body types and preferences. The use of belts is individual. Not all individuals will need or want a support belt.

Figure 4 *Parastomal Hernia Pre- and Post-Application of Hernia Belt With Opening*



Note.
a) side view of unsupported hernia;
b) front view of hernia supported with hernia belt;
c) side view with support.
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The criteria for support garment/belt selection are presented in Table 5. Available options can be categorized as described in Table 6. Even with the help of an NSWOC or a qualified health care professional, it can be challenging to select an appropriate support garment which is comfortable, effective, and cost efficient. There exists a multitude of available support garments and selection can be confusing. Many individuals do not have access to a specialist to fit them for a support garment. Not all NSWOCs or a qualified health care professional have the appropriate experience for fitting support garments. They are costly and without guidance from an experienced clinician, it could require several purchases to find the right fit. This can be cost prohibitive for many individuals who are recovering from surgery, facing additional health care treatments, loss of income and lack of health care insurance.

Borglit et al. (2022) investigated patients' experiences with a hernia bulge.³⁵ Support garments must be user friendly and fit the patient's needs, including body type, stoma type, stoma appliance type, bulge, comfort flexibility. Reassessment with an NSWOC or qualified health care professional was crucial for patients' mental and physical resources. Good fitting support garments reduced pain and enabled patients to resume their daily activities with confidence.

When an individual develops a postoperative surgical wound, there is an increased need to support the abdominal muscles with a support binder. The amount of required support will vary among individuals (See risk factors in Table 2). Control top underwear or bicycle shorts may be recommended to provide light support. Spandex exercise shorts and leggings with a high waist may provide needed support especially as the patient becomes more active on a daily basis. Trialing different types of garments to find the right fit for an individual is essential and can take patience and time.³⁶ The biggest benefits may be comfort, peace of mind, and discretion. Surgeons may have varying views on the importance and value of support garments.

Individuals at a higher risk of developing hernias (see risk factors in Table 2) should be discharged from hospital with abdominal support binders or waistbands, as soon as it is comfortable to wear them, to help support muscles while they heal. Most hospitals do not have a selection of abdominal support garments and use the standard abdominal support binder that is modified to accommodate an ostomy pouch.³⁷ These tend to be ill-fitting and difficult to fasten with no ability for adjustments once the client is discharged from hospital.³⁷ Some may not receive any abdominal support garment in hospital and are given information on where to get fitted and purchase an abdominal support binder at a local vendor.

Table 5 *Criteria for Support Garment/Belt Selection*

Criteria	Considerations
Select the correct garments based on individual assessment	<ul style="list-style-type: none">• suitable to individual needs• comfortable• necessary support• suitably/appropriate fitting
Cost	<ul style="list-style-type: none">• garments vary in cost
Factors to be considered in the choice of garment	<ul style="list-style-type: none">• type of stoma• stoma function• pouch being used• size and shape of stoma• individual characteristics and comorbidities
Who should wear a garment/hernia belt	<ul style="list-style-type: none">• can be worn for parastomal hernia prevention during exercise or “risky” activity involving lifting, to improve comfort, reduce “dragging” sensation or support weight of hernia as well as provide support• use of belts is individual and that not all individuals will need or want a support belt.
Education	<ul style="list-style-type: none">• critical for the patient• understand why support garment/belt is needed• appropriate care and use

Table 6 Support Garment/Hernia Belts for Prevention

Support Garment	Advantages	Disadvantages
<p>Abdominal binders</p> <p>Typical for abdominal support postsurgery.</p> <p>Usually fitted by the OT department or NSWOC in the hospital and hole created to fit the ostomy pouching system.</p>	<ul style="list-style-type: none"> • provide full abdominal support; • can be tailored postoperatively in hospital to provide support immediately for client; and • moderate to high support for hernia depending on application. 	<ul style="list-style-type: none"> • ill-fitting and uncomfortable; • unable to be adjusted once discharged from hospital; • fitted postoperatively and does not accommodate for changes in stoma over 6-12 weeks after surgery; • difficult for client to apply without help; • uncomfortable for client to wear as is stiff and is not flexible to client body contours and folds; and • some suggest that ill-fitting supporting garments can cause pancaking, leaks, and ballooning.
<p>Hernia support belt—with or without hole</p> <p>Customized hernia support.</p>	<ul style="list-style-type: none"> • no hole—supports the entire hernia; • may help to reduce and manage stoma prolapse; • decrease hernia pain; and • with hole—allows for pouching system and free effluent drainage. 	<ul style="list-style-type: none"> • no hole for ostomy; appliance can interfere with enteric drainage into pouch resulting in leakage and pancaking especially if garment not fitted properly; • hole for ostomy appliance may result in hernia through hole; and • can be costly.
<p>Ostomy support belt/garment</p> <p>A belt that supports the ostomy appliance and concealment of an ostomy bag. Also supports ostomy during physical activity.</p>	<ul style="list-style-type: none"> • body appearance; • concealment of bag and support; and • support during physical activity. 	<ul style="list-style-type: none"> • light to moderate support of hernia; and • not necessarily designed as a hernia support garment.
<p>Support underwear/clothing</p> <p>Examples include control top underwear/panties, high waisted Lycra® pants or shorts, shapewear, or belly bands.</p>	<ul style="list-style-type: none"> • comfortable; • provides support over stoma; • may help prevent or manage stoma prolapse; • helpful for body appearance; • can muffle sounds; • concealment of stoma, hernia during intimacy and sexual partners; • easily laundered; • cost-effective; and • variety of choices. 	<ul style="list-style-type: none"> • light to moderate support; • no hole for ostomy appliance can interfere with enteric drainage into the pouch resulting in leakage and pancaking; and • would have to be customized to accommodate the hole.

Abbreviations. OT = occupational therapist.

There are many reasons why individuals stop wearing these garments when they return home. Individuals may find the garments too uncomfortable, particularly if they are not fitted properly, too hot, bulky and/or too difficult to apply.³⁵ Most individuals are instructed to apply the support garment while lying down on a bed so the hernia is reduced and this can be difficult for some patients especially if they live alone, have limited strength and mobility, poor visibility, or suffer from arthritis or other issues affecting dexterity.³⁷ Some support binders with a hole to accommodate the ostomy pouch can shift easily with increased activity and this can disrupt the pouching system causing leakages.

With or Without a Stoma Opening (Hole)

A support garment without a stoma opening (hole) to accommodate the ostomy appliance provides consistent support distributed across the abdomen and hernia.³⁷ If the support garment has too large a hole created to accommodate the pouching system, there is potential for the stoma to prolapse or the skin to bulge through the hole in the garment.³⁷ Stoma's that require a convex wafer may have extra pressure applied to the peristomal skin from too small a hole in the garment and particularly if the hole is reinforced with extra material or plastic.³⁷ Poorly fitting garments or garments that are not worn tightly may shift with activity during the day and disrupt the ostomy pouch, potentially causing leakages.

Conversely, in some cases, depending on stool consistency and level of bowel activity, support garments without a hole for the ostomy pouch may contribute to leakage problems and other issues by holding effluent close to the wafer, pancaking the stool, limiting capacity of the pouch, and impeding the release of gas buildup.³⁶ Also, there is a convenience to emptying the pouching system when it is free and external to the support garment allowing the patient to empty the pouch without having to remove or alter the garment to do so.

To avoid these complications regardless of whether a support garment has a hole or not, it is important for the support garment to be properly fitted and sized taking into account the person's wishes and comfort and providing the person with continued adjustments or support.^{35,37} The use of belts is individual and not all individuals will need or want a support belt.

SECTION 3 – PARASTOMAL HERNIA ASSESSMENT

RECOMMENDATION 9

An individual with an ostomy who has a suspected parastomal hernia must have a diagnosis made in collaboration with their surgeon or primary care provider. (LOE Ib-)

RECOMMENDATION 10

An individual with a parastomal hernia should be assessed at regular intervals in standing, sitting, and lying positions to determine the size and severity of the parastomal hernia. (LOE V)

RECOMMENDATION 11

An individual with a parastomal hernia should have their stoma size and peristomal skin assessed at regular intervals to ensure their pouching system is suitable. (LOE Ia-V)

RECOMMENDATION 12

An NSWOC or primary care provider should document the individual's stoma, hernia, and peristomal skin assessment in the medical record. (LOE Ia-V)

Figure 5 *Parastomal Hernia in Various Positions*

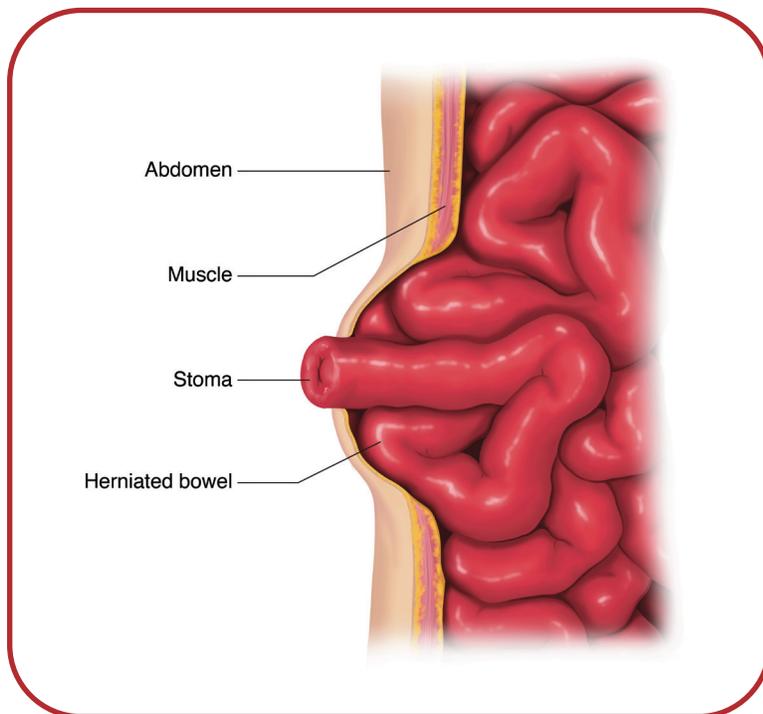


Note. a) a lying front view of a parastomal hernia; b) a lying side view of a parastomal hernia; c) a sitting front view of a parastomal hernia; d) a standing front view of a parastomal hernia. Reproduced with permission of Diane St-Cyr.

Clinical Pearls²⁷

- *The patient should be assessed in both a standing, sitting, and lying position to determine the size and severity of the parastomal hernia.*
- *Assess the size of the stoma as this often will change during the day.*
- *Assess peristomal skin integrity.*
- *The patient should be seen by an NSWOC for follow up related to review of products being used to support the hernia.*
- *Assess the output.*

Figure 6 *Anatomy of a Parastomal Hernia*



Note. © NSWOC, 2023

Figure 7 *Peristomal Skin Trauma From a Parastomal Hernia*



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In a systematic review, de Smet and colleagues³⁹ found that inclusion of a CT scan increased the rate of parastomal hernia detection compared with clinical evidence alone, with a sensitivity of 83%. However, the authors noted that there is no established gold standard modality to examine individuals for the presence of parastomal hernia.^{39,40} Pennings et al. (2021) provide one of the most detailed summaries for clinical and radiologic predictors of parastomal hernia.¹⁶ They note that when individuals with end colostomies undergo preoperative CT, it provides an assessment of essential body metrics (such as waist circumference, amount of fat in different compartments, abdominal muscle status, and presence of other abdominal hernias), all of which are reported parastomal hernia risk factors. Postoperative CT may aid prediction of parastomal hernia development measured by the size of the ostomy opening in the abdominal wall during surgery. Pennings et al. (2021) concluded that “An abdominal wall defect that is too large may lead to parastomal hernia development, so information on maximum safe limits might be of additional value during surgery.”¹⁶

Compounding poor diagnosis is the inconsistency with which an accurate diagnosis or a parastomal hernia is included in the individual’s medical record.⁴¹ Holmdahl (2021) explored the use of stomal ultrasound which demonstrated a high sensitivity and specificity for parastomal hernia and was

primarily performed to avoid exposing the patient to ionising radiation.⁴² If the results of the ultrasound were inconclusive, a CT was also performed.

Many parastomal hernias cause mild or no symptoms and management is often conservative, not requiring surgical intervention.⁴³ The impact on quality of life and psychosocial well-being is often overlooked and not considered a complication.

It must be noted that for the most part, unless advanced directives are in place, diagnosis of a parastomal hernia is beyond the registered nurse and licenced/ registered practical nurse scope of practice. Diagnosis of a parastomal hernia should be confirmed by a surgeon or primary care provider (family physician or nurse practitioner).

Patients may report a bulge/protrusion around their stoma, pain, or a dragging sensation from the weight of the hernia, bleeding, stoma prolapse and irregularity in output.⁴³ It is important to assess for signs of possible mechanical bowel obstruction which may include increased abdominal pain, nausea and vomiting, and decreased stomal output. Bowel incarceration (strangulation and ischemia of the bowel) is a medical emergency. Discolouration of the stoma may be present. Interventions for this are covered in the management section.

Parastomal concerns include skin discomfort from peristomal moisture associated skin damage due to pouch leakage, and skin tears/blistering created by shearing forces under the skin barrier adhesive due to extreme abdominal wall stretch/ movement. The challenges with appropriate ostomy appliance adhesion and unpredictable wear time lead to leakage, increased appliance replacement, and financial burden, Special considerations may be required when selecting a pouching system when a parastomal hernia is present. The peristomal skin may be fragile due to skin stretching and the presence of superficial spider veins, likely due to increased pressure from the hernia, may be noted on the surface of the skin. See Figure 8. This potential increase in skin fragility may place a person with a parastomal hernia at a higher risk for peristomal medical adhesive-related skin injury (PMARSI). A 2019 publication involving an international consensus meeting on PMARSI generated consensus-based statements providing guidance concerning the assessment, prevention, and treatment of peristomal MARSIs.⁴⁴ These recommendations may minimize the risk of skin injury when applying and removing the ostomy pouching system.

Figure 8 *Peristomal Skin Damage*



Note. Reproduced with permission of Tarik Alam

A flexible one- or two-piece pouching system is recommended as the flexibility will accommodate the outward curvature of the hernia. With a parastomal hernia, the stoma

may protrude, be flush with the skin or even retracted in rare cases. Firm or rigid convexity should be avoided as it may increase pressure to the peristomal skin which could cause pressure injury.⁴⁵ Flexible, nonrigid convexity options are available such as barrier rings or soft convexity. Some ostomy barriers contain features that optimize the fit on the curved surface of the hernia such as a star or petal shaped barrier, a concave design or a floating mechanism. Body image disturbances are very common due to the abdominal asymmetry and ensuing cosmetic issues; and with unpleasant odour or soiling of clothes when leakage occurs. Depression and reports of social isolation may also be reported.⁴⁶⁻⁵⁰

Parastomal hernias are easier to confirm when the individual is in the supine position and are often easier to identify when the individual is coughing, or bearing down with the Valsalva manoeuvre.⁴³ If unable to lie comfortably on their back, the individual can be examined in the standing position. In abdominal wall hernias generally, the Valsalva manoeuvre has been demonstrated to improve the detection and characterization of hernias. Usually there is a noticeable bulge around or near the stoma and when the patient lies down flat the bulge reduces.⁴³ Parastomal hernias that do not reduce are at heightened risk of increased pain and intestinal obstruction that require emergency care.⁴³

The NSWOC or surgeon will palpate around the stoma as the patient raises his or her head or coughs to feel the extent of the hernia. The size or extent of the hernia varies according to the size of the defect in the abdominal wall. The defect may encompass the entire parastomal area or only a portion. Assessment may also include insertion of a digit into the stoma, feeling for fascial defect around the intestine. An incomplete fascial ring will be felt in the area of the hernia.

Parastomal hernias frequently increase in size over time, stretching the skin and sometimes

making the stoma larger. Maintaining the adherence of an ostomy pouch can be challenging as the stoma and parastomal hernia change size with positional changes (lying, sitting, and standing position).⁴³ Resizing and changes in ostomy products will require the involvement of an NSWOC or a qualified health care professional to support a client with a parastomal hernia.

There is no evidence in the literature to define *regular interval* for the frequency of assessment. NSWOCs or a qualified health care professional will need to use clinical judgment and critical thinking to consider reassessment timelines for individuals. Similarly, while size can be measured, severity is a determination based on an NSWOCs or a qualified health care professional's assessment of the individual.

Documentation is key to monitoring the size of the parastomal hernia over time. Document the size of hernia in an individual's record. Measure the height and width of the hernia in centimetres, preferably in a standing position. This should be measured the same way each time. With the patient bearing down, gently palpate the parastomal plane to determine where the hernia protrusion exists. For the height of the parastomal hernia, measure from the inferior border of the protrusion upwards or vertically over the bulge to the superior aspect where the protrusion ends. Similarly, for the width of the hernia, measure from the lateral border of the protrusion sideways or horizontally over the bulge to the medial aspect where the protrusion ends.

Sizing of the hernia relates to the largest of the two measurements:

- small—less than 5 cm;
- medium—5-10 cm;
- large—greater than 10 cm.

Assess size of stoma—vertical and horizontal—as this often changes in the presence of a parastomal hernia. Patients may require a new cutting size for the skin barrier or different products or accessories. Assess peristomal skin integrity; if skin appears thin and fragile due to it being stretched take measures to provide skin protection with accessories, ensuring appliances are correctly fitted and possible use of an adhesive remover to reduce skin stripping.^{11,13,15,45,51,52}

SECTION 4 – MANAGEMENT

Surgical Intervention

RECOMMENDATION 13

An individual with a parastomal hernia should be referred to a surgeon or primary care provider to explore the role and benefits of surgical repair. (LOE III-IV)

Surgical repair is indicated for symptomatic parastomal hernias. Urgent indications for parastomal hernia repair include intestinal obstruction, strangulation, incarceration, or ischemia of the hernia contents. Elective indications include pain and poor appliance fitting. “The laparoscopic Sugarbaker technique with a non-absorbable intraperitoneal mesh is emerging as the preferred modern means of parastomal hernia repair.”²⁰ Other options include onlay or underlay keyhole mesh repair. Primary repairs without the use of mesh have a high recurrence rate and are not recommended. Use of the EHS Classification shown in Appendix 4 may help with the decision-making process of performing a surgical repair for a parastomal hernia.^{3,53}

Figure 9 Parastomal Hernias Requiring Surgery



Note. a) front view, large parastomal hernia resulting in QoL issues; b) front view, large parastomal hernia resulting in QoL issues, peristomal skin disruptions, and pouching challenges; c) front view, large parastomal hernia resulting in QoL issues, peristomal skin disruptions, and pouching challenges. Reproduced with permission of Kim LeBlanc.

A parastomal hernia may have an impact on the passage of fecal material in a person with a colostomy. Surgical intervention may be required when the passage of fecal material is impeded in a person with a parastomal hernia. Krokowicz et al. (2015) conducted a study on intestinal disturbances on people with a colostomy³³ and found that the most common indication for surgical treatment of these intestinal passage disturbances was the parastomal hernia (36 patients, 72%).

At the time of writing, there are five Cochrane reviews concerning parastomal hernia, largely related to surgical procedure and repair. These are summarized in Table 7.

Table 7 Parastomal Hernia Reviews in the Cochrane Database of Systematic Reviews

Lead author/year	Search strategy and papers included	Conclusions
<p>Hardt et al. (2019) analyzed the literature to assess if there is a difference regarding the incidence of parastomal herniation and other stoma complications, such as ileus and stenosis, in lateral pararectal versus transrectal stoma placement in people undergoing elective or emergency abdominal wall enterostomy.⁵⁴</p>	<p>Trials in any language from CENTRAL, PubMed, LILACS, Science Citation Index, and trials registers: ICTRP Search Portal and ClinicalTrials.gov to November 2018.</p> <p>One RCT and ten cohort studies met the inclusion criteria</p>	<p>The authors noted inconclusive results between the two techniques. Neither technique was found to be better than the other for any of the stoma-related outcomes of interest. None of the studies measured other stoma-related problems, or death. The authors rated the evidence as moderate, low, or very low. They concluded that “Based on the current knowledge presented in this review, there is no evidence to support the use of one stoma formation technique over the other. Further research is likely to have an important impact on our confidence in the estimate of effect.”</p>
<p>Jones et al. (2018) analyzed the literature to evaluate whether mesh reinforcement during stoma formation reduces the incidence of parastomal herniation. Secondary objectives included the safety or potential harms or both of mesh placement in terms of stoma-related infections, mesh-related infections, patient-reported symptoms/ postoperative quality of life, and rehospitalization/ ambulatory visits.⁵⁵</p>	<p>RCT searched in CENTRAL, Ovid MEDLINE, Ovid Embase, and Science Citation Index Expanded plus mRCT before 2018.</p> <p>Ten RCTs covering 844 patients were included.</p>	<p>The authors found that mesh placement around the stoma at the time of stoma formation reduces the incidence of future hernia formation. The participants having a mesh fitted had a similar level of complications as those not having a mesh. Quality of evidence was low-quality favouring the insertion of a mesh into people having a stoma.</p>
<p>Sauerland et al. (2011) analyzed the literature to compare laparoscopic with open repair in individuals with (primary) ventral or incisional hernia.⁵⁶</p>	<p>RCTs in any language searched through MEDLINE, EMBASE, CENTRAL, mRCT before July 2010.</p> <p>Ten RCTs included with a total number of 880 patients suffering primarily from primary ventral or incisional hernia.</p>	<p>The authors described promising short-term results of laparoscopic repair in ventral hernia. “In spite of the risks of adhesiolysis, the technique is safe. Nevertheless, long-term follow up is needed in order to elucidate whether laparoscopic repair of ventral/incisional hernia is efficacious.”</p>

Lead author/year	Search strategy and papers included	Conclusions
den Hartog D et al. (2008) analyzed the literature to identify the best available open operative techniques for incisional hernias. ⁵⁷	RCTs searched MEDLINE, EMBASE and the CENTRAL from 1990-2010.	“There is good evidence from three trials that open mesh repair is superior to suture repair in terms of recurrences, but inferior when considering wound infection. Six trials yielded insufficient evidence as to which type of mesh or which mesh position (on- or sublay) should be used. There was also insufficient evidence to advocate the use of the components separation technique.”
Güenaga et al. (2007) analyzed the literature to assess the evidence in the use of loop ileostomy compared with loop transverse colostomy for temporary decompression of colorectal anastomosis, comparing the safety and effectiveness. ⁵⁸	RCTs in any language and date searched from MEDLINE, EMBASE, LILACS, and the CENTRAL, plus hand-searches. Five RCTs with 334 patients met inclusion criteria.	“The best available evidence for decompression of colorectal anastomosis, either use of loop ileostomy or loop colostomy, could not be clarified from this review. So far, the results in terms of occurrence of postoperative stoma prolapse support the choice of loop ileostomy as a technique for fecal diversion for colorectal anastomosis, but large scale RCTs is needed to verify this.”

Abbreviations. CENTRAL = Cochrane Central Register of Controlled Trials; RCT = randomized control trial; mRCT = MetaRegister of Controlled Trials.

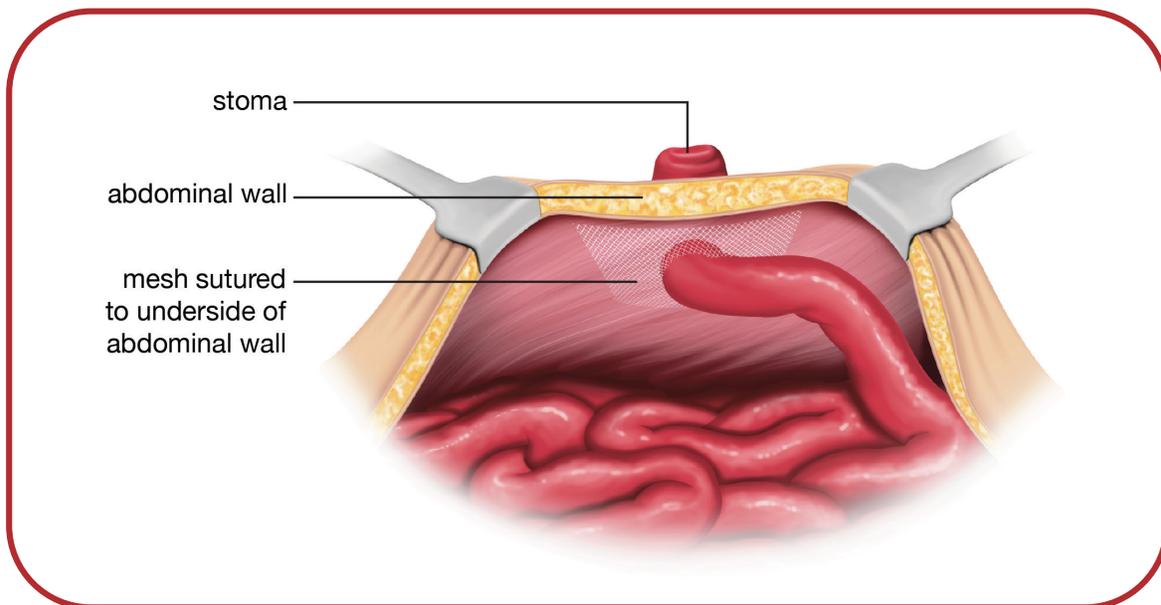
To aid understanding, these surgical terms are defined:

- trephine— a circular incision in the abdominal wall for placement of the stoma;
- onlay—where a mesh is placed overlying the defect made by the hernia;
- underlay— where a mesh is placed on the underside of the gap or inside the fascia;
- Sugarbaker—where the bowel is lateralized and covered with an intra-abdominal mesh;
- sandwich—where the repair of the parastomal hernia is achieved between two layers of mesh;
- keyhole— where the parastomal hernia is repaired with a flat mesh with a central hole through which the bowel is brought.

An individual with a parastomal hernia should be referred to a surgeon to explore the role and benefits of surgical repair. Surgical hernia repair does not guarantee prevention of parastomal hernia recurrence. Chegireddy describes the outcomes from advanced surgical techniques and use of mesh as “disappointing with regard to recurrence and postoperative complication rates.”⁵⁹

Prophylactic mesh augmentation at the time of stoma creation is safe and may be efficacious in preventing a parastomal hernia. Several systematic reviews and meta-analyses have attempted to address without a clear answer.^{49,60,61} It should be noted that the same surgical technique of prophylactic mesh placement may increase the incidence rate of parastomal hernia in individuals with end ileostomy.⁵³ Surgical technical factors are potentially modifiable and include the site, size, and shape of the stoma trephine in the musculofascial layers of the abdominal wall, routing of the afferent stomal limb and whether mesh is used as a prophylactic reinforcement.⁵⁰

Figure 10 *Open Mesh Repair of a Parastomal Hernia*



Note. © NSWOCC, 2023

Data published by Harries describes how trephine size following end colostomy formation demonstrated that all trephine defects increase in size over time, with a faster trephine diameter progression seen in females.⁵ A cohort study by Pennings et al. (2021) in 30 patients conducted univariate analysis to determine clinical parameters that are predictive of parastomal hernia development.¹⁶ The three independent predictors were a) COPD, b) longer operation time, and c) a larger trephine aperture in the abdominal wall of more than 34 mm diameter.¹⁶ Stronger evidence is needed to ascertain whether prophylactic mesh use would be appropriate in patients with one of more of these predictive parameters.⁶²

Parastomal Hernia Recurrence

Huang et al. (2021) reported that one in three individuals with severe parastomal hernia-related symptoms needs surgical correction.¹⁵ The overall recurrence rate for all recurrent parastomal hernia repairs in the study period was 45.7% at a median of 58 months. There was a trend towards a shorter parastomal hernia recurrence-free survival in those who had at least two parastomal hernia repairs previously, suggesting that similar to incisional hernias, the chance of success decreases with each repair after the first recurrent repair. Interestingly, the EHS Classification of parastomal hernia after each recurrence did not alter in 70% of cases. Refer to Appendix 4 for EHS Classification.³ This implies that failure occurs in the same pattern once the trephine defect has already been established, perhaps due to the initial technical failure at ostomy formation or the individual's risk factors or underlying tissue composition, or a combination of each.

Lopez-Cano et al. (2021) indicated⁶³ a recurrence rate [of parastomal hernia] is high in all ostomy types (27.5%). Individuals with a colostomy experienced a higher recurrence rate among various ostomy types (31.5%). High recurrence rates are indicative of the challenges in surgically repairing parastomal hernias. Lopez-Cano reported the history of cancer and preoperative chronic incarceration in the colostomy group were shown to be variables significantly associated with recurrence.⁶³

It is believed that the use of parastomal prophylactic mesh for permanent colostomy formation may reduce the incidence risk of parastomal hernia without an increased risk of complications.

The role of an NSWOC or a qualified health care professional in assessing and leading the diagnosis of parastomal hernia to reduce recurrence is incorporated in Recommendation 9 and supported by the Appendices 2, 3, and 4.

RECOMMENDATION 14

An individual living with a parastomal hernia must be assessed to determine the impact of the hernia on their health-related quality of life and body image and be provided with personalized follow up care to address their specific psychosocial needs. (LOE Ia-V)

Community Support for Individuals

Community supports for people living with a parastomal hernia or looking to prevent a parastomal hernia vary significantly from one community to another and among provinces. There is a lack of resources for patients living with a parastomal hernia in the community and there is no formal education to health care providers on how to support people to prevent or manage parastomal hernias. There is varying knowledge and skills particularly among physiotherapists on how to support people living with ostomies and parastomal hernias. There is a growing group of pelvic health physiotherapists with advanced knowledge and expertise in assessment and treatment of rectus abdominus dysfunction and are the most skilled in the development of exercise programs that help minimize intraabdominal pressure. An NSWOC or a qualified health care professional may collaborate with a pelvic health physiotherapist and refer persons with an ostomy or parastomal hernia on for support in exercise programs. Exercise programs specific to parastomal hernias are more recently being developed and research is slowly beginning to follow.

There is inconsistency in the continuity of care from acute care to community. Due to the short length of stay in the hospital postsurgery, parastomal hernia prevention education takes a back seat to the priority of teaching a patient how to manage and cope with a new ostomy. Follow up with an NSWOC or a qualified health care professional after discharge from the hospital depends on accessibility and availability of an NSWOC or a qualified health care professional and therefore providing the lifelong support for the

prevention and management of parastomal hernia may be triaged as less of a priority to the needs of a patient with a new ostomy. Health care leadership needs to support NSWOC positions in the community to provide continuity of care from hospital to home to provide the lifelong support to persons living with an ostomy requiring parastomal hernia prevention and management. Presently, the NSWOC in hospital and community tend to become involved with clients in the community only when they are experiencing ostomy challenges. Additionally, many nurses or general practitioners lack knowledge in the NSWOC resource providing referrals only when the patient has severe skin breakdown from leakages or complications due to the parastomal hernia. The health care system continues to face challenges with the continuity of care of patients from hospital to home, lacking clear processes or directions for ongoing support. It is important that persons living with an ostomy have access to an NSWOC or a qualified health care professional in order to receive ongoing support. Every patient living with an ostomy has the right to an NSWOC. Patients should contact NSWOC Canada to find an NSWOC if they are not connected to one.

There is a need for action and advocacy for parastomal hernia prevention and management processes/programs to be funded to support patient's quality of life. These could reduce costs to the health care system that result from frequent returns to emergency departments and complications requiring further surgery and hospitalizations.

Additional supports may be available from:

- Ostomy Canada Society chapter;
- local ostomy visitor program or support group;
- pharmacies/ostomy supply store who may have staff certified in fitting garments;
- First Nation communities that may require outside support;
- most responsible provider;
- home and community care;
- private home care;
- medical distributors (often hire NSWOCs to offer support); and
- medical device manufacturers (may have virtual supports available).

NEXT STEPS BEYOND THESE PARASTOMAL HERNIA BEST PRACTICE RECOMMENDATIONS

RECOMMENDATION 15

Further research is required to gain a greater understanding of the risk factors associated with, prevention of, and management strategies for parastomal hernias. (LOE Ia-IV)

The scoping review conducted as part of this best practice recommendations development process highlighted the lack of quality systematic reviews and guidelines available internationally. Consequently, much of the guidance provided in the document is based upon expert opinion. There is hope. The National Institute for Health and Care Research (NIHR) is funding a UK cohort study to investigate the prevention of parastomal hernia (the CIPHER study). The study had aimed to recruit 4,000 individuals undergoing elective or expedited surgery with the intention of forming an ileostomy or colostomy.⁵⁰ Patient recruitment has been stopped at 2,500 to focus on the two-year patient follow up. Published peer reviewed results will be the first to investigate detailed surgical methods of stoma formation in a large, representative cohort of individuals with a range of primary indications. Among the outcome are incidence of symptoms, diagnosis, complications, repair, and resource utilization. You can follow on Twitter @TheCIPHERStudy.

Rather than wait for future research taking a passive approach, we all have a role in advocating for research into parastomal hernia. We can submit case study abstracts to congress and seek further research opportunities to add to the body of evidence.

Publishing further evidence could examine some of the following topics:

- a. psychosocial and health-related quality of life impacts of individuals with a parastomal hernia;
- b. the correct application of support garments/belts in prevention;
- c. exercise to prevent and regain strength after ostomy surgery; and
- d. use of mesh as a preventative measure.

APPENDIX 1 - INTERPRETATION OF EVIDENCE OF RECOMMENDATIONS

Recommendation	Evidence	References	Assigned RNAO Level of Evidence	Notes
1 An individual with an ostomy should be referred to an NSWOC or a qualified health care professional.	Nieves et al., 2017, plus expert opinion	65	V	Articles outside the scoping review
2 An individual undergoing ostomy surgery should receive a comprehensive parastomal hernia risk assessment.	Ayuso et al., 2021 (Ia) Bertoglio et al., 2021 (IV) Carne et al., 2003 (V) Chen & Gilmore, 2021 (III) Correa Marinez et al., 2021 (Ib) DeRobles & Young, 2020 (III) Goffioul et al., 2021(V) Harraz et al., 2020 (IV) Kosuge et al., 2021 (IV) Niu et al., 2022 (Ia) RNAO, 2019 (V) Russell, 2017 (IV)	9, 17, 18, 20, 23, 32, 47, 51, 65-68	Ia - V	Niu et al. and Russell outside the scoping review
3 An NSWOC or qualified health care professional should provide an individual with an ostomy lifelong risk assessment and ongoing education pertaining to parastomal hernia prevention.	ASCN, 2016 (V) Borglit et al., 2022 (III) Fox et al., 2021 (IV) Huang et al., 2021 (IV) Hubbard et al., 2020 (IV) RNAO, 2019 (V) Russell, 2017 (IV) Zelga et al., 2021 (III)	13, 15, 23, 32, 35, 38, 48, 69	III - V	ASCN and Russell outside the scoping review
4 An individual undergoing ostomy surgery should be referred to an NSWOC or a qualified health care professional for preoperative stoma site marking to reduce the risk of parastomal hernia. Refer to the preoperative stoma site marking position statement.	Frigault et al., 2021 (IV) Hsu et al., 2020 (Ib) Kugler et al., 2021 (III) RNAO, 2019 (V) Shiraishi et al., 2020 (III) Wasserman & McGee, 2017 (IV) Zelga et al., 2021 (III)	4, 32, 40, 69-72	Ib - V	Wasserman & McGee outside the scoping review

	Recommendation	Evidence	References	Assigned RNAO Level of Evidence	Notes
5	An individual undergoing ostomy surgery should be referred to an NSWOC or a qualified health care professional to receive preoperative and postoperative personalized education on parastomal hernia prevention.	Bland & Young, 2016 (IV) plus expert opinion	73	IV	Bland & Young outside the scoping review
6	An individual with an ostomy must receive written and verbal information on the importance of regular exercise, movement, and core muscle exercise.	North, 2014 (V) Russell, 2017 (IV)	1, 23	IV - V	North and Russell outside scoping review
7	An individual with a parastomal hernia should be referred to a physiotherapist, or other qualified health care professional to aid in the return to activities of daily living to optimize quality of life.	Russell, 2017 (IV) Russell, 2020 (V)	23, 24	IV - V	Russell outside the scoping review
8	An individual with an ostomy should be assessed to determine the type and level of support garment/belt required for prevention or management of parastomal hernia, taking into account the person's lifestyle, activities of daily living, and personal preference.	SCN, 2016 (V) Borglit et al, 2022 (III) Hubbard et al., 2019 (III) Readding, 2014 (V) Russell, 2017 (IV)	13, 23, 35-37	III - V	ASCN, Borglit et al., Readding, and Russell outside the scoping review

	Recommendation	Evidence	References	Assigned RNAO Level of Evidence	Notes
9	An individual with an ostomy who has a suspected parastomal hernia must have a diagnosis made in collaboration with their surgeon or primary care provider.	Carne et al. 2003 (V) Correa Marinez et al., 2021 (Ib) Shiraishi et al, 2020 (III)	4, 9, 51	Ib - V	
10	An individual with a parastomal hernia should be assessed at regular intervals in standing, sitting, and lying positions to determine the size and severity of the parastomal hernia.	ASCN, 2016 (V) plus expert opinion	13	V	ASCN outside the scoping review
11	An individual with a parastomal hernia should have their stoma size and peristomal skin assessed at regular intervals to ensure their pouching system is suitable.	ACPGBI, 2019 (V) ASCN, 2016 (V) Ayuso et al, 2021 (Ia) Pitman, 2021 (V)	11, 13, 45, 64	Ia - V	ASCN and WOCN outside the scoping review
12	An NSWOC or primary care provider should document the individual's stoma, hernia, and peristomal skin assessment in the medical record.	ASCN, 2016 (V) De Smet 2020 (Ia) Readding 2014 (V)	13, 37, 39	Ia - V	ASCN and Reading outside the scoping review
13	An individual with a parastomal hernia should be referred to a surgeon or primary care provider to explore the role and benefits of surgical repair.	Carne et al., 2003 (V) Chen et al., 2021 (III) DeRobles & Young, 2020 (III) Krogsgaard et al, 2020 (IV)	9, 65, 66, 74	III - V	

Recommendation	Evidence	References	Assigned RAO Level of Evidence	Notes	
14	An individual living with a parastomal hernia must be assessed to determine the impact of the hernia on their health-related quality of life and body image and be provided with personalized follow up care to address their specific psychosocial needs.	ASCN, 2016 (V) Ayuso et al., 2021 (Ia) Fox et al., 2021 (IV) Goodman et al., 2022 (III) Kald et al., 2008 (IV) Readding, 2014 (V) Ripoche et al., 2011 (IIa) Sahebally et al., 2021 (Ia) Tabusa et al., 2021 (IIb)	13, 37, 48-50, 52, 64, 75, 76	Ia - V	ASCN, Goodman et al and Readding outside the scoping review.
15	Further research is required to gain a greater understanding of the risk factors associated with, prevention of, and management strategies for parastomal hernias.	Ayuso et al., 2021 (Ia) Baier et al., 2021 (IV) Bertoglio et al., 2021 (IV) Borglit et al., 2022 (III) Fox et al., 2021 (IV) Harraz et al., 2020 (IV) Harries et al., 2021 (IV) Hotouras et al., 2013 (III) Hubbard et al., 2019 (III) Hubbard et al., 2020 (IV) Tabusa et al., 2021 (IIb)	5, 18, 35, 36, 47, 48, 50, 64, 77-79	Ia - IV	Borglit outside the scoping review.

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Ia	Evidence obtained from meta-analysis or systematic review of randomized controlled trials and/or synthesis of multiple studies primarily of quantitative research.
Ib	Evidence obtained from at least one randomized controlled trial.
IIa	Evidence obtained from at least one well-designed controlled study without randomization.
IIb	Evidence obtained from at least one other type of well-designed quasi-experimental study without randomization.
III	Synthesis of multiple studies primarily by qualitative research.
IV	Evidence obtained from well-designed non-experimental observational studies, such as analytical studies, or descriptive studies and/or qualitative studies.
V	Evidence obtained from expert opinion or committee reports, and/or clinical experiences of respected authorities.

APPENDIX 2 - CLINICAL ASSESSMENT IDENTIFYING RISK OF PARASTOMAL HERNIA⁸

Predisposing consideration	Risk factor	Value	Total
Age	Age 5-15	1	
	Over 70	3	
BMI	Obese	3	
Occupation/lifestyle	Manual*	3	
	Young family	2	
Activity	Fairly active	2	
	Gym / physical exercise	3	
Stoma site	Transverse colostomy	3	
	Colostomy	2	
	Stoma out of rectus muscle	2	
	Previous parastomal hernia repair	3	
	Trephine stoma	2	
	Aperture > 35 mm	3	
Diagnosis	Malignancy	2	
	Diverticular	2	
	Existing hernia (any)*	3	
	Previous hernia	3	
	Abdominal aortic aneurysm	1	
	Connective tissue disorders	2	
	Diabetic up to 1 year after surgery	2	
	Diabetic	1	
Smoking	Smoker	3	
Medication	Steroids up to 1 year after surgery	3	
	Steroids after 1 year	2	
Raised intra-abdominal pressure	COPD / emphysema	3	
	Ascites	3	
	Acute / chronic constipation (colo/uro)	2	
		Final total	

Note. 1 = low risk; 2 = medium risk; 3 = high risk; * indicates high risk regardless of other scores.
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APPENDIX 3 - PREOPERATIVE STOMA SITE MARKING ENABLER²⁵

CANADIAN PRACTICE ENABLER FROM THE POSITION STATEMENT ON PREOPERATIVE STOMA SITE MARKING FOR FECAL DIVERSIONS – ILEOSTOMY & COLOSTOMY

You are welcome to make copies of this enabler of practice. Users of this enabler of practice must ensure they have first familiarized themselves with the full position statement.



OBTAIN – IDENTIFY – ASSESS – MARK



Figure 1 - This photograph is an example of the four quadrants marked in a sitting position. The marks in the upper quadrant are more within the patient's line of vision. **Figure 2** - This shows how the marked positions of four quadrants look different when the patient is standing on the same patient.

PREOPERATIVE STOMA MARKING PROCEDURE

1. Stoma site selection and marking must only be undertaken by qualified practitioners within their scope of practice and who possess the knowledge, skill and judgment to perform stoma site marking – a surgeon or NSWOC are recommended.
2. Invite the preoperative patient to a private area to explain the process.
3. Provide patient education and counselling on living with an ostomy.
4. Obtain patient verbal consent for the assessment and stoma site marking.
5. Learn from the patient their typical range of movements related to their mobility, occupation, lifestyle and cultural practices.
6. Identify the patient's usual beltline in addition to the waistline of the patient in normal clothing in sitting and standing positions.
7. Ask the patient to remove enough clothes to allow access to the abdomen while maintaining privacy.
8. Assess the abdomen to observe scars, skin folds, hernias, skin mounds, creases, wrinkles, bony protuberances/iliac crest, radiation sites, pendulous breasts, and the location of the umbilicus.
9. Ask the patient to lie on their back and have the patient raise their head to see their feet to identify the edge of the rectus abdominis muscle.
10. Identify the halfway point on the imaginary diagonal line between bony protuberances/iliac crest and the umbilicus.
11. Ask the patient to sit, stand, bend, twist and lie down to identify any creases or concerns with the proposed site.
12. Consider the patient's BMI/body habitus and eyesight to confirm that the suggested stoma site is within their visual field, if possible.
13. Mark the abdomen on the flattest possible place in the appropriate quadrant for the planned surgery within the borders of the rectus abdominis muscle, 5cm away from considerations identified in step 8 with a regular pen.
14. Seek a second opinion in the complex abdomen from another NSWOC or surgeon, which may involve sharing a photograph with the patient's consent.
15. Remark with a permanent skin marker on the patient's abdomen, the site agreed by the patient and the NSWOC.
16. Cover the mark with a transparent film dressing. Explain to the patient the importance of maintaining the mark and give supplies to reinforce marking, if required. Remove all other marks with an alcohol swab.
17. Document details in the patient's health record.

OBTAIN – Patient consent

IDENTIFY – ROM - Dexterity - Occupation - Lifestyle - Religious practices - Waistline of the patient (sitting and standing) - Rectus abdominis muscle - Imaginary line connecting umbilicus and iliac crest.

ASSESS – Scars - Skin folds - Hernias - Skin mounds, creases and wrinkles - Bony protuberances - Radiation sites - Pendulous breasts - Location of the umbilicus in sitting, lying, standing, bending and twisting positions.

MARK – On the flattest possible site, after assessing in all positions, in the appropriate quadrant – within the borders of the rectus abdominis muscle – 5 cm away from folds, creases, hernias, bony prominence, scars, umbilicus, and radiation sites – in the patient's visual field – mark with a permanent marker and cover with transparent film. Colostomy sites are predominantly marked on the left side of the abdomen and ileostomy on the right side of the abdomen.

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APPENDIX 4 - EUROPEAN HERNIA SOCIETY CLASSIFICATION TYPES OF PARASTOMAL HERNIA³

EHS Parastomal Hernia Classification		Small ≤ 5 cm	Large > 5 cm
Concomitant incisional hernia	No	I	III
	Yes	II	IV
		P □	R □

Note. P = primary parastomal hernia; R = recurrence after previous parastomal hernia. Reproduced under Creative Commons licence. Springer.

GLOSSARY

parastomal hernia—an abnormal protrusion of the contents of the abdominal cavity through the abdominal wall defect created during placement of a colostomy, ileostomy, or ileal conduit stoma.

peristomal skin—is within the 6-10 cm of skin surface surrounding an abdominal stoma or skin covered by the adhesive portion of the pouching system (skin barrier and tape).⁸⁰

prehabilitation—the process of optimizing physical functionality preoperatively to enable the individual to maintain a normal level of function during and after surgery.

support garment/belt—an individualized adjustable belt, panty, girdle, boxer short designed to provide support to the abdominal muscles for the prevention of parastomal hernia.

fascial trephine—a circular incision in the abdominal wall for placement of the stoma.

ABBREVIATIONS

ACGBI—Association of Coloproctology of Great Britain and Ireland

ASCN UK—Association of Stoma Care Nurses UK

CIPHER—UK cohort study to investigate the prevention of parastomal hernia

CT—computerized tomography

EHS—European Hernia Society

HIIT—high intensity interval training

NSWOC—Nurse Specialized in Wound, Ostomy, and Continence

NSWOCC—Nurses Specialized in Wound, Ostomy and Continence Canada

PT—physiotherapist

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