



## Research paper

# The impact of ostomy nursing care on the risk of postoperative ostomy complications

**Piotr Kluska<sup>1</sup>, Ryszard Tomasiuk<sup>2</sup>, Joanna Mik-Wojtczak<sup>3</sup>, Kamila Kluska<sup>4</sup>, Michał Mik<sup>5</sup>**

<sup>1</sup>Department of General Surgery, Kazimierz Pulaski University of Technology and Humanities in Radom, Radom, Poland

<sup>2</sup>Department of Basic Medical Sciences, Kazimierz Pulaski University of Technology and Humanities in Radom, Radom, Poland

<sup>3</sup>PHIN Consulting, Lodz, Poland

<sup>4</sup>Kazimierz Pulaski University of Technology and Humanities in Radom, Radom, Poland

<sup>5</sup>Department of General and Colorectal Surgery, Medical University of Lodz, Lodz, Poland

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## ABSTRACT

**Introduction:** The most common risk factors for ostomy complications include the cause of stoma emergence (cancer, inflammatory bowel diseases), the type of stoma, concomitant diseases, and stoma care during pre- and postoperative periods.

**Aim:** In this study, authors assessed the impact of stoma care and stoma site designation prior to surgery based on the occurrence of ostomy complications.

**Material and methods:** The study included 104 patients (49 women, 54 men, with the mean subject age being 57 years) in whom a stoma was diagnosed in 2010–2022. The study was conducted in a group of patients who were diagnosed with an intestinal stoma between 2010–2022.

**Results and discussion:** The overall risk of ostomy complications was 84.62%, and the most common complication in the analysed arm was dermatitis around the stoma, which occurred in 78 patients (75% of participants). The study found a 13-fold increase in the risk of ostomy complications in patients who were not under the care of a stoma nurse and in whom a stoma site was not determined prior to surgery (RR = 13.11, CI: 4.21–58.64,  $P < 0.001$ ). The analysis found a lower risk of dermatitis in patients under the care of a stoma nurse when compared to stoma patients without such care (RR = 0.38, CI: 0.16–0.78,  $P = 0.014$ ).

**Conclusions:** The outcomes of this study confirmed that the stoma site should be determined prior to any surgical procedure in which there is a risk of stoma emergence. In addition, every patient with a stoma should be under the care of a stoma nurse pre- and post-operatively.

## 1. INTRODUCTION

There are approximately 700,000 stoma patients in Europe and approximately 1,000,000 in the USA.<sup>1–3</sup> The incidence rate of ostomy complications varies between 3%–81%.<sup>4–7</sup> The most common complications include dermatitis around the stoma, parastomal hernia, prolapse or narrowing and collapse of the stoma and lack of mucocutaneous adhesion.<sup>8–11</sup> In addition, approximately 8% of patients suffer from more than one ostomy complication.<sup>12</sup> The most common cause of stoma emergence is considered to be colorectal cancer.<sup>13–15</sup> Other causes of stoma emergence include inflammatory bowel diseases, complicated diverticulitis, stool incontinence, and injury.

The common risk factors for ostomy complications include body weight, age, cause of stoma emergence, concomitant diseases, stoma emergence mode (ostomy vs elective).<sup>6</sup> One of the most common risk factors for ostomy complications is the determination of the ostomy site prior to surgery and the care of a stoma nurse post-operatively.<sup>16–18</sup> Perioperative care of the ostomy patient is mainly the responsibility of stoma nurses working in the General and Colorectal Surgery Departments.<sup>19–20</sup> In the absence of a stoma nurse, the stoma site is designated by the surgeon prior to surgery.<sup>21</sup>

Pearson et al.<sup>22</sup> conducted a clinical study with a large sample of 3509 patients with colostomy and ileostomy. It was proven that urgent or elective surgical intervention with stoma placement did not affect the nature of complications. Patients with an ileostomy had the most frequent cases of contamination and leakage, especially at night. Complications became more severe 2 years after surgery. Parastomal hernia developed in 35% of patients with an ileostomy and in 46% of patients with a colostomy. At the same time, the location of the stoma was previously determined in 40% of urgent patients and in 96% of planned operations.

According to Albulescu et al.,<sup>23</sup> in order to avoid additional complications and improve the patient's quality of life, it is necessary to take into account a number of factors regarding the preoperative determination of the location of the stoma. In particular, the stoma site should be located away from the surgical site, skin folds and postoperative scars. Optimally, the stoma should be surrounded by a smooth area of healthy skin with a diameter of at least 3 cm. If the patient has a protruding stomach, it is advisable to localize the stoma at the top of the abdominal contour.<sup>24</sup> If the body mass index (BMI) is excessively high, it is better to install the stoma in the upper abdominal quarter, in the place of the thinnest layer of adipose tissue.<sup>25</sup>

Folguera-Arnau et al.<sup>26</sup> tracked the dynamics of complications in patients with an intestinal or urological stoma in 8 clinics where a program of recommendations for stoma care was implemented at 2012–2018. During this time, the number of operations with pre-labeled stoma increased from 25% to 34%. At the same time, the frequency of occurrence of peristomal dermatitis decreased from 17% to 11%. On the other hand, the number of stomal complications increased from 22% to 28%. Obviously, not only the preoperative determination of location and postoperative

care affect the quality of life of a patient with a stoma. Zhou et al.<sup>27</sup> followed 46 patients with ileal stoma (after cystectomy) for 6 months. The control part of the sample carried out independent routine stoma care, while the experimental part received structured multi-component care services from the medical staff. The patients showed skin damage associated with constant moistening of the peristomal area, as well as deposition of uric acid crystals in the peristomal space. However, complications were recorded in only 4% of people from the experimental group, and in 30% of patients from control cohort. The quality of life of people with comprehensive care was assessed with a conditional score of 154, and the group receiving routine care – 138.

## 2. AIM

The aim of this work was to assess the risks of complications of various etiologies in patients with an intestinal stoma in Poland, depending on the preoperative determination of the location of the stoma and the provision of postoperative preventive nurse care. In addition to the complications mentioned in the work, these factors have an influence on the development of other pathological phenomena that were not recorded in the medical histories of the studied sample of patients.

## 3. MATERIAL AND METHODS

The study was conducted in a group of patients who were diagnosed with an intestinal stoma at the General and Colorectal Surgery Department in Lodz, at the Provincial Hospital in Bełchatów, and at the Multi-speciality Hospital in Radom between 2010 and 2022. The study analysed the overall and individual ostomy complications, i.e., dermatitis around the stoma, the occurrence of parastomal hernia, stoma prolapse, and stoma stricture. The effect of stoma site designation prior to surgery and receiving post-operative care from a stoma nurse was analysed. It was taken into account such parameters of patients as: age of patients, sex, BMI, type of surgery (laparotomy or relaparotomy), the stoma location (small or large intestine), and the cause of stoma necessity (oncology transformation, inflammation of the bowel, or others). The age and BMI have been fixed at the day of surgery. Some patients had single-barrelled stomas, and the others – a double-barrelled one.

In cases of postoperative care of the peristomal surface, the treatment was carried out two or three times a day (depending on the diagnosis, type of complication, and purpose) and was supervised by the medical staff or the patient personally. Patient histories and treatment protocols were completed by wounds, ostomy, and continence-certified nurses. This certificate defines the correct care of wounds, stomas, and incontinence in patients.

The study was retrospective. Based on medical documentation and documentation from an outpatient surgical clinic, the occurrence of ostomy complications – both early

and late – was assessed within 3–6 months of the procedure. The analysis of the impact of variables on the occurrence of overall and specific ostomy complications was carried out using a logistic regression model based on a generalised linear model. Standardised parameters were obtained by matching the model to the standardised version of the data set. In total, 95% confidence intervals (95%CI) and *P* values for individual model variables were calculated using Wald distribution approximation. The difference between groups was regarded as statistically significant in cases of  $P \leq 0.05$ .

## 4. RESULTS

The study included 104 patients who underwent stoma emergence surgery. Of this group, 74 patients had a single-barrel stoma, while 30 had a double-barrelled stoma. The study included slightly more men (52.88%) than women (47.12%), but this difference was not statistically significant ( $P = 0.623$ ). The mean age of the patients was 57.5 years, with a range of 37 to 71 years, with an insignificant difference in mean age ( $P = 0.915$ ). Among patients, the median BMI ( $n = 85$ ) was 23.42 kg/m<sup>2</sup> (with a range of 20.42 to 27.56 kg/m<sup>2</sup>). There was no significant difference in BMI between the single- and double-barrel stoma arms ( $P = 0.371$ ).

In the study, the stoma was most often found in the small intestine (68.27% of patients). Colostomy was identified in 31.73% of patients. The most common causes of stoma emergence were inflammatory bowel diseases (43.27%) and malignant diseases (35.58%). Other information regarding the study group is included in Table 1.

The study patient group was diverse in terms of age, gender, type of stoma emergence, as well as its causes. There

were no significant differences between the single-barrel and double-barrel stoma arms in terms of the above characteristics, suggesting that the two arms were similar in these respects. This highlights that the outcomes of this study may be representative of the wider stoma patient population. In the study patient group, the majority (74.04%) received care from a stoma nurse post-operatively. The stoma emergence site prior to surgery was determined in 75.96% of patients. Ostomy complications occurred in 84.62% of patients. Dermatitis around the stoma was the most common complication, affecting 75% of patients. In contrast, parastomal hernia was the second most common complication and occurred in 28.85% of patients. Stoma prolapse and stricture were less common and occurred in 15.38% and 17.31% of patients, respectively. Details regarding complications are included in Table 2.

Before the surgery, the ostomy type has been designed. The preferred location for the formation of ileostomies was the distal ileum, just proximal to the cecum. In general, in patients with soft, flaccid abdomens, the ostomy was designed with a firm wafer, whereas in patients with firm abdominal wall tissue, the ostomy was designed with a more flexible wafer. Convex rings were practiced for patients with retracted or flush stomas because they could funnel the effluent and reduce the frequency of leaks. Patients were prescribed a diet to provide the slow migration of chyme through the digestive tract, as well as to reduce the volume of urine, water retention by the kidneys, and a general decrease in the percentage of body water. In particular, it was recommended to eat sufficiently salty food, with a restriction of simple carbohydrates, in small portions, five to six times a day, and to chew thoroughly, drink liquids, and eat solid food separately.

**Table 1. Characteristics of the tested trial.**

Characteristics	N	Overall	Stoma type		P
			Single-barrel N <sub>1</sub> = 74	Double-barrelled N <sub>2</sub> = 30	
Sex of the patient	104				
Female, n(%)		49 (47.12)	36 (48.65)	13 (43.33)	0.623 <sup>2</sup>
Male, n(%)		55 (52.88)	38 (51.35)	17 (56.67)	
Type of surgery	104				
Laparotomy, n(%)		88 (84.62)	60 (81.08)	28 (93.33)	0.120 <sup>3</sup>
Relaparotomy, n(%)		9 (8.65)	9 (12.16)	0 (0.00)	
Other, n(%)		7 (6.73)	5 (6.76)	2 (6.67)	
Age, years	104	57.50 (37.71) <sup>1</sup>	57.50 (36.25, 71.00) <sup>1</sup>	57.00 (38.50, 69.75) <sup>1</sup>	0.914 <sup>4</sup>
BMI, kg/m <sup>2</sup>	85	23.42 (20.42, 27.56) <sup>1</sup>	23.39 (20.41, 27.36) <sup>1</sup>	24.41 (21.46, 28.04) <sup>1</sup>	0.370 <sup>4</sup>
Stoma site	104				
Small intestine, n(%)		71 (68.27)	53 (71.62)	18 (60.00)	0.249 <sup>2</sup>
Large intestine, n(%)		33 (31.73)	21 (28.38)	12 (40.00)	
Cause for the stoma emergence	104				
Inflammatory bowel diseases, n(%)		45 (43.27)	34 (45.95)	11 (36.67)	0.593 <sup>3</sup>
Malignant disease, n(%)		37 (35.58)	26.00 (35.14)	11 (36.67)	
Other, n(%)		22 (21.15)	14 (18.92)	8 (26.67)	

Comments: <sup>1</sup> Mdn (Q1, Q3); <sup>2</sup> Pearson's chi-squared test; <sup>3</sup> Fisher's exact test; <sup>4</sup> Wilcoxon rank-sum test.

**Table 2. Characteristics of ostomy complications.**

Characteristics	N (%)
Post-operative care of a stoma nurse	104 (100)
No	27 (25.96)
Yes	77 (74.04)
Determination of the stoma emergence site prior to surgery	104 (100)
No	25 (24.04)
Yes	79 (75.96)
Occurrence of ostomy complications (overall)	104 (100)
No	16 (15.38)
Yes	88 (84.62)
Occurrence of dermatitis around the stoma	104 (100)
No	26 (25.00)
Yes	78 (75.00%)
Occurrence of parastomal hernia	104 (100)
No	74 (71.15)
Yes	30 (28.85)
Occurrence of stoma prolapse	104 (100)
No	88 (84.62)
Yes	16 (15.38)
Stoma stricture	104 (100)
No	86 (82.69)
Yes	18 (17.31)

After the meal, patients had to rest for 15–30 minutes. To maintain mineral balance, they had to consume low-calorie drinks with electrolytes. To prevent dehydration, it was necessary to monitor the symptoms of dry mouth, nausea, oliguria, constant thirst and dizziness. The ostomy system included an odour-proof pouch (with a built-in fastener), a skin barrier, and a waterproof tape. The skin barrier was an adhesive layer of hydrocolloid, cut around the opening in such a way that the physiological secretions had no contact with the skin, so did not irritate it.<sup>28–29</sup> As the postoperative oedema subsided, the adhesion density decreased; as it decreased, it was corrected with a hydrocolloid layer. A skin barrier paste to improve the containment that has been applied to some patients. The patients were given a number of recommendations for caring for the ostomy and system at home.

To prevent the bag from detaching from the skin due to its weight, it was recommended to empty it at least 6 times a day. Because of detergents and water, the hydrocolloid layer and film of the bag softened, so one did not need to be washed, just wiped with a tissue after emptying. It was recommended to change a pouch every 3–7 days. The nurse's care of the peristomal skin area included drying with acetic acid-soaked dressings, periodic cooling of the area, and topical treatment with tacrolimus. For patients with excessive secretions (more than 1200 mL per day), drugs were prescribed that slowed down intestinal peristalsis: loperamide (loperamide hydrochloride, 4 mg) and Lomotil (atropine sulphate/diphenoxylate hydrochloride, 2.5–5.0 mg). They

**Figure 1. The case of peristomal irritant contact dermatitis.**

were supplemented with drugs that slowed down gastric/intestinal secretion: omeprazole and cholestyramine. It was shown that consumption of restricting hypotonic or hypertonic fluids reduced the volume of ostomy output in some patients: coffee, fruit juices, slight salt solutions, and cola. In some cases of dermatitis, the peristomal irritant contact dermatitis has been revealed (Figure 1). It was caused by faecal skin damage and successful bacterial inflammation development around the stoma (in separate cases).

Contact dermatitis in the acute phase has been characterised by severe redness around the stoma and vesiculation.<sup>30</sup> The chronic phase has been manifested by severe drying of the skin, the appearance of cracks, and peeling.<sup>31</sup> In these patients, the nurse care consisted of a specialised treatment. To reduce the inflammatory process, make immunosuppression, and alleviate the patient's condition, a combination of fast- and long-acting corticosteroids (betamethasone phosphate and betamethasone propionate, intra-

**Figure 2. The case of parastomal hernia.**

dermal injection) was practiced. This drug made it possible to inhibit the migration of leukocytes, as well as the activation of T-lymphocytes and phagocytosis, and also reduced the titer of immunoactive cells at the focus of inflammation. Because of its action, the production of prostaglandins and related inflammatory molecules fell down, and the dilation of blood vessels has been counteracted. In cases of complication with candidiasis, the skin has been treated with antifungal powder (nystatin or 2% miconazole). For patients with hypersensitivity to the above-mentioned drug, the usage of immunomodulators, calcineurin inhibitors, has been recommended. They ultimately suppressed signal transmission by phosphorylation in T cells. Due to this mechanism, the inflammatory reaction has been suppressed. Such drugs included tacrolimus and pimecrolimus. The complication in the form of parastomal hernia is illustrated by Figure 2.

There are three techniques for the repair of parastomal hernia: the laparoscopic approach, the suture repair, and the restraining mesh usage. The suture repair technique was not recommended for patients because of high risks of recurrence. At the same time, the laparoscopic treatment has no advantages versus open surgery. For laparoscopic parastomal hernia repair, a mesh without a hole was suggested in preference to a keyhole mesh. In mesh technique, the use of specific mesh material for parastomal hernia repair has not been recommended: there were no preferences for bio or synthetic materials for recurrence.

When assessing the impact of perioperative stoma care on the overall risk of complications, it was found that patients who had a stoma emergence site designated prior to surgery had a 60% (RR = 0.40, 95%CI: 0.13–0.97) lower risk of ostomy complications compared to those who did not have this procedure. This effect was close to statistical significance ( $P = 0.071$ ). Patients who received stoma nurse care post-operatively had a 62% (RR = 0.38, 95%CI: 0.12–0.91) lower risk of ostomy complications compared to those who did not receive such care. This effect was also close to statistical significance ( $P = 0.053$ ). For patients who did not have a designated stoma site prior to surgery and did not receive nursing care postoperatively, the risk of ostomy complications was 13 times higher (RR = 13.11, 95%CI: 4.21–58.64,  $P < 0.001$ ). Other data regarding the impact of stoma care on the overall risk of complications are presented in Table 3.

It was demonstrated that patients who had a designated stoma site prior to surgery had a 20% lower risk of dermatitis around the stoma. Nevertheless, this effect did not turn out to be statistically significant (RR = 0.80, 95%CI: 0.40–1.52,  $P = 0.497$ ). On the other hand, patients who received nursing care post-operatively had a 62% lower risk of dermatitis around the stoma. This effect was statistically significant (RR = 0.38, 95%CI: 0.16–0.78,  $P = 0.014$ ), which indicates the importance of nursing care in reducing the risk of dermatitis around the stoma. In turn, the lack of post-operative stoma

**Table 3. Stoma care and the risk of ostomy complications.**

Ostomy complications	Explanatory variables		
	Lack of stoma site designation and without the care of a stoma nurse	Determination of the stoma emergence site (Yes)	Post-operative care of a stoma nurse (Yes)
Overall occurrence of stoma complications			
RR	13.11	0.40	0.38
95%CI	4.21–58.64	0.13–0.97	0.12–0.91
<i>P</i>	<0.001***	0.071	0.053
Dermatitis around the stoma			
RR	5.10	0.80	0.38
95%CI	2.22–13.54	0.40–1.52	0.16–0.78
<i>P</i>	<0.001***	0.497	0.014*
Occurrence of parastomal hernia			
RR	0.88	0.66	0.84
95%CI	0.46–1.67	0.37–1.19	0.48–1.50
<i>P</i>	0.696	0.167	0.558
Stoma prolapse			
RR	0.42	0.78	1.04
95%CI	0.19–0.86	0.41–1.54	0.54–2.08
<i>P</i>	0.022*	0.470	0.918
Stoma stricture			
RR	0.37	1.36	0.78
95%CI	0.16–0.77	0.68–2.88	0.42–1.47
<i>P</i>	0.011**	0.404	0.427

Comments: RR – relative risk; statistically sufficient difference: \*  $P \leq 0.05$ ; \*\*  $P \leq 0.01$ ; \*\*\*  $P \leq 0.001$ .

care and stoma site designation prior to surgery increased the risk of dermatitis more than five times ( $RR = 5.10$ , 95%CI: 2.22–13.54,  $P < 0.001$ ).

In this analysis, authors did not find a statistically significant impact of stoma care on the risk of parastomal hernia ( $P = 0.696$ ). The designation of the stoma site and the post-operative care of a stoma nurse separately did not have a statistically significant impact on the risk of stoma prolapse and stricture. In contrast, the absence of stoma care of any kind (stoma site designation and post-operative nurse care) in this analysis was associated with a lower risk of stoma prolapse and stricture. Stoma prolapse was 58% less frequent in these patients ( $RR = 0.42$ , 95%CI: 0.19–0.86,  $P = 0.022$ ). In contrast, stoma stricture was 63% less frequently diagnosed in patients without any stoma care ( $RR = 0.37$ , 95%CI: 0.16–0.77,  $P = 0.011$ ).

Thus, this study showed that preventive determination of the location of the stoma and proper nursing care of the stoma help to reduce the risks of development of parastomal hernia, peristomal dermatitis and occurrence of stoma prolapse.

## 5. DISCUSSION

Year by year, the number of intestinal stomas is increasing. Therefore, the risk of ostomy complications also increases. In the literature, there are many reports of a reduction in the number of ostomy complications in patients under the care of a stoma nurse during the perioperative and post-operative periods.<sup>32</sup> Approximately 15% of patients enter the operating room without prior stoma site designation. This is especially true for patients being operated on in the emergency room.<sup>33</sup> In this study, most patients had a stoma site designated prior to surgery (75.9%), which is confirmed by data from the literature. However, it is important to note that the sites where the study was conducted had a stoma nurse on duty and the medical staff were trained on how to designate a stoma prior to surgery which is not necessarily the standard in other sites.

Based on the available literature, it can be concluded that patients with a designated stoma site prior to surgery have a lower risk of ostomy complications than those in whom it has not been designated (this applies mainly to patients operated on in the ostomy mode). According to the available literature, the incidence rate of ostomy complications in the absence of stoma site designation prior to surgery may increase up to twofold, which is reflected in this work in which the lack of ostomy site designation prior to surgery and the lack of care of a stoma nurse increased the risk of ostomy complications by a total of 13 times.<sup>34</sup>

Numerous publications, including Zewude et al.,<sup>35</sup> Zwiep et al.,<sup>36</sup> Ambe et al.,<sup>37</sup> Ota et al.,<sup>38</sup> Slagle et al.,<sup>39</sup> report that patients who have a stoma site on the abdomen have a better quality of life after the procedure in relation to patients who have not undergone it. Persson came to similar conclusions by analysing the impact of preoperative stoma site designation based on the frequency of complications,

quality of life and patient independence after surgery. Persson found that the quality of life of patients whose stoma site was designated preoperatively was significantly better than that of patients who were not, their independence parameters were significantly improved, and the percentage of complications was lower. All these outcomes were statistically significant, regardless of the type of stoma.

In contrast, some studies found that the designation of the stoma site by a stoma nurse prior to surgery did not affect the incidence rate of skin complications, but reduced the risk of early ostomy complications, i.e. within 30 days of the intestinal stoma emergence. Ayik et al.<sup>32</sup> observed that parastomal hernia is much more common in patients not evaluated by a stoma nurse prior to surgery ( $OR\ 7.895$ ,  $P = 0.002$ ). In this study, the impact of stoma nurse care and stoma site designation prior to surgery was not statistically significantly associated with a greater risk of parastomal hernia. These outcomes suggested that the parastomal hernia is a complex phenomenon that is likely the result of many factors that have not been studied in this analysis. It is necessary to consider that the main risk factors for parastomal hernias are female sex, age over 60 years,  $BMI > 25$ , hypertension, nicotine use.<sup>40,41</sup> Furthermore, according to the literature, the stoma is supposed to emerge via the straight abdominal muscle, which may reduce the risk of parastomal hernia.

On the other hand, in the case of ostomy surgery, it is often impossible for the stoma nurse to designate the stoma site prior to surgery due to the urgency of the operation and the absence of such a nurse on call. In Tsujinaka et al.<sup>42</sup> study, of the 19 stomas performed in the emergency room, only 10 were designated prior to surgery. In contrast, 72 of the 78 elective stomas were designated prior to surgical treatment.

In this study, the majority of patients (75.9%) had a stoma site designated prior to surgery by a stoma nurse or surgeon, and the most common ostomy complication was dermatitis around the stoma, which occurred in as many as 75% of patients and was less in patients in whom a stoma site was designated prior to surgery. Nevertheless, this value was not statistically significant. Similarly, in the case of other ostomy complications, i.e. parastomal hernia and stoma prolapse, in which the designation of the stoma site reduced the risk of these complications, but in a statistically insignificant manner. This is related to the rare occurrence of these complications in the study arm. Kim et al.,<sup>11</sup> Nozawa et al.<sup>43</sup> and Guler et al.<sup>44</sup> came to similar conclusions, who in independent studies stated that the designation of the stoma site prior to surgery was associated with an overall lower risk of ostomy complications, including skin complications. In the study, the risk of parastomal hernia and stoma prolapse in patients with a previously designated stoma site was also lower, but these outcomes were not statistically significant.

In the study arm, the majority (74%) of patients were provided care by a stoma nurse after ostomy surgery. The care of the stoma nurse reduced the risk of ostomy complications in general, including dermatitis around the stoma to the greatest extent. This is understandable due to



the difficulty in operating ostomy equipment, especially in elderly patients and in the early stages of intestinal stoma emergence.

In addition, the care of the stoma nurse post-operatively reduced the risk of stoma hernia, and stoma stricture post-operatively. However, these outcomes were not statistically significant, which is most likely due to the small number of study participants and the multifactorial nature of the origin of ostomy complications. In turn, in the study patient group, ostomy prolapse was slightly more frequent in patients under the care of a stoma nurse. The outcome was far from statistically significant and may also have been related to the stoma nurse's more frequent recognition of this complication compared to those who were not under the care of a stoma nurse.

One should note that the stoma nurse's role is not only to select stoma devices but to provide holistic care for the patient with a stoma, including the selection of post-operative hernia belts or skin care products and recommendations for the stoma patient's way of life. The outcomes authors obtained confirm how important the role of the stoma nurse is. Burch<sup>45</sup> comes to similar conclusions, according to which the care of a stoma nurse after surgery reduced the number of stoma complications (OR=0.15; 95%CI: 0.03–0.69).

Zewude et al.<sup>35</sup> also stated in their work that the lack of post-operative care by a stoma nurse increases the risk of ostomy complications. They noted a particular correlation in older patients in whom the lack of care of a stoma nurse was associated with a greater number of ostomy complications and a worse psychological condition of the patient. Bird et al.<sup>46</sup> also suggested the need for care by a stoma nurse in elderly patients after ostomy surgery.

In turn, in this study, the simultaneous lack of stoma site designation prior to surgery and the lack of care of a stoma nurse post-operatively were associated with a lower risk of stoma prolapse and stricture. This is most likely related to the underestimation and lesser recognition of these complications in patients who are not under stoma care. In addition, in this study, 15.8% of patients suffered from stoma prolapse and 17.31% had stoma stricture and a more quantitatively representative group of patients is necessary in the future to more accurately assess the risk factors for these complications.

## 5. CONCLUSIONS

1. Preventive determination of the stoma site before surgery reduced overall complication risk by 60% and dermatitis risk by 20%.
2. Post-operative nursing care reduced the overall risk of complications by 62%.
3. The absence of both preoperative stoma site designation and post-operative nursing care increased the overall risk of complications 13 times.
4. The risk of peristomal dermatitis increased fivefold in patients without designated stoma site and post-operative nursing care.

5. Post-operative nursing care significantly reduced the risk of dermatitis around the stoma.
6. Parastomal hernia, stoma prolapse, and stricture are complex conditions influenced by multiple factors not analyzed in this study.
7. The study was limited by a small sample size from three clinics in different cities, which may affect generalizability.

## Conflict of interest

Authors declare no competing interest.

## Funding

No funding was received for conducting this study.

## Ethics

The study was conducted according to the ethical principles established by the Declaration of World Medical Association of Helsinki and was approved by the Ethics Committee, which included representatives of the above-mentioned hospitals. A study was approved by the Kazimierz Pulaski University of Technology and Humanities in Radom, No. 98753. Patients participated in the clinical trial on a voluntary basis with strict confidentiality and anonymity of all the data. The patients have previously been informed about the design of the experiment (verbally and in writing), after which they signed voluntary consent documents.

## Data availability

All data supporting the findings of this study are available from the corresponding author upon reasonable request.

## References

- 1 Hubbard G, Beeken RJ, Taylor C, et al. A physical activity intervention to improve the quality of life of patients with a stoma: A feasibility study protocol. *Pilot Feasibility Stud.* 2019;5:78. <https://doi.org/10.1186/s40814-019-0461-2>.
- 2 Claessens I, Probert R, Tielemans C, et al. The Ostomy Life Study: The everyday challenges faced by people living with a stoma in a snapshot. *Gastrointest Nurs.* 2015;13(5):18–25. <https://doi.org/10.12968/gasn.2015.13.5.18>.
- 3 Wound, Ostomy and Continence Nurses Society & Guideline Development Task Force. WOCN society clinical guideline: Management of the adult patient with a fecal or urinary ostomy – An executive summary. *J Wound Ostomy Continence Nurs.* 2018;45(1):50–58. <https://doi.org/10.1097/WON.0000000000000396>.
- 4 Correa Martinez A, Bock D, Carlsson E, et al. Stoma-related complications: A report from the Stoma-Const randomized controlled trial. *Colorectal Dis.* 2021;23(5):1091–1101. <https://doi.org/10.1111/codi.15494>.
- 5 Malik T, Lee MJ, Harikrishnan AB. The incidence of stoma related morbidity – A systematic review of randomised

- controlled trials. *Ann R Coll Surg Engl.* 2018;100(7):501–508. <https://doi.org/10.1308/rcsann.2018.0126>.
- 6 Arolfo S, Borgiotto C, Bosio G, et al. Preoperative stoma site marking: A simple practice to reduce stoma-related complications. *Tech Coloproctol.* 2018;22(9):683–687. <https://doi.org/10.1007/s10151-018-1857-3>.
  - 7 Babakhanlou R, Larkin K, Hita AG, et al. Stoma-related complications and emergencies. *Int J Emerg Med.* 2022;15:17. <https://doi.org/10.1186/s12245-022-00421-9>.
  - 8 Sung YH, Kwon I, Jo S, Park S. Factors affecting ostomy-related complications in Korea. *J Wound Ostomy Continence Nurs.* 2010;37(2):166–172. <https://doi.org/10.1097/10.1097/WON.0b013e3181cf7b76>.
  - 9 Nastro P, Knowles CH, McGrath A, et al. Complications of intestinal stomas. *Br J Surg.* 2010;97(12):1885–1889. <https://doi.org/10.1002/bjs.7259>.
  - 10 Harilingam M, Sebastian J, Twum-Barima C, et al. Patient-related factors influence the risk of developing intestinal stoma complications in early post-operative period. *ANZ J Surg.* 2017;87(10):E116–E120. <https://doi.org/10.1111/ans.13397>.
  - 11 Kim YM, Jang HJ, Lee YJ. The effectiveness of preoperative stoma site marking on patient outcomes: A systematic review and meta-analysis. *J Adv Nurs.* 2021;77(11):4332–4346. <https://doi.org/10.1111/jan.14915>.
  - 12 Radkowski P, Dawidowska-Fidrych J, Fidrych R, Podlińska I, Mandziuk-Radkowska O, Mieszkowski M. Postoperative residual curarization as a complication after general anesthesia. *Pol Ann Med.* 2022;29(2):274–280. <https://doi.org/10.29089/2021.21.00204>.
  - 13 Persson E, Berndtsson I, Carlsson E, et al. Stoma-related complications and stoma size – A 2-year follow up. *Colorectal Dis.* 2010;12(10):971–976. <https://doi.org/10.1111/j.1463-1318.2009.01941.x>.
  - 14 Koc U, Karaman K, Gomceli I, et al. A retrospective analysis of factors affecting early stoma complications. *Ostomy Wound Manag.* 2017;63(1):28–32.
  - 15 Golicki D, Styczen P, Szczepkowski M. Quality of life in stoma patients in Poland: Multicentre cross-sectional study using WHOQOL-BREF questionnaire. *Przegl Epidemiol.* 2013;67(3):491–593.
  - 16 Hsu MY, Lin JP, Hsu HH, et al. Preoperative stoma site marking decreases stoma and peristomal complications: A meta-analysis. *J Wound Ostomy Continence Nurs.* 2020;47(3):249–256. <https://doi.org/10.1097/WON.0000000000000634>.
  - 17 Hajikari M, Mojdeh S, Shariari M. Comparison of a novel herbal skin care ointment with regular ointments to treat skin around the abdominal stoma: A clinical trial study. *Pol Ann Med.* 2019;26(2):90–97. <https://doi.org/10.29089/2019.19.00086>.
  - 18 Forsmo HM, Pfeffer F, Rasdal A, et al. Pre- and postoperative stoma education and guidance within an enhanced recovery after surgery (ERAS) programme reduces length of hospital stay in colorectal surgery. *Int J Surg.* 2016;36:121–126. <https://doi.org/10.1016/j.ijssu.2016.10.031>.
  - 19 Sahalevych AI, Sergiyshuk RV, Ozhohin VV, et al. The Modified Procedure of Totally Tubeless PNL. *Int J Bio Biomed Eng.* 2022;16:82–89. <https://doi.org/10.46300/91011.2022.16.10>.
  - 20 Komilova NK, Mukhammedova NJ, Tojiyeva ZN, et al. Territorial definitions of population mortality in Uzbekistan. *Astra Salv.* 2019;619–640.
  - 21 Rotshtein A. Design and tuning of fuzzy rule-based systems for medical diagnosis. In: *Fuzzy and Neuro-Fuzzy Systems in Medicine*. Boca Raton: CRC Press; 2017. <https://doi.org/10.1201/9780203713419>.
  - 22 Pearson R, Knight SR, Ng JC, et al. Stoma-related complications following ostomy surgery in 3 acute care hospitals: A cohort study. *J Wound Ostomy Continence Nurs.* 2020;47(1):32–38. <https://doi.org/10.1097/WON.0000000000000605>.
  - 23 Albulescu EL, Bratiloveanu T, Sandulescu S, et al. Role of a stoma nurse in the management of the specific stoma-related complications. *Curr Health Sci J.* 2024;50(1):5–11. <https://doi.org/10.12865/CHSJ.50.01.01>.
  - 24 Ravshanov AX, Suhail M, Komilova N, et al. Medical geographical zoning in part of Uzbekistan – A regional synthesis. *Reg Sci Pol Pract.* 2024;16(12):100142. <https://doi.org/10.1016/j.rspp.2024.100142>.
  - 25 Mamontov IN. Results of treatment for Mirizzi syndrome. *Klin Khirurh.* 2016;(9):25–27.
  - 26 Folguera-Arnau M, Gutiérrez-Vilaplana JM, González-María E, et al. Implementation of best practice guidelines for ostomy care and management: Care outcomes. *Enfermeria Clin.* 2020;30(3):176–184. <https://doi.org/10.1016/j.enfcli.2019.10.029>.
  - 27 Zhou H, Ye Y, Qu H, et al. Effect of ostomy care team intervention on patients with ileal conduit. *J Wound Ostomy Continence Nurs.* 2019;46(5):413–417. <https://doi.org/10.1097/WON.0000000000000574>.
  - 28 Polatova DSh, Ibragimova DA, Madaminov AY, et al. Dynamics of the incidence of non-melanoma malignant neoplasms of the skin in the republic of Uzbekistan for the 2018–2022. *Sark Kost Mag Than Opuh Koz.* 2023;15(3):11–16. <https://doi.org/10.17650/2219-4614-2023-15-3-11-16>.
  - 29 Cattolico A, Sergio F, Catani O, et al. Correction of hallux valgus through minimally invasive percutaneous techniques: the WOS procedure Long-term efficacy and application across different age groups. *Miner Orthop.* 2024;75(4):263–268. <https://doi.org/10.23736/S2784-8469.24.04443-2>.
  - 30 Hartmane I, Ivdrā I, Mikapāns I, et al. Correlation of immunological and clinical changes in psoriasis patients treated with tumour necrosis factor-alpha (TNF-α) blocking biologic drugs: one-year dynamic observation. *Proceed Latv Acad Sci Sect B Natur Exact Appl Sci.* 2021;75(5):357–363. <https://doi.org/10.2478/prolas-2021-0052>.
  - 31 Hartmane I, Mikazāns I, Ivdrā I, et al. Experience of phototherapy in dermatological praxis in complex therapy of psoriasis patients. *Proceed Latv Acad Sci Sect B Natur Exact Appl Sci.* 2016;70(1):7–12. <https://doi.org/10.1515/prolas-2016-0002>.
  - 32 Ayik C, Özden D, Cenan D. Ostomy complications, risk factors, and applied nursing care: A retrospective, de-



- scriptive study. *Wound Manag Prev.* 2020;66(9):20–30. <https://doi.org/10.25270/wmp.2020.9.2030>.
- <sup>33</sup> Li S, Luo C, Xie M, et al. Factors influencing readiness for hospital discharge among patients undergoing enterostomy: A descriptive, cross-sectional study. *Adv Skin Wound Care.* 2024;37(6):319–327. <https://doi.org/10.1097/ASW.0000000000000159>.
  - <sup>34</sup> Liu C, Bhat S, Sharma P, et al. Risk factors for readmission with dehydration after ileostomy formation: A systemic review and meta-analysis. *Colorectal Dis.* 2021;23(5):1071–1082. <https://doi.org/10.1111/codi.15566>.
  - <sup>35</sup> Zewude WC, Derese T, Suga Y, Teklewold B. Quality of life in patients living with stoma. *Ethiop J Health Sci.* 2021;31(5):993–1000. <https://doi.org/10.4314/ejhs.v31i5.11>.
  - <sup>36</sup> Zwiep TM, Helewa RM, Robertson R, et al. Preoperative stoma site marking for fecal diversions (ileostomy and colostomy): Position statement of the Canadian Society of Colon and Rectal Surgeons and Nurses Specialized in Wound, Ostomy and Continence Canada. *Can J Surg.* 2022;65(3):E359–E363. <https://doi.org/10.1503/cjs.022320>.
  - <sup>37</sup> Ambe PC, Kugler CM, Breuing J, et al. The effect of preoperative stoma site marking on risk of stoma-related complications in patients with intestinal ostomy – A systematic review and meta-analysis. *Colorectal Dis.* 2022;24(8):904–917. <https://doi.org/10.1111/codi.16118>.
  - <sup>38</sup> Ota E, Hiyoshi Y, Matsuura N, et al. Standardization of preoperative stoma site marking and its utility for preventing stoma leakage: A retrospective study of 519 patients who underwent laparoscopic/robotic rectal cancer surgery. *Tech Coloproctol.* 2023;27(12):1387–1392. <https://doi.org/10.1007/s10151-023-02839-6>.
  - <sup>39</sup> Slagle D, Harb W, Dillon K. Stoma site marking. *Dis Colon Rectum.* 2024;67(5):e298. <https://doi.org/10.1097/DCR.0000000000003010>.
  - <sup>40</sup> Manole TE, Daniel I, Alexandra B, Dan PN, Andronic O. Risk factors for the development of parastomal hernia: A narrative review. *Saudi J Med Med Sci.* 2023;11(3):187–192. [https://doi.org/10.4103/sjmms.sjmms\\_235\\_22](https://doi.org/10.4103/sjmms.sjmms_235_22).
  - <sup>41</sup> Niu N, Du S, Yang D, et al. Risk factors for the development of a parastomal hernia in patients with enterostomy: A systematic review and meta-analysis. *Int J Colorectal Dis.* 2022;37(3):507–519. <https://doi.org/10.1007/s00384-021-04068-5>.
  - <sup>42</sup> Tsujinaka S, Tan KY, Miyakura Y, et al. Current management of intestinal stomas and their complications. *J Anus Rectum Colon.* 2020;4(1):25–33. <https://doi.org/10.23922/jarc.2019-032>.
  - <sup>43</sup> Nozawa H, Sasaki S, Hayashi C, et al. Preoperative stoma site marking reduces postoperative stoma-related complications in emergency surgery: A single center retrospective cohort study. *Scand J Surg.* 2024;113(1):40–49. <https://doi.org/10.1177/14574969231186282>.
  - <sup>44</sup> Guler S, Eyuboglu G, Baykara ZG, et al. The effect of stoma site marking on stomal complications: A long-term retrospective study. *Adv Skin Wound Care.* 2024;37(5):254–259. <https://doi.org/10.1097/ASW.0000000000000134>.
  - <sup>45</sup> Burch J. An overview of stoma-related complications and their management. *Br J Community Nurs.* 2021;26(8):390–394. <https://doi.org/10.12968/bjcn.2021.26.8.390>.
  - <sup>46</sup> Bird A, Burch J, Thorpe G. The role of the clinical nurse specialist in stoma care: A scoping review. *Br J Nurs.* 2023;32(16):S6–S16. <https://doi.org/10.12968/bjon.2023.32.16.S6>.