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REVIEW PAPER
ARTIGO DE REVISÃO

Risk factors associated with the development of elimination stoma and peristomal skin complications

Fatores de risco associados ao desenvolvimento de complicações do estoma de eliminação e da pele periestomal

Factores de riesgo asociados al desarrollo de complicaciones del estoma de eliminación y de la piel periestomal

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Abstract

Background: Stoma formation leads to changes that are influenced by several factors, namely the presence of stoma and/or peristomal skin complications. It is estimated that 80% of ostomy patients have at least one stoma-related complication throughout their life.
Objectives: To identify the risk factors associated with the development of elimination stoma and peristomal skin complications.
Methodology: Literature review, based on the methodological strategy of the Joanna Briggs Institute for scoping reviews. A total of 1,492 articles were identified, of which 22 were included for analysis.
Results: Most of the risk factors for the development of complications are non-modifiable. Pre and postoperative education, stoma site marking, and follow-up after hospital discharge are some of the nursing-sensitive factors.
Conclusion: The identification of risk factors associated with the development of stoma complications allows nurses to early identify patients' vulnerability indicators and intervene more effectively.

Keywords: ostomy; risk factors; nursing care

Resumo

Enquadramento: A confeção de um estoma constitui-se como um evento gerador de mudanças influenciado por diversos fatores, nomeadamente a presença de complicações do estoma e/ou pele periestomal. Estima-se que 80% das pessoas com ostomia experienciam, pelo menos, uma complicação relacionada com o estoma ao longo da sua vida.
Objetivos: Identificar os fatores de risco associados ao desenvolvimento de complicações do estoma de eliminação e da pele periestomal.
Metodologia: Revisão da literatura, com base na estratégia metodológica do Instituto *Joanna Briggs* para *Scoping Reviews*. Foram identificados 1492 artigos, sendo incluídos para análise 22.
Resultados: A maioria dos fatores de risco para o desenvolvimento de complicações não é modificável. Dos sensíveis à intervenção do enfermeiro evidenciam-se a educação pré e pós-operatória, a marcação do local do estoma e o acompanhamento após a alta hospitalar.
Conclusão: O reconhecimento de fatores de risco associados ao desenvolvimento de complicações do estoma permite ao enfermeiro, por um lado, identificar precocemente indicadores de vulnerabilidade nos seus clientes e, por outro lado, intervir de forma mais efetiva.

Palavras-chave: ostomia; fatores de risco; cuidados de enfermagem

Resumen

Marco contextual: La confección de un estoma constituye un acto que genera cambios y en el que influyen diversos factores, en particular, la presencia de complicaciones del estoma y/o de la piel periestomal. Se estima que el 80 % de las personas con ostomía experimenta, al menos, una complicación relacionada con el estoma a lo largo de su vida.
Objetivos: Identificar los factores de riesgo asociados al desarrollo de complicaciones del estoma de eliminación y de la piel periestomal.
Metodología: Revisión de la literatura, con base en la estrategia metodológica del Instituto Joanna Briggs para *Scoping Reviews*. Se identificaron 1492 artículos, de los cuales 22 se incluyeron en el análisis.
Resultados: La mayoría de los factores de riesgo para el desarrollo de complicaciones no se puede modificar. Entre los sensibles a la intervención del enfermero se encuentran la educación pre y posoperatoria, la marcación del lugar del estoma y el seguimiento después del alta hospitalaria.
Conclusión: El reconocimiento de factores de riesgo asociados al desarrollo de complicaciones del estoma permite al enfermero, por un lado, identificar previamente los indicadores de vulnerabilidad en sus pacientes y, por otro lado, intervenir de forma más efectiva.

Palabras clave: estomía; factores de riesgo; atención de enfermería

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Introduction

In recent years, the number of people with colorectal cancer has increased and, consequently, so has the number of ostomy surgeries (Vonk-Klaassen, de Vocht, den Ouden, Eddes, & Schuurmans, 2016).

Stoma formation is a life-changing event that can be both physically and psychologically agonizing (Di Gesaro, 2012; Slater, 2010), and have a strong impact on patients' quality of life (Jayarajah, Samarasekara, & Samarasekera, 2016).

One of nurses' objectives is to help ostomy patients by minimizing the impact of this event on their lives, thus it is essential to analyze the factors influencing patients' quality of life, namely stoma-related complications (Jayarajah et al., 2016; Pittman, Kozell, & Gray, 2009).

A significant number of ostomy patients have at least one stoma-related complication throughout their life, which affects the person's ability to care for the stoma, and, consequently, leads to psychosocial problems, increased morbidity, and increased healthcare-related costs (Sung, Kwon, Jo, & Park, 2010). Indeed, the management of complications requires frequent visits of health professionals, hospital admissions, and possibly new surgeries that have a negative economic impact on the patient and the healthcare system (Jayarajah et al., 2016).

Given that the reported incidence of stoma and peristomal skin complications can reach up to 84% (Formijne Jonkers et al., 2012; Pittman, 2011), the identification of the factors that contribute to the development of these complications will help identifying those patients who are at higher risk of developing them.

In this review, the following peristomal skin complications were considered: dermatitis, erythema, ulcers, and granulomas. The following stoma complications were also considered: poor positioning (which requires, at least, one effluent collection device during 24 hours), retraction (stoma lumen below skin level), mucocutaneous dehiscence, necrosis, peristomal hernia, prolapse, stenosis, stoma mucositis, fistula, hemorrhage, and ischemia.

A preliminary literature search in the CINAHL database using the terms *ostomy* and *complications* revealed that some research studies suggest the existence of factors associated with a higher incidence of complications. However, no literature review was found that specifically identified the risk factors for the development of stoma and peristomal skin complications.

Thus, the development of this review emerged from the lack of formal nursing knowledge about the risk factors associated with the development of stoma and peristomal skin complications, as well as their importance in the planning of interventions for this population.

The main objective of this review was to identify risk factors associated with the development of elimination stoma and peristomal skin complications.

To this end, the following research question was formulated based on the mnemonic PCC (Population, Concept, and Context):

What are the risk factors associated with a greater development of elimination stoma and/or peristomal skin complications in adults aged over 18 years in hospital settings or after hospital discharge?

Methodological procedures were described in a previously established protocol (unpublished for lack of time), including the objectives, the inclusion criteria, and the methods to be used.

Methodological procedures of integrative review

A scoping review of the literature was conducted on the risk factors associated with the development of stoma and peristomal skin complications, following the Joanna Briggs Institute methodology (Peters et al., 2015) and the guidelines established by the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) model.

Studies were identified through a search conducted on 24 March 2017 in the MEDLINE Complete, Cochrane Library Plus, and CINAHL Plus With Full Text databases, using a combination of several MeSH terms and natural language. Table 1 describes the search strategies used for each database.

Table 1
Search strategy using Boolean expressions

MEDLINE complete	CINAHL Plus with Full Text	COCHRANE Library Plus
((MM Colostomy) OR (MM Ileostomy) OR (MM Cecostomy) OR (MM Ostomy) OR (Ostomies) OR (Stoma) OR (urostomy) OR (peristomal)) AND ((complications) OR (adverse effects) OR (problems) OR ("adverse events"))	((MM Colostomy) OR (MM Ileostomy) OR (MM Cecostomy) OR (MM Ostomy) OR (Ostomies) OR (Stoma) OR (urostomy) OR (peristomal)) AND ((complications) OR ("adverse effects") OR (problems))	((MM Colostomy) OR (MM Ileostomy) OR (MM Cecostomy) OR (MM Ostomy) OR (Ostomies) OR (Stoma) OR (urostomy) OR (peristomal)) AND ((complications) OR ("adverse effects") OR (problems))

The following inclusion criteria were applied: studies that included patients aged over 18 years; with an elimination ostomy; who had developed stoma or peristomal skin complications; in the postoperative period (hospital or community); primary or secondary studies, qualitative or quantitative, published in Portuguese, English, or Spanish, between 1 September 2010 and 28 February 2017. This publication timeframe was set because there was already a literature review on this topic that integrated the existing evidence until 2010 (Pittman, 2011).

A relevance test (Pereira & Bachion, 2008) was designed using a list of direct questions to evaluate the relevance of the studies for the purpose of this review. Studies were initially evaluated after reading their title and abstract, resulting in affirmative or negative answers. Articles with at least one negative answer were excluded from the analysis.

The application of the relevance tests and the selection of articles were independently performed by two researchers. In case of disagreement about the inclusion of an article, a third researcher was consulted.

All articles included through the application of the relevance test in the first phase were then subjected to the same process in the phase of full-text article reading.

Results and Interpretation

The search initially conducted in the mentioned databases retrieved 1,492 records, of which 289 were excluded because they are duplicates. Then, the relevance test was applied after title and abstract reading of the remaining 1,203 studies, and 1,147 studies were excluded. A total of 56 studies passed the test and were subjected to another analysis and application of the relevance test after full-text reading. At the end, 23 articles were included in this review. One article was excluded during data extraction because it included complications that did not relate to the topic of this review, namely the time spent by patients dressing themselves or adapting effluent collection systems. Figure 1 illustrates the process of study identification and selection.

With regard to the type of studies included in this review, most of them were descriptive (6 articles) and cohort (10 articles) studies. Only one randomized controlled trial and one literature review were found, this last one focusing mainly on peristomal skin complications. Table 2 summarizes the objectives of the studies included in this review.

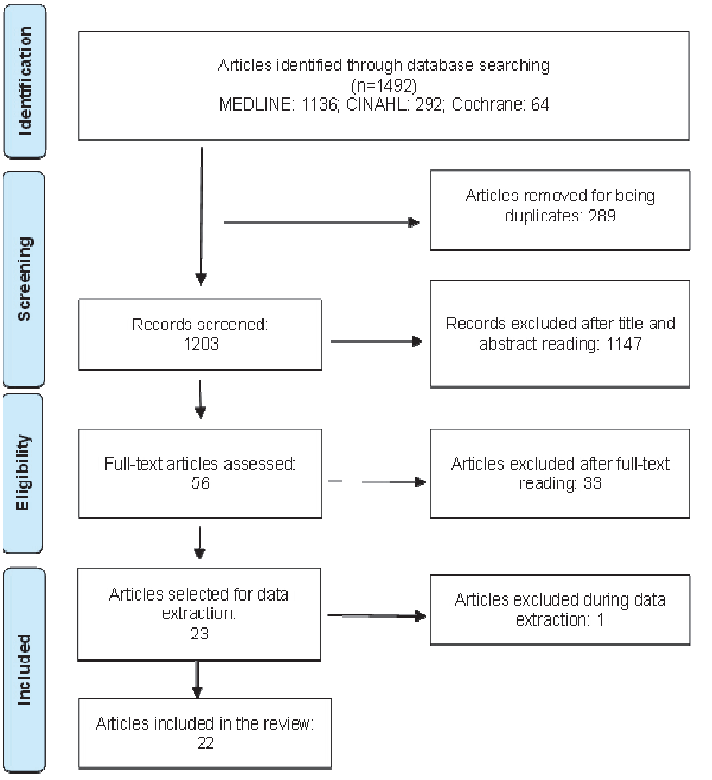

Figure 1. Process for study selection - PRISMA *diagram flow*.

Table 2
Objectives of the included studies

Author/Year/Title	Objectives
S1 Jayarajah, U., Samarasekara, A. M., & Samarasekera, D. N. (2016). A study of long-term complications associated with enteral ostomy and their contributory factors. *BMC Research Notes*, *9*. doi:10.1186/s13104-016-2304-z	To describe the long-term complications of enteral ostomies and their contributory factors.
S2 Marinez, A. C., González, E., Holm, K., Bock, D., Prytz, M., Haglind, E., & Angenete, E. (2016). Stoma-related symptoms in patients operated for rectal cancer with abdominoperineal excision. *International Journal of Colorectal Disease*, *31*(3), 635–641. doi:10.1007/s00384-015-2491-4	To characterize the frequency, severity, and distress of symptoms from the colostomy and colostomy acceptance in rectal cancer patients.
S3 Ay, A., & Bulut, H. (2015). Assessing the validity and reliability of the peristomal skin lesion assessment instrument adapted for use in Turkey. *Ostomy Wound Management*, *61*(8), 26–34.	To assess the validity, usability, and reliability of the Peristomal Skin Lesions Assessment instrument (SACS instrument) adapted to Turkish from English.

S4 Baykara, Z. G., Demir, S. G., Karadag, A., Harputlu, D., Kahraman, A., Karadag, S., … Cihan, R. (2014). A multicenter, retrospective study to evaluate the effect of preoperative stoma site marking on stomal and peristomal complications. *Ostomy Wound Management*, *60*(5), 16–26.	To determine the effect of stoma site marking on stomal and peristomal complications.
S5 Funahashi, K., Suzuki, T., Nagashima, Y., Matsuda, S., Koike, J., Shiokawa, H., … Kaneko, H. (2014). Risk factors for parastomal hernia in Japanese patients with permanent colostomy. *Surgery Today*, *44*(8), 1465–1469. doi:10.1007/s00595-013-0721-3	To identify the risk factors for parastomal hernia in Japanese patients with permanent colostomies.
S6 Donahue, T. F., Bochner, B. H., Sfakianos, J. P., Kent, M., Bernstein, M., Hilton, W. M., … Vargas, H. A. (2014). Risk factors for the development of parastomal hernia after radical cystectomy. *The Journal Of Urology*, *191*(6), 1708–1713. doi:10.1016/j.juro.2013.12.041	To determine the prevalence and risk factors for the development of parastomal hernia after radical cystectomy.
S7 Zhang J-E, Wong F. K., You, L. M., Zheng, M. C., Li, Q., Zhang, B. Y., … Liu, J. L. (2013). Effects of enterostomal nurse telephone follow-up on postoperative adjustment of discharged colostomy patients. *Cancer nursing*, *36*(6), 419–428.	To evaluate the effect of enterostomal nurse telephone follow-up on the adjustment levels of discharged colostomy patients.
S8 Hotouras, A., Murphy, J., Power, N., Williams, N. S., & Chan, C. L. (2013). Radiological incidence of parastomal herniation in cancer patients with permanent colostomy: What is the ideal size of the surgical aperture? *International Journal Of Surgery*, *11*(5), 425–427. doi:10.1016/j.ijsu.2013.03.010	To establish the radiological incidence of herniation in patients with a permanent colostomy and correlate it with the size of the abdominal wall defect in order to identify an aperture diameter associated with a reduced herniation risk.
S9 Lindholm, E., Persson, E., Carlsson, E., Hallén, A.-M., Fingren, J., & Berndtsson, I. (2013). Ostomy-related complications after emergent abdominal surgery a 2-year follow-up study. *Journal of Wound, Ostomy and Continence Nursing*, *40*(6), 603–610. doi:10.1097/WON.0b013e3182a9a7d9	To prospectively evaluate ostomy-related complications and describe ostomy configuration in patients undergoing acute abdominal surgery.
S10 Salvadalena, G. D. (2013). The incidence of stoma and peristomal complications during the first 3 months after ostomy creation. *Journal Of Wound, Ostomy, And Continence Nursing*, *40*(4), 400–406. doi:10.1097/WON.0b013e318295a12b	To determine the incidence of stoma and peristomal complications during the first 3 months after ostomy creation.
S11 Formijne Jonkers, H. A., Draaisma, W. A., Roskott, A. M., van Overbeeke, A. J., Broeders, I. A., & Consten, E. C. (2012). Early complications after stoma formation: A prospective cohort study in 100 patients with 1-year follow-up. *International Journal Of Colorectal Disease*, *27*(8), 1095–1099.	To provide an overview of all complications that may occur after ileostomy or colostomy formation (loop or end) in daily practice.
S12 Person, B., Ifargan, R., Lachter, J., Duek, S. D., Kluger, Y., & Assalia, A. (2012). The impact of preoperative stoma site marking on the incidence of complications, quality of life, and patient's independence. *Diseases Of The Colon And Rectum*, *55*(7), 783–787. doi:10.1097/DCR.0b013e31825763f0	To evaluate the impact of preoperative stoma site marking on patients' quality of life, independence, and complication rates.

S13 Parmar, K. L., Zammit, M., Smith, A., Kenyon, D., & Lees, N. P. (2011). A prospective audit of early stoma complications in colorectal cancer treatment throughout the Greater Manchester and Cheshire colorectal cancer network. *Colorectal Disease: The Official Journal Of The Association Of Coloproctology Of Great Britain And Ireland*, *13*(8), 935–938. doi:10.1111/j.1463-1318.2010.02325.x	To identify the incidence of early stoma problems after surgery for colorectal cancer to identify predisposing factors and to assess the effect on discharge from hospital and the greater need for community stoma care.
S14 Pittman, J. (2011). Characteristics of the patient with an ostomy. *Journal of Wound, Ostomy and Continence Nursing*, *38*(3), 271–279. doi:10.1097/WON.0b013e3182152bbf	To examine the demographic and clinical characteristics of new ostomy patients.
S15 Pittman, J. A. (2011). *Ostomy complications and associated risk factors: Development and testing of two instruments* (Doctoral dissertation). Indiana University, School of Nursing. Retrieved from https://scholarworks.iupui.edu/handle/1805/2640	To identify risk factors contributing to the development of fecal ostomy complications; To describe the incidence and severity of early fecal ostomy complications; To estimate the reliability and validity of two newly developed instruments, Ostomy Risk Factor Index (ORFI) and Ostomy Complication Severity Index (OCSI).
S16 Scarpa, M., Ruffolo, C., Boetto, R., Pozza, A., Sadocchi, L., & Angriman, I. (2010). Diverting loop ileostomy after restorative proctocolectomy: predictors of poor outcome and poor quality of life. *Colorectal Disease: The Official Journal Of The Association Of Coloproctology Of Great Britain And Ireland*, *12*(9), 914–920. doi:10.1111/j.1463-1318.2009.01884.x	To analyze the predictors of complications of the ileostomy formation and closure and of the QOL of these patients.
S17 Whiteley I., & Sinclair G. (2010). A review of peristomal skin complications after the formation of an ileostomy, colostomy or ileal conduit. *World Council of Enterostomal Therapists Journal*, *30*(3), 23–29 7p.	To identify the factors that contribute to the development of peristomal skin complications and their frequency with a view to identifying high-risk patients and improving outcomes.
S18 Nastro, P., Knowles, C. H., McGrath, A., Heyman, B., Porrett, T. R. C., & Lunniss, P. J. (2010). Complications of intestinal stomas. *The British Journal Of Surgery*, *97*(12), 1885–1889. doi:10.1002/bjs.7259	To examine the incidence and potential risk factors for the development of stomal complications.
S19 Sung, Y. H., Kwon, I., Jo, S., & Park, S. (2010). Factors affecting ostomy-related complications in Korea. *Journal Of Wound, Ostomy, And Continence Nursing*, *37*(2), 166–172. doi:10.1097/WON.0b013e3181cf7b76	To determine the type and incidence of ostomy-related complications and identify associated factors in Korean ostomy patients.
S20 Millan, M., Tegido, M., Biondo, S., & García-Granero, E. (2010). Preoperative stoma siting and education by stomatherapists of colorectal cancer patients: A descriptive study in twelve Spanish colorectal surgical units. *Colorectal Disease*, *12*(7), e88–e92. doi:10.1111/j.1463-1318.2009.01942.x	To examine the care received by ostomy patients with colorectal cancer in Spanish colorectal surgery units, to assess its quality and to detect areas for improvement.
S21 Agarwal, S., & Ehrlich, A. (2010). Stoma dermatitis: Prevalent but often overlooked. *Dermatitis: Contact, Atopic, Occupational, Drug*, *21*(3), 138–147.	To summarize various skin irritations that can occur after an ostomy, as well as review previously published reports of peristomal allergic contact dermatitis.
S22 Persson, E., Berndtsson, I., Carlsson, E., Hallén, A.-M., & Lindholm, E. (2010). Stoma-related complications and stoma size - a 2-year follow up. *Colorectal Disease*, *12*(10), 971–976. doi:10.1111/j.1463-1318.2009.01941.x	To prospectively describe stoma configuration and evaluate stoma-related complications and their association with possible risk factors.

To facilitate data analysis, the results were distributed into groups based on the risk factors associated with the complications: clinical and treatment-related factors (Table 3); sociodemographic factors (Table 4); and factors related to health resources (Table 5).

Table 3
Clinical and treatment-related factors associated with the development of stoma and peristomal skin complications

Positioning/Site	Inappropriate stoma site (S11, S14); Lack of preoperative stoma site marking (S4, S10, S12, S13, S18, S20); Stoma created at an alternative site to that marked (S13); Stoma on the left side (S16) or in the abdominal wall (S3); Longer distance between stoma and navel (S16).
Stoma characteristics	Ileostomy (S1, S3, S4, S17, S18, S21), namely end ileostomy (S1, S22) and loop ileostomy (S22); End colostomy (S18); End ostomies when compared to loop ostomies (S1); Loop colostomy - higher incidence of stomal prolapse (S1); Shorter stoma length (S13) - colostomy height <5mm (E9, S22), ileostomy height <20mm (S9, S22); Oval stoma (S9); Presence of more than one stoma (S4).
Effluents	Presence of liquid effluents (S3); High output stoma (S14, S22) - the production of more than 1200ml in 24 hours (S22).
History and/or reasons for stoma formation	Stoma formation associated with diagnosis of neoplasm (S18, S19) or inflammatory bowel disease (S22); Diabetes (S18, S19); Smoking (S18, S21); Musculoskeletal comorbidities (S18); Cardiac comorbidities (S18); ASA III or IV classification (S18); Use of nonsteroidal anti-inflammatory drugs (S10);
Type of Surgery	Emergency surgery (S4, S11, S13, S16, S19, S20); Retention suture (S14); Elective surgery - associated with higher incidence of hyperplasia (S19); Abdominal wall defect smaller than 25mm in diameter (S8).

Table 4
Sociodemographic factors associated with the development of stoma and peristomal skin complications

Personal characteristics	Female gender (S13, S4); Younger age, namely aged under 42 years (S17, S22) or under 60 years (S1); Aged 65 years or over (S19, S21); BMI over 25kg/m^2 (S18) or 30kg/m2 (S13).

Table 5
Protective and risk factors related to health resources associated with the development of stoma and peristomal skin complications

Protective factors	Nurse telephone follow-up after clinical discharge (S7); Preoperative stoma site marked by a nurse (E18); Pre and postoperative education provided by a nurse (S20);
Risk factors	Lack of perioperative monitoring and assessment by a nurse (S1).

Interpretation of results

Stomal and peristomal skin complications have a significant impact at personal, social, and economic levels (Pittman et al., 2009), which translates into a lower perceived quality of life, social isolation, longer hospital length-of-stay (S13), increased use of primary health care services (S13), and more follow-up visits (S17).

The fact that the included studies were carried out in developed countries, predominantly in Europe and North America, gives more robustness to the adequacy of the results to the Portuguese context.

Only eight articles (S1, S2, S5, S6, S15, S16, S17, S18) set the objective of identifying factors associated with the development of stoma and/or peristomal skin complications, which reflects the scarce research developed in this context. However, it was possible to identify a set of aspects which were classified as follows: clinical and treatment-related factors, sociodemographic factors, and factors related to health resources.

The following clinical factors should be noted: ostomy formation after diagnosis of neoplasm or inflammatory bowel disease, history of diabetes, smoking, musculoskeletal diseases, cardiac diseases, and ASA III or IV classification. In addition, the literature revealed other clinical factors, such as the use of nonsteroidal anti-inflammatory drugs and low preoperative albumin levels. These clinical comorbidities may negatively affect postoperative recovery mechanisms and lead to the development of complications.

The following treatment-related factors were identified: stoma type and positioning, namely ileostomy, colostomies with <5 mm in height, ileostomies with <20mm in height, positioning in the left side or in the abdominal wall, the presence of more than one stoma, the longer distance from the navel, high output stomas, presence of liquid effluents, and oval stomas. Factors related to the surgical approach were also identified, namely emergency surgery, retention sutures, abdominal wall defect bigger than 25mm in diameter, and the use of laparoscopic or transperitoneal approach. Stoma height, shape, and size may influence the selection and adaptation of collection systems to the skin, leading to skin complications resulting from the contact with effluents.

The type of ostomy, namely ileostomy, can also contribute to peristomal skin complications due to the characteristics of the effluents. Stoma positioning may also hinder the adaptation of collection systems.

The following sociodemographic factors were highlighted: age, female gender, and body mass index (BMI) over 25kg/m^2. The latter factor is associated with intraoperative difficulties related to the surgical technique, as well as with the subsequent selection and adaptation of collection systems in large abdomens.

Old age emerges as a condition that may be associated with the risk of complications, namely peristomal skin complications, as a result from the increased skin's sensitivity to collection systems, effluents, and friction of devices due to the patient's thinner keratin (Hellman & Lago, 1990).

The higher prevalence of complications in women may be associated with a greater abdominal muscle weakness and, possibly, with obesity. It should also be noted that the literature is sometimes inconsistent given the fact that some articles identify age and gender as risk factors (S13, S4, and S21), while others contradict it (S10, S15, S16). Therefore, both factors should be included as potential risk factors for the development of complications and analyzed individually.

The factors related to health resources included the lack of preoperative stoma site marking, of preoperative information, of perioperative monitoring by a stoma therapy nurse, and of follow-up after hospital discharge. The type of device was also identified as a risk factor for peristomal complications. In fact, preoperative marking facilitates the selection of the stoma site in order to improve the adaptation of the collection system and the patient's comfort in the postoperative period. On the other hand, the characteristics of each type of stoma may require the use of different types of devices to ensure its effectiveness. The change in the shape and size of the stoma during the first days after surgery may also require a readjustment of the device to prevent leaks and

skin problems. Therefore, patients should be followed-up by nurses with experience and knowledge in this specific area and materials.
In view of these results, it is clear that there are many factors and that several of them can be present simultaneously. Thus, since a comprehensive analysis of the identified factors is essential, they were divided into modifiable and non-modifiable factors.
The identification of non-modifiable risk factors is important because it enables nurses to profile patients who have higher risk of who have higher risk of developing complications. The early identification of sociodemographic and clinical indicators of vulnerability will enable nurses to establish an intervention plan that takes into account these factors and contributes to the prevention or early detection of complications.
In relation to modifiable factors, given the type of research, only nursing-sensitive factors were analyzed. Therefore, it should be noted that there are several key factors for the development of complications which are associated with nurses' performance. First, the impact of stoma devices on the development of complications should be highlighted. Since nurses are capable of influencing the choice of devices, they play a key role in the selection of the most adequate devices for the stoma. Therefore, nurses should be aware of all the available devices to be able to choose the most appropriate ones to the specificities of each stoma. It is also important that teams caring for this group of patients include experienced nurses with differentiated knowledge, such as stoma therapy nurses. Teams to make the right choice based on these professionals' knowledge about the available resources and experience in their use.
Stoma site marking and pre and postoperative information emerge as protective factors in the development of complications.
People who had the stoma site marked and received preoperative education by a nurse had lower anxiety levels (Millan, Tegido, Biondo, & García-Granero, 2010), a significantly better quality of life, improved confidence and independence in stoma care, and fewer postoperative complications, regardless of the stoma type (Person et al., 2012).
Patients who are more informed, know how to identify the causes of complications, monitor their stoma, and care for it properly are less likely to develop complications, not only because they are more competent in self-care, but also because they are able to early identify indicators of potential complications. Indeed, prevention and detection of complications is a key aspect of the self-care competence of patients with an intestinal elimination ostomy (Pinto, Santos, Brito, & Queirós, 2016).
With regard to the methods used for assessment and measurement of complications, most studies only reported the presence or absence of complications rather than using validated instruments.
The use of validated instruments for the assessment and report of complications allows health professionals to elaborate better and more consistent clinical descriptions. However, the development of forms to report the presence of complications seems to be a simple, intuitive, easy to apply, and useful tool to standardize and ensure continuity of care in the data collection process (Nybaek, Knudsen, Laursen, Karlsmark, & Jemec, 2010).
Results should be interpreted with caution, given the limitations identified in the studies, particularly the fact that most of the included studies were retrospective, descriptive, and cohort studies using nonprobability sampling. Other limitations of this review included the lack of grey literature, the publication timeframe, and the number of searched databases.

Conclusion

This article contributes to the identification of risk factors for the development of stoma and peristomal skin complications, which allows nurses to early identify patients who are more vulnerable to these complications.
Most of the identified factors are non-modifiable factors. However, some aspects are sensitive to nursing care and contribute to reducing the incidence of complications or early identifying their presence, thus promoting a better quality of life for patients with an

elimination stoma.
Two factors should be highlighted: pre and postoperative education, with the purpose of maximizing stoma self-care skills, and systematic follow-up after clinical discharge.
Most of the complications associated with the presence of an elimination stoma are peristomal skin lesions. Therefore, a significant number of complications can be prevented through the promotion of stoma self-care skills among patients or family caregivers.

Implications for nursing research and practice

From a research perspective, the authors suggest the development of studies on the association between risk factors and the development of complications, as well as of systematic literature reviews on the effectiveness of nursing interventions in reducing stoma and peristomal skin complications among adults with elimination stomas.
The scientific community should also operationalize the concept of stoma and peristomal skin complications and determine the most appropriate instrument for their identification and measurement.
Based on the modifiable and non-modifiable risk factors for the development of stoma and peristomal skin complications, it is essential to implement nursing intervention programs that can lead to better outcomes in patients with an elimination stoma, namely training for self-care, surveillance, and follow-up in order to prevent and/or early identify the presence of complications.
It is also essential to increase the number of nurses who are able to mark stoma sites in emergency and inpatient units, because only then will this intervention be possible for every patient selected for ostomy surgery.

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