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The Effectiveness of Nurse-Led Ostomy Education in Preventing Stoma-Related Complications

Nayed Jameel Ayed Al Rashedy[1], Faydhah Madloul S. Al Shammari[2], Maryam Mathan Alruwaili[3], Sami Munadhir Waddas Alruwaili[4], Mamdouh Lafi Owaynan Alanazi[5], Nehad Mohammed Ali Al Johani[6], Manal Oudah A. Alenezi[7], Almalki, Abdulmajeed Dakhilallah S[8], Alanazi, Afaf Lafi O[9], Ghadeer Mohammed Alamri[10]

[1] Nursing Technician – Vector-Borne and Zoonotic Diseases Control Center, Khaybar General Hospital, Madinah Health Cluster, Ministry of Health, Khaybar, Madinah Region, Saudi Arabia.
Email: Njalrashedy@moh.gov.sa
[2] Nursing Technician – Prince Mutaib bin Abdulaziz Hospital, Al Jouf Health Cluster, Ministry of Health, Sakaka, Al Jouf Region, Saudi Arabia.
Email: amlmaralshmry@gmai.com
[3] Nursing Technician – Regional Laboratory, Al Jouf Health Directorate, Ministry of Health, Sakaka, Al Jouf Region, Saudi Arabia.
Email: malrwoili@moh.gov.sa
[4] Nursing Specialist – Eradah and Mental Health Hospital, Al Jouf, Al Jouf Health Cluster, Ministry of Health, Sakaka, Al Jouf Region, Saudi Arabia.
Email: Samiksa444@gmail.com
[5] Nursing Technician – Al-Qurayyat General Hospital, Al Jouf Health Cluster, Ministry of Health, Al Qurayyat, Al Jouf Region, Saudi Arabia.
Email: mmdoh9814@gmail.com
[6] Nursing Specialist – Al Mundasa Primary Health Care Center, Madinah Health Cluster, Ministry of Health, Madinah, Madinah Region, Saudi Arabia.
Email: nemaljohani@moh.gov.sa
[7] Senior Specialist – Primary Health Care Nursing – North Medical Tower Hospital, Northern Borders Health Cluster, Ministry of Health, Arar, Northern Borders Region, Saudi Arabia.
Email: meme1619@gmail.com
[8] Emergency Nursing Specialist – Taif Health Cluster, Ministry of Health, Taif, Makkah Region, Saudi Arabia.
Email: Abdulmajeed3829@gmail.com
[9] Nursing Technician – Al-Aziziyah Primary Health Care Center, Al Jouf Health Cluster, Ministry of Health, Al Qurayyat, Al Jouf Region, Saudi Arabia.
Email: Aflalanazi@moh.gov.sa
[10] Oncology and Palliative Care Nursing Specialist – King Fahad Hospital, Madinah Health Cluster, Ministry of Health, Madinah, Madinah Region, Saudi Arabia.
Email: Gmalamri@moh.gov.sa

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ABSTRACT: Stoma formation, whether from colorectal cancer, inflammatory bowel disease, or trauma, confronts patients with profound physical and psychosocial adjustments, and complications such as peristomal skin breakdown, leakage, and mucocutaneous separation remain disturbingly common in the early postoperative period. Nurse-led education has emerged as a promising structured intervention, typically encompassing hands-on pouch-changing demonstrations, skin care instruction, dietary and hydration guidance, and psychosocial support delivered by stoma care or enterostomal therapy nurses. This systematic review synthesizes the available evidence on whether such programs reduce the incidence and severity of stoma-related complications compared with routine or ad hoc education, drawing on published trials and observational studies that report outcomes including peristomal skin injury, pouch leakage, infection, hospital readmission, and patient-reported self-management confidence. Across the included literature, nurse-led education interventions were generally associated with lower rates of peristomal skin complications and improved ostomy self-care competence, with several studies reporting reduced unplanned healthcare visits and higher quality-of-life scores in the short to medium term. However, the evidence base is constrained by substantial methodological heterogeneity: interventions varied widely in duration, intensity, delivery format, and the qualifications of the delivering nurse, while outcome definitions and measurement instruments were inconsistently applied, complicating pooled analysis. Many studies were small, single-centre, and vulnerable to performance and detection bias, and follow-up periods were often too short to capture late complications. The review therefore supports nurse-led ostomy education as a plausible and low-risk strategy for complication prevention, while calling for larger, well-designed randomized controlled trials with standardized outcome measures and longer follow-up to establish definitive effectiveness and inform best-practice guidelines.

INTRODUCTION:

Stoma formation remains a common surgical procedure across benign and malignant colorectal, urological, and emergency general surgery settings, yet it carries a strikingly high burden of postoperative morbidity. Contemporary cohort data indicate that clinically significant stoma-related complications occur in approximately 29% of patients, with the wider literature reporting morbidity ranges from 21% to 70% depending on case mix, emergency status, and follow-up duration [1]. These complications are not merely minor inconveniences; they drive emergency department attendance, unplanned readmissions, reoperation, delayed adjuvant therapy, and sustained reductions in health-related quality of life. The economic consequences are equally substantial, with prolonged hospitalization and repeated appliance-related interventions consuming healthcare resources that are increasingly constrained [1].

Stoma-related complications are conventionally understood through a taxonomy that distinguishes early from late events and major from minor events [2]. Early complications include mucocutaneous separation, necrosis, retraction, bleeding, infection, and early skin breakdown, whereas late complications include parastomal hernia, prolapse, stenosis, chronic peristomal skin disorders, and fistula formation [2]. This taxonomy is important because different complications have different causal pathways and therefore different responsiveness to educational intervention. Early ischaemic and technical complications depend predominantly on surgical technique and perfusion, whereas peristomal skin damage, leakage-related dermatitis, appliance trauma, and several late mechanical problems are far more plausibly amenable to structured self-care education [2].

What makes this morbidity pattern particularly actionable is that a large proportion of stoma-related complications are considered preventable through structured education, appropriate appliance selection, careful stoma siting, and early recognition of warning signs. Unlike many surgical complications that depend on intraoperative technique or patient biology, peristomal skin breakdown, leakage-related dermatitis, appliance misfitting, and even some mechanical complications are strongly influenced by the quality of self-care and the timeliness of specialist support. Peristomal skin complications are the most common complication after ostomy formation, and a systematic review and meta-analysis involving 3,753 patients with ostomies found that 981 patients experienced such complications, with incidence estimates ranging from 15.5% to 47.7% [3].

Longitudinal data from the first year after stoma surgery further demonstrate that both leakage and peristomal skin complications are independently associated with lower mental well-being and health-related quality of life, with severity gradients observed across mild, moderate, and severe presentations [4].

Beyond the immediate clinical burden, the risk profile of patients undergoing stoma formation heavily influences complication rates. Epidemiological studies have consistently identified several risk factors that predispose patients to early stoma-related complications, including advanced age, elevated body mass index, emergency surgical settings, and specific stoma types [5]. Understanding these demographic and clinical variables is crucial because they directly shape the intensity and focus of required educational interventions. Patients with multiple risk factors require more robust preoperative preparation and closer postoperative surveillance, reinforcing the need for risk-stratified nurse-led care that addresses individual patient vulnerabilities rather than applying a uniform teaching approach [5].

Compounding the clinical challenges, stoma-related morbidity places a substantial strain on healthcare systems and resources. Unplanned readmissions, frequent emergency department visits, and prolonged reliance on specialized wound care are common downstream consequences of inadequate stoma management [6]. These utilization patterns not only escalate healthcare costs but also disrupt continuity of care and negatively impact patient outcomes. Consequently, identifying effective, scalable interventions—such as structured nurse-led education—is essential for reducing preventable hospital encounters and improving the overall efficiency of ostomy care delivery. This recognition has driven a shift away from viewing ostomy education as a discretionary adjunct towards positioning it as a core component of complication prevention [6].

Nurse-led education has emerged as the principal delivery model for this preventive agenda, reflecting both the specialist expertise of stoma care nurses and the practical realities of healthcare workforce distribution. A systematic review of nursing-led interventions for patients with urinary diversion, synthesising fourteen studies including randomised and quasi-experimental designs, concluded that nurse-led interventions generally reduced peristomal complications and improved stoma self-care ability, self-efficacy, and quality of life [7]. The review emphasised that interventions centred on education, stoma care skills training, and continuous care were most consistently associated with improved outcomes, while multidimensional and ongoing interventions showed particular promise despite limited evidence [7].

Randomised evidence has strengthened causal inference regarding nurse-led education. A blinded-assessor randomised controlled trial of 124 patients with temporary stomas evaluated a nurse-led, Skinner-based health education model delivered across seven stages: preoperative education, stoma observation, care training, active participation, self-care, home management, and supportive guidance [8]. The intervention group demonstrated statistically significant improvements in readiness for hospital discharge, stoma self-management, social impact, and incidence of complications compared with the control group [8].

Defining and Classifying Stoma-Related Complications

Any meaningful evaluation of preventive education requires a clear taxonomy of the outcomes being prevented. Stoma-related complications are conventionally classified by timing and by mechanism [2]. Early complications, generally defined as those occurring within 30 days of surgery, include mucocutaneous separation, stomal necrosis, retraction, bleeding, infection, and early skin breakdown. Late complications, arising beyond 30 days, encompass parastomal hernia, prolapse, stenosis, chronic peristomal skin disorders, and fistula formation [2]. An alternative classification distinguishes major complications, such as retraction, prolapse, stenosis, necrosis, and parastomal hernia, from minor complications, of which peristomal skin breakdown is the most frequent [2].

This taxonomy matters for evaluating nurse-led education because different complications have different causal pathways and therefore different responsiveness to educational intervention. Early mucocutaneous separation and necrosis are predominantly technique- and perfusion-dependent, and education can contribute mainly through preoperative siting and postoperative surveillance rather than through direct prevention [2]. By contrast, peristomal skin complications, leakage-related dermatitis, appliance trauma, and late mechanical problems associated with poor appliance management are far more plausibly amenable to structured self-care education [3]. Parastomal hernia occupies an intermediate position: educational interventions addressing lifting restrictions, abdominal pressure management, weight control, and early recognition may reduce risk, but the evidence for education-specific effects is less mature than for skin-related outcomes, and current best-practice recommendations emphasise prevention, assessment, and structured management pathways [9].

Peristomal skin complications deserve particular attention because they are the most common complication after ostomy formation. A systematic review and meta-analysis found incidence estimates ranging from 15.5% to 47.7%, while other systematic reviews have reported ranges from 11% to 45%, and some series describe incidence as high as 73.4% [3]. These figures establish peristomal skin complications as a high-frequency, predictable, and therefore high-priority target for preventive education. The clinical significance of these skin complications is amplified by their association with leakage, odour, social withdrawal, and reduced mental well-being [4]. Longitudinal data demonstrate that both leakage and peristomal skin complications are independently associated with lower mental well-being and health-related quality of life, with severity gradients observed across mild, moderate, and severe presentations [4].

The Evolution of Nurse-Led Ostomy Education

Nurse-led ostomy education has evolved from informal, task-oriented teaching delivered opportunistically during inpatient stays into a structured, multi-component intervention with defined competencies, staged progression, and planned follow-up. The traditional model relied heavily on the availability of a stoma care nurse during admission, with content often focused on appliance changing and immediate problem-solving. This model was vulnerable to variability in nurse availability, weekend gaps in teaching, and early discharge pressures that truncated learning. Contemporary nurse-led programmes are more likely to incorporate preoperative preparation, staged psychomotor skill acquisition, return demonstration, written and digital reinforcement, and post-discharge telephone or telehealth follow-up [7].

The evidence base supporting this evolution is now substantial. A systematic review of nursing-led interventions for patients with urinary diversion, synthesising fourteen studies including randomised and quasi-experimental designs, concluded that nurse-led interventions generally reduced peristomal complications and improved stoma self-care ability, self-efficacy, and quality of life [7]. The review emphasised that interventions centred on education, stoma care skills training, and continuou s care were most consistently associated with improved outcomes, while multidimensional and ongoing interventions showed particular promise despite limited evidence [7]. This finding is important because it suggests that the effectiveness of nurse-led education is not simply a function of information transfer but of sustained skills rehearsal and reinforcement.

Randomised evidence has strengthened causal inference. A blinded-assessor randomised controlled trial of 124 patients with temporary stomas evaluated a nurse-led, Skinner-based health education model delivered across seven stages: preoperative education, stoma observation, care training, active participation, self-care, home management, and supportive guidance [8]. The intervention group demonstrated statistically significant improvements in readiness for hospital discharge, stoma self-management, social impact, and incidence of complications compared with the control group [8]. The model's explicit procedural teaching sequence, which moves from observation to supervised performance to independent self-care, reflects a pedagogically coherent approach to psychomotor skill acquisition and may explain its effect on complication rates rather than knowledge alone [8].

Evidence on Peristomal Skin Complications

Peristomal skin complications represent the most direct and best-evidenced target for nurse-led preventive education. The mechanisms linking education to skin integrity are biologically plausible and clinically observable: correct appliance selection and fitting reduce mechanical trauma and leakage; appropriate skin cleansing and barrier use prevent irritant dermatitis; early recognition of erythema or moisture-associated damage allows prompt intervention before erosion or ulceration develops; and dietary and fluid guidance can reduce effluent liquidity and frequency, particularly in ileostomy care [3]. Meta-analytic evidence on preoperative stoma education found that the relative risk reduction of peristomal skin complications was 55% in patients receiving preoperative education compared with standard care, although the certainty of evidence was low for most outcomes and very low for others [10]. This 55% relative risk reduction is clinically meaningful and aligns with the hypothesis that preoperative education establishes correct appliance habits and expectations before maladaptive practices become entrenched [10].

A quasi-experimental study of 45 patients with newly formed stomas evaluated structured education, counselling, and follow-up based on Orem's Self-Care Deficit Nursing Theory [11]. Peristomal skin complications occurred in 54.2% of the experimental group versus 95.2% of the control group, a statistically significant difference [11]. The most frequent complications were irritant dermatitis and hyperplasia, and mean recovery time was substantially shorter in the experimental group (21 days versus 44.65 days) [11]. Although the non-randomised design and small sample necessitate cautious

interpretation, the magnitude and consistency of the effect support the hypothesis that structured, theory-informed education can reduce both the incidence and duration of skin complications [11].

Randomised evidence, while less directly focused on skin outcomes, is concordant. The nurse-led Skinner-based trial reported a significant reduction in overall complication incidence, a category that included skin-related events, alongside improvements in self-management [8]. A risk-stratified protocol for preventing peristomal skin complications provides further support for structured, nurse-delivered preventive care, and age, body mass index, and pathway assignment have been identified as significant predictors of peristomal skin complications [12]. This finding illustrates a complementary principle: education is most effective when it is risk-stratified rather than uniformly delivered. Patients with favourable stoma anatomy, lower body mass index, and adequate dexterity may require less intensive input, whereas those with flush or retracted stomas, obesity, impaired vision, or limited manual dexterity require more intensive and prolonged nurse-led support [12].

Table 1. Summary of Key Studies Evaluating Nurse-Led Education and Complication Outcomes

Study design	Population / sample	Intervention	Key complication outcome
Systematic review of 14 studies	Adults with urinary diversion	Nurse-led education, skills training, continuous care	Reduced peristomal complications; improved self-care and quality of life
Randomised controlled trial (n = 124)	Adults with temporary stomas	Seven-stage Skinner-based nurse-led education	Significant reduction in complication incidence
Quasi-experimental study (n = 45)	Adults with newly formed stomas	Self-Care Deficit Nursing Theory-based structured education	Peristomal skin complications 54.2% vs 95.2%
Systematic review and meta-analysis	Adults undergoing colorectal surgery with new stomas	Preoperative stoma education	55% relative risk reduction in peristomal skin complications
Randomised controlled trial	Adults with stomas	Nurse navigation programme	Improved stoma adjustment and quality of life; reduction in stoma complications

Evidence on Mechanical, Infectious, and Late Complications

Beyond skin integrity, nurse-led education may influence a broader spectrum of mechanical and infectious complications, although the evidence is more heterogeneous and the causal pathways more complex. Mechanical complications include appliance leakage, wafer displacement, skin stripping from repeated appliance changes, and trauma from inappropriate cleansing agents [2]. Infectious complications include peristomal cellulitis, fungal dermatitis, and, in some cases, mucocutaneous infection. Late complications such as parastomal hernia, prolapse, and stenosis are multifactorial, with patient anatomy, surgical technique, intra-abdominal pressure, connective tissue quality, and lifestyle factors all contributing [9].

The nurse navigation programme randomised controlled trial is instructive in this regard. The intervention significantly improved stoma adjustment and quality of life, and the authors concluded that it also reduced stoma complications, although the complication rate difference was not statistically significant in isolation [13]. This pattern suggests that nurse-led interventions may exert their strongest and most detectable effects on self-management and psychosocial adaptation, with complication reduction occurring as a downstream consequence that requires larger samples and longer follow-up to demonstrate statistically [13]. The same trial found that all participants had received stoma training, mostly from nurses, indicating that the comparison was between structured nurse navigation and usual nurse-delivered education rather than between education and no education [13]. This ceiling effect is an important methodological consideration: as usual care improves, the incremental benefit of a new nurse-led programme becomes harder to detect.

Nurse-led discharge planning has also been evaluated as a vehicle for complication prevention. A randomised controlled trial of colorectal cancer patients with stomas found that a nurse-led discharge planning programme improved quality of discharge teaching, readiness for hospital discharge, stoma quality of life, and reduced complications and unplanned readmission [14].

The inclusion of complication incidence and readmission as outcomes is notable because it moves the evidence beyond knowledge and self-efficacy towards hard clinical and utilisation endpoints. The mechanism is plausible: structured discharge planning ensures that appliance supply, follow-up appointments, warning-sign education, and contact pathways are in place before the patient leaves hospital, reducing the risk of preventable deterioration in the community [14].

Meta-analytic evidence on educational interventions for enterostomy patients provides additional support for complication reduction. A meta-analysis of 13 randomised controlled trials involving 1,530 participants found that educational eHealth and mHealth interventions significantly improved self-care ability, quality of life, stoma adjustment, and self-efficacy, and reduced ostomy complications (SMD = 0.18, 95% CI [0.12, 0.27], $p < 0.001$) [15]. Although the effect size for complications is modest compared with the effects on self-care and quality of life, it is statistically robust and derived from randomised comparisons [15]. A separate meta-analysis of educational intervention programmes in ostomised colorectal cancer patients reported a large effect on self-care values (SMD = 1.44), reinforcing the conclusion that education reliably changes the behaviours that mediate complication risk [16].

Delivery Modalities: From Face-to-Face to Digital and Telehealth

The modality through which nurse-led education is delivered has expanded considerably, particularly following the COVID-19 pandemic and the wider adoption of digital health technologies. Face-to-face, individualised teaching remains the reference standard and is embedded in clinical guidelines. Digital and mobile health interventions represent a further modality. A meta-analysis of digital health interventions for patients with ostomy found significant improvements in self-management competence (SMD = 0.96, 95% CI [0.65, 1.23]), although the certainty of evidence was low [17]. The eHealth and mHealth meta-analysis discussed earlier similarly reported improvements in self-care, quality of life, and complication reduction [15]. These findings position digital delivery as a promising adjunct rather than a replacement for specialist nurse contact. The most defensible model may be blended: preoperative and early postoperative face-to-face education for psychomotor skills and emotional support, followed by digital reinforcement and telehealth follow-up for monitoring, troubleshooting, and adherence support [15][17].

Telehealth and videoconferencing have been evaluated as alternatives or supplements to in-person education. A randomised controlled study of education via videoconferencing at home found that the intervention significantly increased self-efficacy and stoma adaptation scores, leading the authors to recommend structured, continuous nurse-delivered education using videoconferencing [18]. Telehealth delivery may be particularly valuable for rural and remote patients, for whom access to a stoma care nurse is limited by geography. However, a randomised prospective trial of an ostomy telehealth self-management programme reported no clear overall benefit compared with attention control usual care, although there may have been an advantage based on tumour type. This null finding is important: it suggests that telehealth is not automatically superior and that the quality of the curriculum, the intensity of interaction, and the fit with patient needs matter more than the technology itself [17].

Table 2. Delivery Modalities for Nurse-Led Ostomy Education

Modality	Strengths	Limitations	Evidence of complication reduction
Face-to-face, individualised	Direct observation, return demonstration, emotional support, immediate correction	Resource-intensive; access limited by specialist workforce	Strongest evidence, particularly for skin complications and self-management
Telehealth / videoconferencing	Geographic reach; convenience; continuity of contact	Requires technology and digital literacy; less tactile assessment	Improves self-efficacy and adaptation; mixed effects on hard clinical outcomes
Digital / mHealth	Scalable; asynchronous reinforcement; data capture	Low certainty evidence; risk of disengagement	Modest reduction in complications; improved self-care

Structured discharge planning	Integrates education with system navigation and supply provision	Dependent on organisational infrastructure	Reduced complications and unplanned readmission

The Critical Role of Timing: Preoperative Education and Stoma Siting

The timing of nurse-led education is increasingly recognised as a determinant of its effectiveness. Preoperative education offers several theoretical advantages: it allows time for psychological adjustment, enables informed participation in stoma siting, establishes correct appliance habits before surgery, and ensures that patients and caregivers have realistic expectations. Postoperative education, by contrast, competes with pain, opioid effects, early mobilisation, and the psychological shock of a new stoma, potentially limiting encoding and retention of information. Clinical guidelines from the Wound, Ostomy and Continence Nurses Society and the American Society of Colon and Rectal Surgeons recommend preoperative, perioperative, and postoperative education delivered by an ostomy nurse specialist, with content extending beyond appliance changing to include physiology, dietary and fluid modification, skin care, sexual counselling, and psychosocial support [19].

Meta-analytic evidence supports the superiority of preoperative education. A systematic review and meta-analysis of preoperative stoma education found that patients receiving preoperative education achieved stoma management proficiency sooner than controls, with a median time to proficiency of 5.5 days versus 9 days ($p = 0.0005$) [10]. Self-care knowledge and proficiency scores were significantly higher in the intervention group, and anxiety and depression scores were lower [10]. The 55% relative risk reduction in peristomal skin complications associated with preoperative education is particularly relevant to the preventive argument [10]. A scoping review of perioperative education similarly concluded that preoperative education reduced anxiety and depression, postoperative education supported long-term adaptation, and interventions combining both components were linked to shorter length of stay and fewer complications [20].

Stoma siting is a nurse-delivered procedure that exemplifies the preventive potential of preoperative specialist input. A well-sited stoma, placed within the rectus abdominis, away from bony prominences, skin folds, scars, and the belt line, and visible to the patient, reduces the risk of leakage, appliance failure, and skin damage [21]. Observational evidence indicates that preoperative stoma site marking by a stoma therapist may reduce postoperative stoma-related complications, and one analysis reported that stoma-related complications developed in 25% of marked cases versus 32% of non-marked cases, although the difference did not reach statistical significance in all comparisons [21]. The evidence is therefore supportive but not definitive; nevertheless, the combination of biological plausibility, low risk, and professional guideline endorsement makes preoperative siting a rational component of nurse-led preventive care [19][21].

Table 3. Timing of Nurse-Led Education and Associated Outcomes

Timing	Key educational components	Reported outcomes
Preoperative	Stoma siting, expectation setting, appliance familiarisation, psychomotor preparation	Reduced anxiety and depression; earlier proficiency; reduced peristomal skin complications
Perioperative / inpatient	Staged skills training, return demonstration, self-care participation	Improved discharge readiness, self-management, and reduced complication incidence
Post-discharge / follow-up	Telephone follow-up, telehealth, digital reinforcement, troubleshooting	Reduced readmissions and emergency visits; improved long-term adaptation

Psychosocial Mediators: Self-Efficacy, Self-Care, and Quality of Life

The effectiveness of nurse-led education in preventing complications is mediated substantially by psychosocial and behavioural mechanisms. Self-efficacy, defined as confidence in one's ability to perform stoma care tasks and manage problems, is a consistent predictor of self-care behaviour and a frequent target of educational interventions. A systematic review of nursing interventions for self-efficacy in ostomy patients found that training, telephone follow-up, psychosocial support groups, and mobile applications increased self-efficacy, decreased stoma-related complications, and improved stoma adaptation [22]. The co-occurrence of self-efficacy gains and complication reduction across studies supports a causal pathway in which education enhances confidence, confidence drives consistent self-care, and consistent self-care prevents avoidable complications [22].

Videoconferencing-delivered education has also been associated with increased self-efficacy and stoma adaptation, reinforcing the principle that structured interaction, rather than simple information provision, is the active ingredient [18].

Quality of life is both an outcome in its own right and a mediator of complication risk. Patients with severe peristomal skin complications or frequent leakage report lower mental well-being and health-related quality of life, and these psychosocial burdens can lead to avoidance of social situations, reduced physical activity, and poorer dietary and fluid choices, which in turn increase complication risk [4]. Nurse-led education that improves quality of life may therefore exert a secondary preventive effect by interrupting this cycle. The nurse-led discharge planning trial and the nurse navigation trial both reported improvements in stoma quality of life alongside complication reduction, consistent with this mediating pathway [13][14].

Healthcare Utilization, Readmission, and Economic Outcomes

The economic case for nurse-led ostomy education rests on its potential to reduce avoidable healthcare utilisation. Structured post-discharge support programmes spanning one to eighteen months have been associated with reductions in readmissions (odds ratio 0.45) and emergency visits (odds ratio 0.37), and nurse-led discharge planning and patient education have been shown to reduce unplanned outpatient visits without increasing overall care costs [6]. These utilisation effects are clinically plausible: patients who can recognise early warning signs, troubleshoot leakage, select appropriate appliances, and access timely nurse advice are less likely to present to emergency departments or require readmission for dehydration, skin breakdown, or appliance failure [6]. The nurse-led discharge planning trial similarly reported reduced unplanned readmission alongside improved discharge readiness and stoma quality of life [14].

Cost analyses of nurse-led stoma care clinics provide complementary evidence. A business case evaluation of a nurse-led stoma care clinic reported cost avoidance through reduced ward staff time, more cost-effective use of appliances and accessories, and diversion of patients from alternative National Health Service resources [23]. A community stoma care service evaluation found that nurse-led intervention was associated with a 10% decrease in product costs, corresponding to an annual saving of approximately £450,106 in the study group, and conferred cost benefits not only through product savings but by diverting ostomates from alternative healthcare resources [23]. These economic data should be interpreted cautiously because of variations in healthcare systems, pricing, and the difficulty of attributing cost savings solely to education. Nevertheless, the direction of effect is consistent: nurse-led education is at least cost-neutral and probably cost-saving when readmission and emergency care avoidance are accounted for [6][23].

Heterogeneity, Limitations, and Quality of the Evidence

The evidence base supports a generally favourable conclusion regarding nurse-led ostomy education and complication prevention, but important limitations constrain the strength of that conclusion. The first limitation is heterogeneity of intervention content. "Nurse-led education" in the literature ranges from a single preoperative session to a seven-stage inpatient programme, from a mobile application to a structured discharge planning pathway, and from individual teaching to group videoconferencing [7][8][17]. These interventions differ in dose, intensity, timing, theoretical underpinning, and provider training, and they are unlikely to have equivalent effects. Pooling them under a single label risks overstating the effectiveness of low-intensity interventions and understating the importance of specific design features [7].

The second limitation is heterogeneity of outcome measurement. Complication outcomes are defined and ascertained inconsistently across studies. Some trials use composite complication measures that combine skin, mechanical, and infectious events; others focus exclusively on peristomal skin complications; others rely on readmission or unplanned consultation as proxies [3][10]. Follow-up durations vary from discharge to twelve months or longer. This heterogeneity limits the precision of pooled effect estimates and makes it difficult to determine which complications are most responsive to which educational components [10].

The third limitation is methodological quality. Many studies are single-centre, unblinded, and vulnerable to performance and detection bias. Blinding of participants and providers is inherently difficult in educational trials, and blinded outcome assessment is inconsistently reported [10][17]. Sample sizes are often modest, and several studies are underpowered to detect statistically significant differences in complication rates, particularly when usual care already includes some nurse-delivered education [13]. The preoperative education meta-analysis explicitly graded the certainty of evidence as very low for most outcomes and low for peristomal skin complications, reflecting these limitations [10]. The digital health meta-analysis similarly rated the certainty of evidence for self-management outcomes as low [17].

The fourth limitation is implementation context. The effectiveness of nurse-led education depends on the availability of trained stoma care nurses, organisational support for preoperative siting and follow-up, and patient access to appropriate appliances. In resource-constrained settings, barriers include limited curriculum time in nursing education, insufficient simulation infrastructure, and inadequate faculty expertise [24]. Delayed discharge related to stoma education has been attributed to the unavailability of ostomy teaching on weekends, patient-related challenges, suboptimal stoma positioning, and unavailability of appliances [24]. These implementation barriers mean that efficacy demonstrated in well-resourced trial settings may not translate directly into effectiveness in routine care. A scoping review of perioperative education further highlights that combining preoperative and postoperative education is more consistently associated with shorter length of stay and fewer complications than single-component approaches [20].

Implications for Practice and Policy

The evidence supports several practice implications. First, nurse-led ostomy education should be positioned as a preventive intervention rather than a discharge formality. This requires organisational commitment to preoperative referral, protected nurse time for staged skills training, and systematic follow-up after discharge [7][19]. Second, education should be sequenced and staged rather than delivered as a single episode. The seven-stage Skinner-based model and the Self-Care Deficit Nursing Theory-based programme both demonstrate that progression from observation to supervised performance to independent self-care is associated with better outcomes than unstructured information provision [8][11]. Third, preoperative education and stoma siting should be prioritised wherever surgery is planned, because the evidence for timing-specific benefits is strongest for preoperative interventions [10][21]. A single-session, in-hospital preoperative education programme has also been shown to be feasible and beneficial, suggesting that even brief structured preoperative input can add value when resources are limited [25].

Fourth, delivery should be blended rather than monomodal. Face-to-face education remains essential for psychomotor skills and emotional support, but digital and telehealth modalities can extend reach, reinforce learning, and support troubleshooting between visits [15][17][18]. Fifth, education should be risk-stratified. Patients with obesity, flush or retracted stomas, limited manual dexterity, visual impairment, limited health literacy, or inadequate caregiver support require more intensive and prolonged nurse-led input than lower-risk patients [12]. Sixth, outcomes should be measured beyond knowledge, including peristomal skin condition, leakage frequency, appliance usage, unplanned consultations, readmission, and patient-reported quality of life [3][4][6].

For policy, the economic and utilisation data provide a rationale for commissioning nurse-led stoma services as cost-effective preventive care. Reductions in readmissions and emergency visits, combined with cost avoidance in appliance provision and ward staff time, suggest that investment in specialist stoma nursing is likely to be offset by downstream savings [6][23]. Policy frameworks should also address the workforce pipeline, ensuring that sufficient stoma care nurses are trained and that nursing curricula include adequate ostomy education [24]. Service specifications should include preoperative siting, staged inpatient teaching, structured discharge planning, and post-discharge follow-up as core components rather than optional extras [19][25].

Future Research Priorities

Several research gaps warrant attention. First, adequately powered, multicentre randomised controlled trials with blinded outcome assessment are needed to confirm the effect of nurse-led education on hard complication endpoints, particularly peristomal skin complications and parastomal hernia [10][17]. Second, component analysis is required to identify which elements of multifaceted interventions drive effectiveness: is it preoperative siting, staged psychomotor training, return demonstration, follow-up intensity, or a combination? Third, dose-response studies should determine the optimal frequency and duration of education for different risk groups, incorporating established risk factors such as age, body mass index, emergency surgery, and stoma type [12][5]. Fourth, implementation research should evaluate strategies for embedding nurse-led education into routine care in resource-constrained settings, including task-shifting models, digital decision support, and weekend teaching coverage [24]. Fifth, economic evaluations should adopt a societal perspective and include productivity losses, caregiver time, and long-term complication costs [23]. Sixth, patient-reported outcome measures should be standardised to allow comparison across studies and inclusion in future meta-analyses [4].

CONCLUSION

Nurse-led ostomy education is a clinically plausible, evidence-supported, and economically rational strategy for preventing stoma-related complications. The strongest evidence concerns peristomal skin complications, where structured education has been associated with substantial reductions in incidence and duration, and where preoperative education has been linked to a 55% relative risk reduction. Randomised trials of nurse-led education models have demonstrated improvements in self-management, discharge readiness, quality of life, and composite complication outcomes, while meta-analyses of eHealth, mHealth, and educational interventions have reported consistent, if modest, reductions in ostomy complications. The evidence is limited by heterogeneity of interventions and outcomes, variable methodological quality, and implementation barriers, but these limitations qualify rather than overturn the central finding. The most effective programmes appear to be structured, staged, risk-stratified, and blended, with preoperative siting and education as foundational components and post-discharge follow-up as a reinforcing layer. Investment in nurse-led ostomy education should be accompanied by rigorous evaluation using standardised complication outcomes, so that the preventive potential of this intervention can be realised more fully in routine care.

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