Digital Health Technologies in the Continuum of Stoma Care: A Narrative Synthesis of Applications, Mechanisms, and Outcomes

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Abstract

This narrative review summarizes current applications and research progress of digital health technologies across the continuum of care for patients with colorectal cancer-related stomas. A systematic search of PubMed, Web of Science, the Cochrane Library, China National Knowledge Infrastructure (CNKI), and Wanfang Data identified English- and Chinese-language articles published from January 2015 to December 2025. Evidence was synthesized thematically by care stage, technology type, and outcome domain, with the Capability-Opportunity-Motivation-Behavior (COM-B) model used to interpret potential behavioral mechanisms. Digital interventions have been applied to perioperative education, post-discharge transitional care and remote follow-up, monitoring of stoma-related complications, symptom and quality-of-life support, psychological and social adaptation, and self-management. Collectively, these approaches may support a digitally enabled continuum of care; however, the evidence is heterogeneous and predominantly narrative. Existing studies suggest that digital technologies may improve disease-related knowledge, self-care capacity, continuity of care, complication detection, and selected physical or psychological outcomes. They may also support nursing efficiency and have potential economic value; however, these findings should be interpreted cautiously because intervention designs, methodological quality, and outcome measures vary substantially. Persistent challenges include the digital divide, limited long-term and economic evaluation, data privacy, cybersecurity, and ethical governance. Future studies should prioritize standardized intervention frameworks, well-designed multicenter studies, and implementation evaluations to strengthen clinical translation.

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Keywords: colorectal cancer; intestinal stoma; digital health; smart nursing; continuum of care

Introduction

Colorectal cancer represents a high-burden malignant tumor of the digestive system worldwide, with both its incidence and mortality ranking among the leading causes of cancer-related morbidity and death[1]. With changes in disease spectrum and the widespread implementation of early screening programs, the number of patients undergoing intestinal ostomy continues to increase[2]. Intestinal ostomy surgery is an important treatment modality for low rectal cancer and certain types of colon cancer and can significantly improve patient survival outcomes[3]; however, it also imposes persistent physical and psychological burdens[4]. Patients often experience multiple challenges, including insufficient ostomy care skills, increased risk of stoma-related complications, altered body image, psychological adaptation difficulties, and impaired social functioning[5,6]. These care needs extend from the perioperative period to long-term home-based management, placing high demands on continuous care and individualized support. Nevertheless, current clinical nursing models remain predominantly focused on in-hospital health education and episodic outpatient follow-up, with limitations such as insufficient continuity of care, delayed information feedback, weak cross-setting coordination, and limited support for patient self-management[7]. In the context of population aging and the coexistence of multiple chronic conditions, these limitations are further amplified, and traditional care models are increasingly unable to meet the demands of long-term, dynamic, and personalized health management[8,9].

Digital health leverages technologies such as the internet, mobile communications, big data, artificial intelligence (AI), and wearable devices to provide new pathways for transforming healthcare delivery models[10]. Its applications in chronic disease management and continuity of care have been steadily expanding, including mobile health applications, telemedicine services, intelligent monitoring systems, AI-assisted decision-making, and digital health education platforms[11]. By enabling real-time, cross-temporal and cross-spatial health information connectivity and dynamic monitoring, these technologies support early risk identification and continuous health management, thereby facilitating a shift in nursing care from a hospital-centered model to one focused on life-course health management[12]. Although digital health technologies have demonstrated promising value in the management of various chronic diseases, their application in the comprehensive care of patients with colorectal cancer-related stomas remains fragmented[13]. Different intervention modalities lack systematic integration, and their actual effectiveness, applicable scenarios, and implementation pathways remain unclear[14]. Current research faces the following knowledge gaps: First, the effectiveness of different forms of digital intervention (e.g., mobile applications, teleconsultation, wearable devices) in stoma patients has not been systematically compared[15]. Second, the effect sizes for various outcome measures (e.g., self-care ability, complications, psychological adaptation) vary considerably, and the sources of heterogeneity are poorly understood[16]. Third, most studies have short follow-up periods and small sample sizes, limiting the robustness and generalizability of conclusions[17]. Fourth, from a methodological perspective, the substantial heterogeneity in study design, intervention content, and assessment tools across existing evidence limits the appropriateness of conducting a single quantitative meta-analysis across the full scope of this review[18]. Narrative synthesis, due to its ability to flexibly integrate quantitative and qualitative evidence and to reveal patterns and mechanisms across studies, is more suitable for answering questions such as “how effective” and “why effective.”[19] Therefore, we adopted a narrative synthesis approach for the qualitative integration of included studies[18,19]. In contrast to previous reviews that focused on single technology types or single care stages, this review adopts a care continuum perspective, integrating digital health applications across the full disease trajectory of stoma patients, and applies the Capability-Opportunity-Motivation-Behavior (COM-B) model as a theoretical framework to elucidate the mechanisms and differential effects of various interventions at different stages[20].

Based on this context, this review systematically examines the progress of digital health applications in the continuum of care for patients with colorectal cancer-related stomas, with a particular focus on their effects in health education, transitional and continuity care, complication management, self-management support, and psychological support. It also analyzes current implementation barriers and future directions, aiming to provide evidence to support the development of a standardized, continuous, and patient-centered digital stoma care model.

Methods

This narrative review used a narrative synthesis approach to integrate and critically appraise the diverse evidence on digital health technologies in the continuum of stoma care for colorectal cancer patients. Given the high heterogeneity in intervention designs, outcome measures, and study populations in this field, a narrative synthesis approach was selected rather than a single meta-analysis because it permits structured integration of heterogeneous quantitative and qualitative evidence and facilitates the identification of patterns, mechanisms, and evidence gaps across studies[21].

Search strategy

We systematically searched PubMed, Web of Science, Cochrane Library, China National Knowledge Infrastructure (CNKI), and Wanfang Data for articles published between January 2015 and December 2025. The lower date limit was selected pragmatically to capture a contemporary phase of digital health development. By 2015, the literature was already documenting the rapid expansion of mobile-health applications and mobile Internet-enabled healthcare services, making this a reasonable starting point for technologies more comparable with current patient-facing digital care[22]. This publication-date restriction applied to studies eligible for inclusion in the evidence synthesis; seminal methodological, theoretical, guideline, and contextual references used to support the review methods or background were not subject to this restriction. The search strategy combined relevant terms for: (1) digital health (e.g., "digital health," "telemedicine," "mobile health," "eHealth," "smart nursing," "artificial intelligence," "wearable devices"); (2) stoma (e.g., "stoma," "colostomy," "ileostomy"); (3) colorectal cancer (e.g., "colorectal cancer," "rectal cancer," "colon cancer"); and (4) continuity of care (e.g., "continuity of care," "transitional care," "self-management," "patient education"). Searches were conducted in English and Chinese databases. Boolean operators and MeSH terms were used where applicable. The COM-B model was used as the theoretical framework to characterise and design behaviour change interventions[23].

Inclusion and exclusion criteria

We included: (1) original research articles (randomized controlled trials, quasi-experimental studies, cohort studies, and qualitative studies) and systematic or scoping reviews focused on digital health interventions for patients with colorectal cancer-related stomas[24]; (2) articles published in English or Chinese; and (3) articles published between January 2015 and December 2025. We excluded: (1) studies available only as abstracts, commentaries, and case reports; (2) studies focusing on stoma care in non-cancer populations (e.g., inflammatory bowel disease or trauma) without separate data for patients with colorectal cancer[25]; and (3) studies in which digital health was not the core intervention component[26]. Broader colorectal-cancer and general digital-health publications used only to contextualize mechanisms or implementation issues were not treated as included stoma-focused studies in Table 1. Systematic and scoping reviews were retained to characterize higher-level evidence and identify research gaps rather than to serve as additional independent outcome-level units. When a review and an included primary study addressed overlapping evidence, outcome-level interpretation was attributed to the primary study, while review-level findings were used for contextual triangulation; this rule was applied to minimize double counting in the narrative synthesis.

Data extraction and synthesis

Two reviewers independently screened titles, abstracts, and full texts, and extracted data using a standardized form. Data items included: author, year, country, study design, sample size, type of digital health intervention, stage of the care continuum, reported outcomes, and key findings.

Table 1: Characteristics of included stoma-focused digital health studies and evidence syntheses.

No.	Author	Year	Study design	Country	Sample size/ evidence base	Digital intervention	Principal findings
1	Moulaei et al.[15]	2023	Systematic review	Iran	10 articles	Health information technologies	The review identified potential benefits for education, self-care, and self-efficacy, but the evidence base was limited and heterogeneous.
2	Wei-Ying et al.[25]	2024	Systematic review and meta-analysis	China	22 studies; 2,237 participants	Telemedicine	Pooled estimates were associated with fewer stoma and peristomal complications; variation in study design and quality limits certainty.
3	da Silva et al.[27]	2025	Scoping review	Brazil	12 studies; 13 apps	Mobile applications	Application functions and usability varied, and evidence for patient-level outcomes remained limited.
4	Weinstein et al.[28]	2021	Technology analysis within an RCT	United States	93 participants; 80 completed	Telehealth ostomy self-management	Videoconference delivery was feasible with dedicated technical support; this technology-focused report did not establish clinical effectiveness.
5	Wan et al.[29]	2021	Development and preliminary evaluation study	Singapore	5 preliminary users	Patient-centered perioperative digital solution	Multidisciplinary co-design supported development and early usability evaluation, but the small preliminary sample precluded effectiveness conclusions.
6	Wang et al.[30]	2018	RCT	China	203 (100 intervention; 103 control)	Home-care mobile app	The app was associated with better selected post-discharge self-care and adjustment outcomes; replication and longer follow-up are needed.
7	Yiğitoğlu and Şendir[31]	2021	Quasi-experimental study	Turkey	60 (30 intervention; 30 control)	STOMA-M mobile education app	App users reported better adjustment and self-care than booklet users, but the APP did not prevent peristomal skin lesions.
8	Toğluk Yiğitoğlu et al.[32]	2025	Quasi-experimental study	Turkey	60 (30 intervention; 30 control)	Mobile stoma education	The intervention was associated with higher adjustment and self-efficacy and fewer peristomal skin lesions during short-term follow-up.
9	Xu and Zhou[33]	2023	Three-group comparative intervention study	China	187 (62/62/63)	Internet-linked extended care	Internet-linked care was associated with better selected self-efficacy, mood, quality-of-life, and complication outcomes than usual care.
10	Özkaya and Harputlu[34]	2024	RCT	Turkey	60 (30 intervention; 30 control)	Home videoconference education	Structured videoconference education was associated with higher stoma self-efficacy and adaptation scores.

(*continued*)

Table 1

(continued)

No.	Author	Year	Study design	Country	Sample size/ evidence base	Digital intervention	Principal findings
11	Augestad et al.[35]	2020	RCT	Norway	110 (52 teleconsultation; 58 hospital follow-up)	Telemedicine follow-up	Teleconsultation did not improve quality of life, but it reduced travel burden and was feasible for postoperative follow-up.
12	Qiao et al.[36]	2024	Meta-analysis	China	13 RCTs; 1,530 participants	Educational eHealth and mHealth	Pooled estimates suggested better self-care, quality of life, adjustment, and self-efficacy and fewer complications; heterogeneity warrants caution.
13	Wang et al.[37]	2024	RCT	China	113 (57 intervention; 56 control)	3D-printed intelligent ostomy appliance	The device was associated with greater convenience, reliability, and patient acceptance; findings were device-specific and require replication.
14	van der Storm et al.[38]	2024	Double-blind RCT	Netherlands	208 analyzed app users (96 full; 112 restricted)	Stoma app	A small improvement in stoma-related quality of life was reported at 1 month; secondary outcomes did not differ significantly.

Note. Sample size refers to the analyzed sample unless otherwise stated. Abbreviations: RCT, randomized controlled trial; app, application.

Evidence synthesis was conducted using thematic analysis. Extracted data were first categorized by stage of the care continuum (perioperative, transitional, long-term follow-up), then by type of digital health technology (mobile apps, telemedicine, wearable sensors, etc.), and finally by reported outcomes (knowledge, self-efficacy, complications, quality of life, etc.). To enhance theoretical depth, we applied the COM-B model as an analytical framework to interpret the mechanisms by which digital interventions may influence patient behaviors and outcomes. Evidence quality was assessed qualitatively based on study design, sample size, effect sizes, and risk of bias, rather than using a quantitative scoring tool, consistent with narrative review methodology. Table 1 summarizes the design, country, sample size or evidence base, intervention type, and principal findings of the included stoma-focused digital health studies and evidence syntheses. Primary studies formed the main basis for outcome-level interpretation. Systematic and scoping reviews were used to triangulate broader patterns and evidence gaps and were not treated as additional independent observations when their underlying evidence overlapped with primary studies included in this review.

Applications of digital health technologies in the continuum of stoma care

Digital health education in the perioperative period

The perioperative period is an important stage in which patients with colorectal cancer-related stomas begin to develop disease-related knowledge and self-care competencies that may influence postoperative recovery and longer-term self-management[39]. Traditional education often relies on verbal instruction and printed materials, which may provide limited interactivity and individualization and may not fully address changing information needs[40]. Mobile and multimedia technologies have therefore been used to supplement conventional education with more interactive and personalized approaches[41].

Before surgery, patients may experience limited disease understanding, uncertainty about the procedure, and fear related to stoma formation[42]. Mobile applications, social-media platforms, short videos, three-dimensional

visualization, and virtual demonstrations may help patients understand stoma formation and anticipated lifestyle changes[27,43]. Some intervention and development studies suggest that visual and remotely supported education may reduce preoperative anxiety or improve engagement, although effects vary across study designs and populations[28]. Patient-centered co-design may improve the relevance of perioperative digital materials[29]. AI-assisted educational materials are also being developed, but preliminary expert validation does not yet establish patient-level effectiveness[44].

After surgery, digital education generally shifts from knowledge delivery toward the development of practical self-care and self-management skills[45]. Stepwise video instruction and interactive learning platforms may help patients practice pouch changing, leakage management, and peristomal skin care through procedural demonstrations, feedback, and remote guidance[27,45]. WeChat-based or similarly staged education models have been associated with better adherence to selected self-care behaviors, although intervention content and follow-up intensity differ across studies[46]. Mobile applications and telehealth platforms may support self-efficacy or adaptation, but the evidence remains heterogeneous[30,31]. Visual and mobile education may also improve selected self-care outcomes, although sustained effects require confirmation[32,47].

From a service-delivery perspective, digital tools may extend perioperative education beyond the hospital and provide more continuous cross-setting support[28]. They may improve access to specialist nursing advice, but digital access, literacy, and individual preferences remain important constraints[48,49]. Much of the evidence is derived from small or protocol-stage studies, and heterogeneity in intervention intensity, content, and outcome measurement limits comparison and certainty[50,51]. Multicenter trials with longer follow-up are therefore needed. Clinical quality and accuracy of information delivered through digital tools also require attention. Multidisciplinary content governance, including regular clinical review, version control, and outcome monitoring, may reduce the risk of outdated or misleading information[52]. These safeguards should be integrated into routine platform maintenance rather than treated as one-time validation activities[53].

Transitional care and remote follow-up after discharge

Transitional care is a key component of the care continuum for patients with colorectal cancer-related stomas and is among the more frequently studied applications of digital health[17,25]. The early post-discharge period may carry increased risks of stoma-related problems and challenges as patients move from care dependence toward greater self-management[33,46]. Conventional telephone follow-up and outpatient visits may be limited by delayed feedback, low contact frequency, and insufficient individualization[17]. Digital approaches may supplement these services by supporting more frequent communication and better linkage between inpatient and home care[16,34]. Mobile internet-based models, including WeChat groups, official accounts, and mini-programs, can provide education, symptom reporting, dietary guidance, and reminders; however, their effects appear to depend on engagement, content quality, and professional oversight[46,54].

Remote video follow-up and image-based assessment may allow clinicians to review stoma color, mucosal condition, and peristomal skin and may facilitate earlier recognition of selected complications[34,35]. Existing studies suggest that remote follow-up may improve the timeliness of problem identification[35]. Evidence for readmission reduction remains inconsistent[17,25]. Findings from broader remote-monitoring fields also show variable clinical and resource outcomes[55,56]. Reviews further indicate that feasibility depends on device, workflow, and data-management factors[57], while scalability is not consistently assessed[58].

Policy support for internet-based healthcare has encouraged the development of tele-nursing services[26]. Risk-stratified transitional-care models have also emerged, using clinical characteristics, self-care ability, and psychological status to guide differentiated follow-up. Such models may improve the targeting and efficiency of nursing support, but require validation across settings[51,58]. Remote peer support, telehealth education, and home monitoring may strengthen social support or facilitate symptom reporting[28,34], although outcome definitions and measurement methods remain heterogeneous[51].

Compared with conventional transitional care, digital approaches may offer both practical advantages and important limitations.

Potential advantages include fewer temporal and geographic constraints, more frequent access to nursing information, and faster transmission of patient-reported data[17]. Integrated platforms may support follow-up, reminders, and risk alerts, but current comparative evidence does not establish consistent superiority over telephone or face-to-face models across all outcomes[25,58]. Automated records and trend displays may assist nursing decisions when data quality, escalation pathways, and clinical accountability are clearly defined[52].

Digital care may not fully reproduce emotional resonance and non-verbal communication available during face-to-face contact, particularly when patients require complex assessment or psychological support[51,59]. Trust may also be weakened by frequent platform changes, unclear professional responsibility, or discontinuity in staff contact[53]. In addition, remote systems may provide less direct assessment of the home environment, caregiver capacity, and offline social-support network than home visits[59].

Accordingly, digital health technologies are more appropriately positioned as a complement to, rather than a replacement for, conventional transitional care[17,25]. A hybrid online-offline model may be suitable: digital tools can support routine education, data collection, and risk alerts, whereas face-to-face care can be reserved for complex assessment, emotional support, and relationship maintenance[34]. This continuum care pathway across the whole disease journey is illustrated in Figure 1.

Intelligent monitoring and management of stoma-related complications

Stoma leakage, peristomal dermatitis, and parastomal

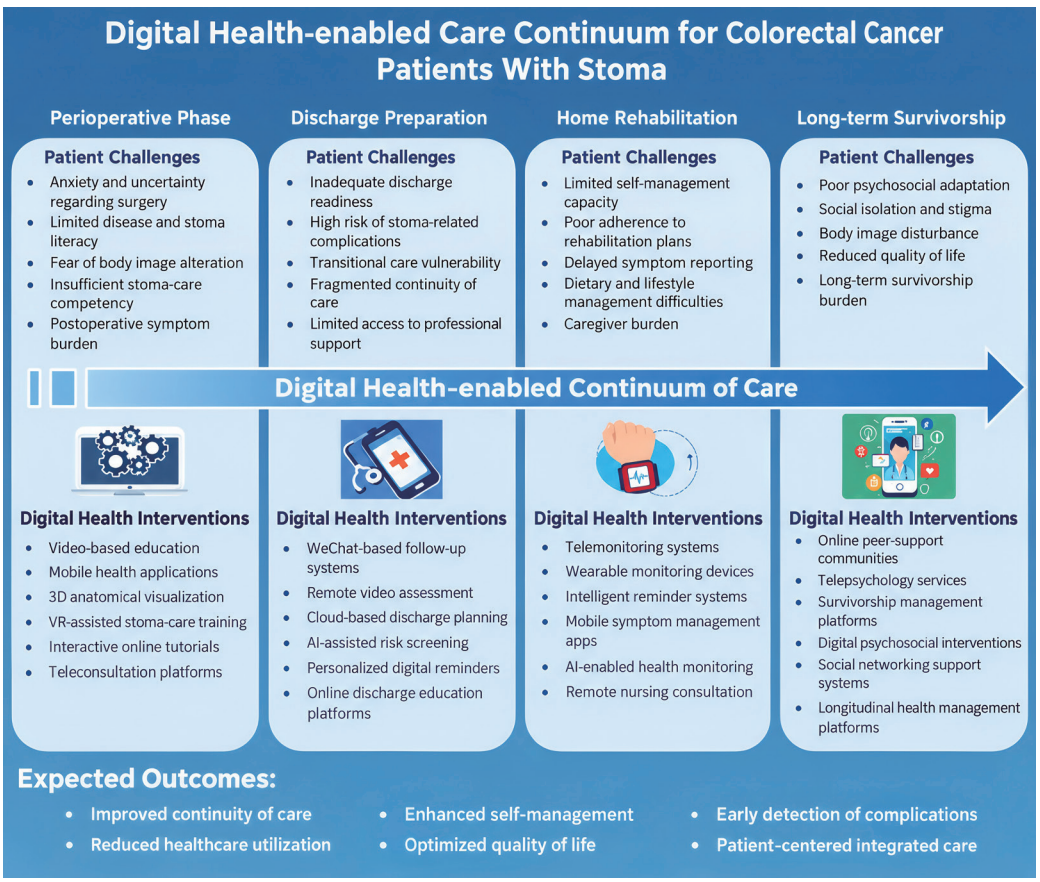


Figure 1: Framework of digital health-enabled continuum care for patients with colorectal cancer-related stomas.

hernia are common complications that may adversely affect postoperative recovery and quality of life[24]. Conventional management often relies on patient self-observation and intermittent review, which may delay recognition and introduce subjective variation.

Intelligent sensing technologies and mobile health tools are being explored for stoma-related complication management. Emerging wearable and smart-bandage technologies may detect local environmental changes, but their direct clinical applicability to stoma care remains uncertain[60,61]. Multi-parameter systems that measure humidity, temperature, or pH may offer opportunities for earlier warning, although real-world stability and long-term performance require further validation[62]. Current technical concerns include skin irritation from adhesives, sensor calibration and durability, false alarms, and alarm fatigue, all of which may reduce trust and sustained use[53,62].

Remote nursing combined with video assessment and online guidance may facilitate earlier recognition of abnormal stoma changes and timely advice[25,34]. Meta-analytic evidence suggests that telemedicine, eHealth, and mHealth interventions may reduce selected stoma-related complications, but heterogeneity and methodological limitations warrant caution[36]. Individualized 3D-printed assistive devices may improve appliance fit, leakage control, or patient acceptance, although replication and longer-term evaluation are needed[37].

Mobile health-based closed-loop models may shift complication management from episodic response toward earlier prevention and dynamic follow-up. However, device reliability and long-term performance still require validation[62]. Standardized implementation pathways and clinical outcome measures remain underdeveloped[36]. Cost-effectiveness and integration with care systems also require further evaluation[52].

Behavioral adaptation and patient empowerment supported by digital health

Symptom management and quality of life support

Symptom burden in patients with colorectal cancer-related stomas is a dynamic process shaped by symptom perception, behavioral self-regulation, and continuity of care[63]. Digital interventions may be most useful when monitoring is linked to feedback and feasible behavioral adjustment rather than functioning as data collection alone[23]. A plausible pathway is improved symptom recognition, activation of self-regulatory behavior, and greater participation in care decisions[23]. When this behavioral translation is absent, monitoring tools alone may have limited effects on quality of life[64].

Quality-of-life effects also appear to differ across dimensions. Physical outcomes, such as peristomal skin problems, may be more responsive to high-frequency monitoring and clearly specified behavioral actions[62]. Psychological and social outcomes are less consistent, possibly because many interventions provide information without sustained behavioral support or integration into patients' social contexts[65].

Current evidence therefore suggests that the relationship between digital health and quality of life is context-dependent[51]. Benefits appear more likely when data acquisition is connected to understandable feedback, appropriate clinical response, and sustained behavior-change support[52].

Psychological support and social adaptation

Psychological distress after colorectal cancer-related stoma surgery is closely associated with body-image changes and altered social roles[3,4]. Digital psychological support may contribute through education, contextual practice, and social connection rather than through symptom relief alone. Mobile applications, virtual or simulated training, and online support platforms may help correct misconceptions, reduce avoidance of selected situations, and provide peer support[27,66]. These pathways may be associated with short-term improvements in emotional status, but the strength and durability of effects remain uncertain[66]. This mechanism of digital health intervention for stoma continuous care is presented in Figure 2.

Findings for anxiety, depression, and psychological adaptation remain inconsistent, suggesting substantial heterogeneity rather than a stable intervention effect[3,66].

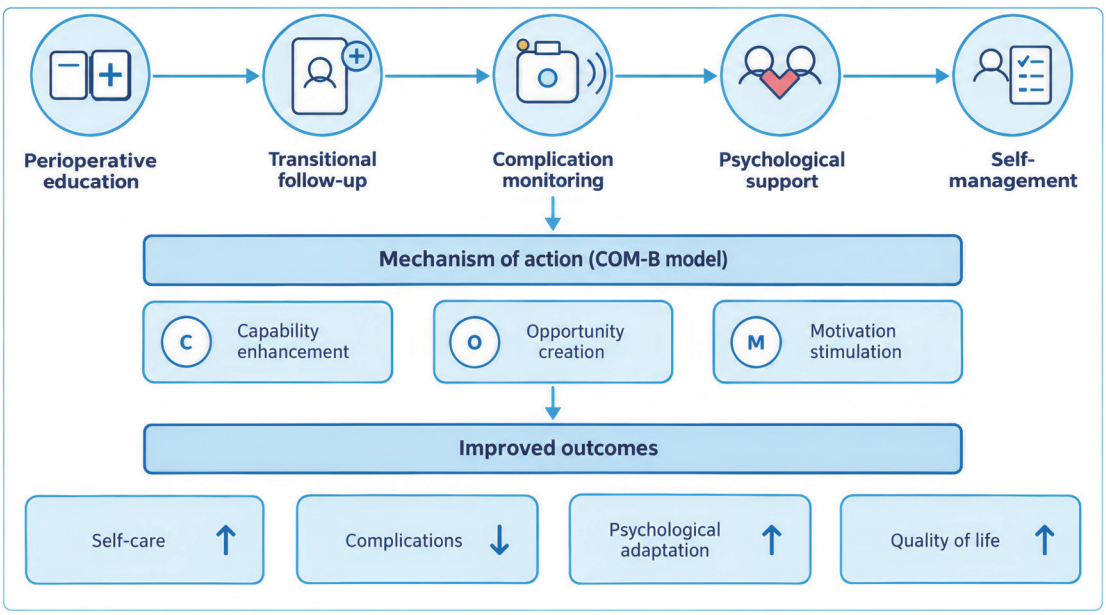


Figure 2: Application mechanism model of digital health technology in stoma continuity of care.

Abbreviation: COM-B, Capability-Opportunity-Motivation-Behavior.

Baseline psychological profiles, intervention intensity and duration, theoretical foundations, and measurement tools differ across studies and may contribute to variable findings[51]. Some interventions may reduce early negative emotions without producing sustained behavioral adaptation or social reintegration[66].

Digital platforms may lower barriers to accessing support and help maintain social connections[59]. However, online support could also substitute for rather than facilitate gradual participation in real-world settings for some patients, particularly those with low health literacy or limited offline support[59]. Digital social support may therefore be most useful as a transitional resource when combined with progressive engagement in everyday social contexts[65].

Overall, digital psychological interventions appear more likely to support longer-term adaptation when emotional regulation is linked to behavioral change and restoration of social functioning, rather than when technology is used as a stand-alone support channel[66].

Self-management and patient empowerment

The value of digital health for self-management may lie less in information transmission alone than in its capacity to support the gradual development of practical capability[23]. Barriers often include discontinuities between hospital instruction and home practice, between knowing what to do and performing it under real-life conditions, and between early support and long-term independence[46,51]. Digital guidance, reminders, and feedback may help address some of these gaps and may strengthen self-efficacy when patients repeatedly complete appropriate self-care tasks[32].

Continuous feedback and reminders may reinforce correct behaviors during everyday practice and help patients accumulate successful experiences[46]. Discussions of empowerment should therefore extend beyond access to information and consider whether patients gain confidence, decision-making ability, and reduced dependence on external support[23]. These mechanisms appear to depend on intervention design, responsiveness, and fit with the patient's capabilities and context[51].

Accordingly, evaluation should consider not only whether digital support is available, but also whether intervention intensity can be reduced stepwise as patients internalize self-management skills and become more independent[23].

Challenges and future directions

Current challenges

The available evidence suggests that digital health in stoma care is not a single-tool effect but a dynamic process involving patient behavior, technology performance, and care-system integration[51,52]. Its pathways may be considered across three related levels: information-to-behavior transformation, technological support, and integration with clinical and home-care systems[23].

At the patient level, continuous information and feedback may shorten the interval between symptom recognition and behavioral response, but sustained self-management depends on reinforcement in everyday contexts[23]. At the technology level, usability, accessibility, data quality, interoperability, and reliable escalation pathways influence whether tools are used consistently and safely[52]. At the system level, fragmented workflows and weak linkage between digital platforms and clinical services may limit continuity and dilute potential benefits[52].

The central question is therefore not simply whether a digital intervention is effective, but under which conditions it may produce a coordinated and sustainable care process. Variation in these conditions is likely to contribute to the heterogeneity of current evidence[51].

Beyond digital literacy and contextual fit, implementation should address data privacy, cybersecurity, and ethical governance[53]. Sensitive health data should be protected through proportionate security controls and transparent data-use policies[53]. Informed consent and accountable oversight are necessary to preserve patient autonomy[67]. Equitable access should also be considered to avoid widening disparities[26]. Together, these safeguards may strengthen patient trust and support sustainable integration into clinical practice[52].

Future directions

Future research should move beyond short-term efficacy testing and examine mechanisms, implementation processes, and system-level effects[51]. Studies should identify which core components may be transferable across stoma-care settings and which effects depend on local resources, patient characteristics, and professional workflows[52].

Research organized around mechanistic units, such as symptom monitoring, feedback regulation, behavioral reinforcement, and escalation to professional care, may improve comparability across interventions and strengthen theoretical consistency[23].

Digital tools should increasingly be evaluated as components of clinical pathways rather than as stand-alone applications. Integration with documentation systems, nursing workflows, and long-term care plans may be necessary for sustained use[52]. Adaptive designs are also needed because differences in digital literacy, access, language, and functional capacity may produce unequal intervention exposure and outcomes[51].

Implementation studies should assess acceptability, feasibility, fidelity, reach, maintenance, cost, and unintended consequences across hospital and home settings[52]. Data privacy and cybersecurity should be incorporated into design and evaluation from the outset[53]. Consent, accountability, and equitable access should also be addressed prospectively[26,67]. Favorable findings from app-based stoma trials should be replicated across settings[38].

Limitations of this review

As a narrative review based on a systematic search, this study did not undertake quantitative pooling or apply a single formal risk-of-bias scoring tool across all heterogeneous study designs. Although evidence syntheses were separated from primary outcome-level interpretation to reduce double counting, residual overlap cannot be completely excluded because the reporting of included studies varies across systematic and scoping reviews. In addition, restriction to English- and Chinese-language publications and to the 2015–2025 publication window may have excluded relevant earlier or other-language evidence. These limitations should be considered when interpreting the conclusions.

Conclusions

Digital health may support a shift in stoma care from hospital-centered episodic management toward more continuous monitoring, feedback, education, and self-management support. Potential benefits have been reported across perioperative education, transitional care, compli-

cation monitoring, psychological adaptation, and patient empowerment; however, current evidence is heterogeneous and is often based on small, single-center, or methodologically diverse studies. Digital technologies should therefore be interpreted as context-dependent complements to professional care rather than universally effective replacements. Future research would benefit from stronger comparative designs, standardized outcomes, longer follow-up, implementation and economic evaluation, and explicit governance for privacy, cybersecurity, consent, accountability, and equity. These priorities may help translate digital innovation into safe, sustainable, and patient-centered stoma care.

Author contributions

Patiguli·Abudu and Tingting Hu contributed equally to this work. Patiguli·Abudu: Investigation, Data curation, Writing–original draft. Tingting Hu: Investigation, Data curation, Methodology. Wenjia Guo: Methodology, Formal analysis, Writing–review & editing, Supervision. Yanting Han: Methodology, Resources, Supervision, Writing–review & editing. Zhe Yin: Conceptualization, Methodology, Project administration, Supervision, Writing-review & editing. All authors reviewed and edited the manuscript, approved the final version, and agree to its publication.

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Data availability statement

No datasets were generated or analyzed for this work.

Ethics statement

Not applicable.

AI statement

The authors used GPT-5.6 (online version) as a language-editing tool to improve grammar, clarity, and readability. The AI tool was not used for data analysis, data generation, image processing, or scientific content creation. All outputs were carefully reviewed and verified by the authors, who take full responsibility for the final content.

Conflicts of interest

The authors declare no conflicts of interest.

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