Title
Preoperative Ostomy Care: Evidence-Based Quality Improvement Pilot Project

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Publication Date
2023

Peer reviewed|Thesis/dissertation

UNIVERSITY OF CALIFORNIA

Los Angeles

Preoperative Ostomy Care:

Evidence-Based Quality Improvement Pilot Project

A dissertation submitted in partial satisfaction of the

requirements for the degree

Doctor of Nursing Practice

by

Maki Jerden

2023

ABSTRACT OF THE DISSERTATION

Preoperative Ostomy Care:

Evidence-Based Quality Improvement Pilot Project

by

Maki Jerden

Doctor of Nursing Practice

University of California, Los Angeles, 2023

Professor Wendie A. Robbins, Chair

Background: An estimated 750,000 to 1 million people live with an ostomy, and approximately 100,000 – 120,000 people undergo the creation of a new ostomy surgery every year. Faster recovery times have decreased ostomy patients' post-operative hospital length of stay (LOS). As a result, patients have limited time to receive adequate ostomy education and training during hospitalization. Because the LOS is short, providing necessary patient education, training, and stoma site marking (SSM) before ostomy surgery as an outpatient can impact patients' well-being, decreasing ostomy-related complications and reducing financial burden. **Objectives**: This preoperative ostomy care quality improvement (QI) pilot project aimed to evaluate the impact of

providing preoperative ostomy education, care training, and stoma site marking (SSM) on patients undergoing scheduled fecal ostomy creation surgery, including length of stay (LOS), emergency department (ED) visitation, and readmission occurrences associated with ostomy issues including dehydration and acute renal insufficiency. **Methods:** This QI project was a single-site project at a large community hospital in Los Angeles County. The project's subjects included two groups of adult patients who had undergone scheduled colorectal surgery for new fecal ostomy creation: those who had surgery prior to initiation of the QI project (non-intervention group); and those who had surgery after initiation of the intervention for the QI project (intervention group). The QI project used a pre-and post-intervention design and was guided by the Plan-Do-Study-Act (PDSA) cycle. The intervention implementation was for four months, and the data collection was for a total of five months. Due to the small sample size, a descriptive statistical analysis was used. **Results:** The control group had 26 participants, and the intervention group had five participants. The average LOS in the control group was 7.2 days, and 3.8 days in the intervention group. The total 30-day post-discharge ED visits were six cases in the control group (23.1%) and none in the intervention group (0%). The total 30-day post-discharge readmission was five cases in the control group (19.2%) and none in the intervention group (0%). **Conclusion:** Despite the small sample size, a more than three-day reduction of average LOS, and a reduction to zero readmissions or ED visitations are clinically and financially meaningful findings. Further research with larger sample sizes to examine generalizability is recommended.

The dissertation of Maki Jerden is approved.

Nancy Jo Bush

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Wendie A. Robbins, Committee Chair

University of California, Los Angeles

2023

This dissertation is dedicated to ostomates, and healthcare providers devoted to improving ostomy care. Their strength and courage have enabled me to overcome the challenges and make my passion alive.

I wholeheartedly dedicate this to my beloved husband, Cris, who gives me strength and continuous support. Thank you, I could not have done it without you. To my dear son Leo, my dedication and educational achievement may inspire you to achieve your dreams. Last but not least, to my mom, Akiko, thank you for your continued emotional support and words of encouragement during this chapter in my life.

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ACKNOWLEDGEMENTS

I would like to acknowledge the tremendous effort of all my faculty members, especially Drs. Nancy Jo Bush and Theresa Brown who guided me to be the best scholar I could be and believed in me to achieve this educational goal. To Ms. Soo Kwon for being the backbone of our class, thank you for being readily available for my questions and requests.

This DNP project would not have come to fruition without the help and guidance of my committee chair Dr. Wendie A. Robbins. I am forever thankful for her unwavering support, knowledge, and encouragement.

I would also like to acknowledge the remainder of my committee, Dr. Sophie Sokolow and Dr. Elizabeth Anne Thomas. Your invaluable recommendations have been instrumental to my growth. In addition, I would like to acknowledge my clinical mentors, Dr. Mary Hersh, and Dr. Linda Lillington, for their presence and continuous support. I recognize the great work and willingness to improve ostomy care by colorectal surgeons, Drs. Vijay Muraliraj, Megan Linnebur, and David Koller. I appreciate their continuous collaboration.

Lastly, I would like to acknowledge all my classmates for their support, passion, friendship, and encouragement, which allowed me to complete this journey.

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Brighton, United Kingdom, 1998	The 12th Biennial Congress of the World Council of Enterostomal Therapists "Development of an ideal stoma model"

PUBLICATIONS

1 **Jerden, S. M.** (2010). Nurse practitioner's responsibilities in the U.S. and future possibilities in Japan. *Director of Nursing Communication: Nissoken 8*(4). [Japanese]

2 Pressure Ulcer Prevention Quick Reference Guide Japanese Version 2014 2014, Tokyo, Japan *(Translation of the National pressure ulcer prevention guide, English to Japanese)*

3 **Jerden, S. M.** (2017). Chapter: Acute wound and ostomy care in U.S. and Japan. In R. Kawamoto, *A passport for clinical training* (pp. 121-139). Haru Shobo, Tokyo, Japan [Japanese]

CHAPTER ONE: INTRODUCTION

A significant number of people in the United States (U.S.) live with ostomies, and yet ostomy care remains suboptimal and challenging. An estimated 750,000 to 1 million people live with an ostomy, and approximately 100,000 – 120,000 people undergo the creation of a new ostomy every year (Abdelmohsen, 2020; Seo, 2019; Sheetz et al., 2014). An ostomy is an artificial opening created on the surface of the abdominal wall using an intestine by a surgical procedure to evacuate body waste (Kugler et al., 2021; National Institute of Diabetes and Digestive and Kidney Diseases [NIDDK], 2021). The creation of ostomies automatically results in an incontinent bowel or bladder diversion because there is no sphincter (Burrell, 2013). Therefore, most new ostomy patients must learn how to care for and wear pouching systems after surgeries to prevent ostomy-related complications.

There are two types of fecal ostomies: colostomy and ileostomy. A colostomy uses a large intestine to create an ostomy. An ileostomy is the end part of a small intestine used to create an ostomy, and the entire large intestine is bypassed or removed. (see Appendix A: Glossary). Complications of fecal ostomies may include stoma or peristomal skin complications (PSCs), dehydration, and intestinal obstruction. The incidence of ostomy-related complications is 10-70%, and PSCs such as skin irritation, erosion, and ulceration are the most common early postoperative complications (Ambe et al., 2018). Taneja et al. (2019) report that approximately one-third of ostomy patients develop PSCs due to leakage or ill-fitting pouching following ostomy surgeries within 90 days after surgery and PSCs are associated with more likelihood of hospital readmission. Moreover, in ileostomies and proximal colostomies, the absence or reduction of the resorption surface of the large intestine creates a loss of high volumes of fluid, leading to patients developing dehydration or acute kidney injury (AKI) (Ambe et al., 2018).

Enhanced recovery after surgery (ERAS) protocols are the current standard of practice for colorectal surgeries and are holistic, multidisciplinary tools for improving postoperative patients' recovery and outcomes (Brindle et al., 2020; Forsmo et al., 2016; Melnyk et al., 2011). The ERAS protocols consist of pre, peri, and postoperative evidence-based treatment measures to reduce the hospital length of stay (LOS) and complications (see Appendix A: Glossary). Despite using ERAS protocols, the hospital readmission rate within 30 days after discharge among new ileostomy patients is a common problem (Van Butsele et al., 2021). Sanaiha et al. (2020) reported that 15.3% of colostomy creation surgery patients were readmitted to the hospital within 30 days after discharge. The researchers concluded that there is an opportunity to prevent readmission for patients with colostomy. Van Butsele et al. (2021) reported that 25% of new ileostomy patients were readmitted within 90 days after discharge. Among those readmitted patients, acute renal insufficiency accounted for 24%, and high output stoma (11%) were the reasons for the readmissions (see Appendix A: Glossary). Therefore, the researchers concluded that ERAS protocols should include ostomy education and prevention of high output ostomy and dehydration to prevent readmissions.

Faster recovery times because of laparoscopic procedures, robotic surgeries, and utilizing the ERAS as the colorectal surgery standard of practice have decreased ostomy patients' post-operative hospital LOS (Centers for Medicare & Medicaid Service [CMS], 2018b; Krouse et al., 2016; Ngu & Kim, 2019; Sun et al., 2013). In the U.S., the average LOS after ostomy creation surgery is 5.7 days (Wahl et al., 2018). As a result, patients have limited time to receive adequate ostomy education and training during hospitalization. Most patients receive ostomy education and training during initial hospitalization on the first or second postoperative days when acutely recovering from surgery with little follow-up or reinforcement (Zganjar et al., 2021).

Because the LOS is short, providing necessary patient education, training, and stoma site marking (SSM) before ostomy surgery as an outpatient can impact patients' well-being, decreasing ostomy-related complications and thus reducing financial burden (Stokes et al., 2017). While expert opinion recognizes that preoperative ostomy training can reduce LOS, there is limited empirical evidence for the benefits of this approach (Danielsen et al., 2013; Hughes et al., 2020). Furthermore, interventions like preoperative ostomy education and SSM are included in the global surgical reimbursement package for the surgery during the preoperative period. Therefore, those preoperative interventions are not separately reimbursable (CMS, 2018a). As a result, there is inadequate or no preoperative ostomy surgery preparation, even though ostomy surgeries are costly for patients, healthcare organizations, CMS, and insurers because of longer LOS and a higher readmission rates (Sheetz et al., 2014). Patients who undergo ostomy surgery have high emergency department (ED) visitations and readmissions. These events are frequent and costly and demonstrate patients' unmet medical needs (Mohamed et al., 2021; Sanaiha et al., 2020; Van Butsele et al., 2021).

A preoperative SSM is to select the optimal ostomy location on the abdominal surface to prevent early and late ostomy-related complications such as ostomy pouching leakage, peristomal dermatitis, and hernia (see Appendix A: Glossary). Moreover, SSM enhances the likelihood of independence of patients' self-care, pouching wear times, and control of healthcare costs. Therefore, SSM is a recommended standard of care for all patients when the creation of an ostomy is a possibility (Salvadalena et al., 2015). Also, it is one of the Ostomy and Continent Diversion Patient Bill of Rights ([PBOR], Burgess-Stocks et al., 2022). However, many patients undergo ostomy creation surgery without any preoperative interventions (Kim et al., 2021; Miller, 2020; Salvadalena et al., 2015). In a cross-sectional study, Miller (2020) found that only

42% had received preoperative ostomy education and SSM. Furthermore, there is little follow-up or reinforcement of education relating to ostomy care and complications after discharge (Zganjar et al., 2021). Changing the care paradigm to include preoperative ostomy education is an evidence-based intervention that can contribute to improved postoperative outcomes for new ostomy patients.

Problem Statement

Patients with ostomies need education and skill training to care for their ostomies. Placement of the stoma in the optimal location of the abdomen facilitates self-care and reduces ostomy-related complications. The PBOR states that patients have a right to have preoperative ostomy education and SSM (Burgess-Stocks, 2022). However, less than half of the patients who undergo ostomy surgery receive such care and preparation (Miller, 2020). The absence of preoperative ostomy education, training, and SSM leads to insufficient self-care, unnecessary ED visitation, readmission, and higher healthcare costs for patients and healthcare organizations.

Aim and Objectives

The Doctor of Nursing Practice (DNP) project aimed to evaluate the impact of providing preoperative ostomy education, care training, and SSM on patients undergoing scheduled fecal ostomy creation surgery, including LOS, ED visitation, and readmission status. The project objectives were to provide SSM, ostomy care education, and care training by utilizing a brochure (see Appendix B) and the American College of Surgeons (ACS) educational kit (2021) before the scheduled surgery date. Data about patients' postoperative course LOS, reasons for ED visitation, and readmission associated with ostomy issues, including ostomy pouch leakage or ill-fitting pouching, skin irritation, erosion, ulceration, dehydration, and acute renal injury (ARI), was collected from the electronic medical records (EMRs). The intervention group’s data was

collected at the discharge for LOS and the first 30-day after surgery for ED visitation and readmission.

The DNP degree prepares advanced practice registered nurses (APRNs) to meet the needs of the rapidly changing healthcare arena. Three essentials supported this DNP project to improve postoperative ostomy surgery patients' outcomes. The DNP Essential II *Organizational and systems leadership for quality improvement and system thinking* emphasizes the impact on healthcare delivery and patient outcomes. This DNP project focused on quality improvement to enhance ostomy surgery patients' outcomes by changing the healthcare delivery pattern by focusing on prevention. The DNP Essential III *Clinical scholarship and analytical methods for evidence-based practice* highlight the application of evidence-based practice by evaluating, integrating, and translating scientific evidence. This DNP project was guided by current scientific evidence and evidence-based practice. The DNP Essential VI *Interprofessional collaboration for improving patient and population health outcomes* prepares the DNP to facilitate collaboration with clinical teams and healthcare organizations' leaderships to improve postoperative outcomes for new ostomy patients. This DNP project required a multidisciplinary approach to achieve the desired outcomes for ostomy surgery patients (American Association of Colleges of Nursing [AACN], 2006).

Population, Intervention, Comparison, Outcome and Time (PICOT) Question

In adult patients undergoing scheduled colorectal surgeries with new fecal ostomy creation (P), how do preoperative interventions: stoma site marking (SSM), ostomy education, and training (I), compared with no preoperative interventions (C), affect the length of stay (LOS), 30-day post-discharge readmission, and 30-day post-discharge emergency department (ED) visitation associated with ostomy issues, including ostomy pouch leakage or ill-fitting

pouching, PSCs such as skin irritation, erosion, and ulceration, dehydration, acute renal injury (ARI), and acute renal failure (ARF) (O), within four months of the intervention (T)?

CHAPTER TWO: THEORETICAL FRAMEWORK

This DNP scholarly project was an evidence-based quality improvement (QI) pilot project focusing on preoperative ostomy interventions to improve ostomy surgery patients' postoperative outcomes measured by LOS, 30-day post-discharge ED visitation, and readmission occurrences. Utilizing the Plan-Do-Study-Act (PDSA) cycle was suitable and practical to guide this DNP project. The PDSA cycle is a systemic process to continually improve a product, process, or service by gaining knowledge (The W. Edwards Deming Institute [TWEDI], 2021). The PDSA cycle provides a structure for repetitive testing and evaluation of changes to improve quality, and this framework is widely utilized in healthcare improvement and QI projects (Taylor et al., 2014). This project aimed to improve postoperative ostomy patients' outcomes using the PDSA cycle as a theoretical framework for guiding the DNP project to complete the first cycle. Because this was a pilot project, it is expected to repeat PDSA cycles for continuous improvement even after completing the DNP project implementation.

Four steps form the PDSA cycle. The first step is P and stands for *Plan*. This first phase involves identifying a goal or purpose, formulating a theory, and setting objectives based on service and patient needs. The second step is D and stands for *Do*. During this phase, the Plan is implemented and carried out. The third step is S, which stands for *Study*. In this phase, the project results are obtained and analyzed. In addition, this step involves monitoring outcomes of testing the Plan's validity and identifying problems and improvement opportunities. The last step is the A, which stands for *Act*. During this step, the project improvements are ensured and

implemented. Moreover, the project's goal, objectives, methods, and theory are adjusted as indicated by the results for the next PDSA cycle. The QI project team repeats these four steps as necessary for continuous improvement (TWEDI, 2021).

In terms of this DNP project, the *Plan* phase was developing the PICOT question, creating the Generalized Activity Normalization Time Table (GANTT) chart for the implementation timeline, submitting the project to the Institutional Review Board (IRB) at the University of California, Los Angeles (UCLA) requesting exemption of the project from review, and getting the DNP project implementation site IRB exempt status and support for the project. The *Do* phase was the project implementation utilizing the brochure (see Appendix B) and the ACS educational kit (2021). Patients scheduled for fecal ostomy surgery received preoperative interventions: SSM, ostomy education, and training. In the *Study* phase, the data was collected and analyzed. In the last *Act* phase, the project was evaluated for the project's goal, objectives, methods, and theory. The project is adjusted to prepare for the next PDSA cycle.

The PDSA cycle uses small-scale change at the beginning and testing to follow rapid assessment and additional change (Taylor et al., 2014; TWEDI, 2021). Therefore, the PDSA cycle was a desirable theory and model to guide this pilot QI project because the project implementation was short with a small sample size and the expected need for continuous improvement. Due to the limited implementation time and small sample size, this DNP project served as the first PDSA cycle, and continuous necessary changes and improvements will be evaluated for the second cycle after the DNP project completion.

CHAPTER THREE: REVIEW OF LITERATURE

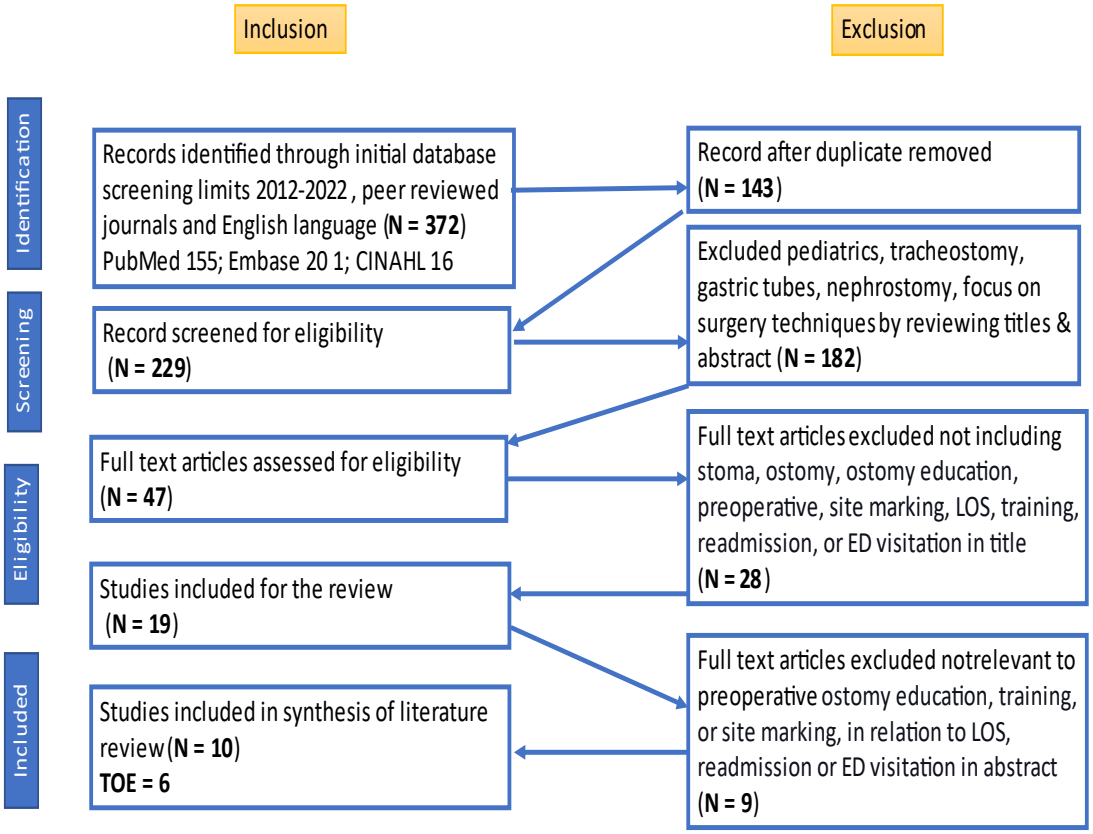
Literature Search

The articles were obtained using the Preferred Reporting Items for Systematic Review and Meta-analysis (PRISMA) method as illustrated in Figure 1. The literature search was conducted using PubMed, Excerpta Media Database (EMBASE), the Cumulative Index to Nursing and Allied Health Literature (CINAHL), and The Journal of Wound, Ostomy and Continence Nursing (JWOCN) journal, most of which were completed on 7/12/2022. The six population search terms initially utilized the Boolean Operator “OR” were: "colorectal surgery" OR "fecal ostomy" OR ostomy OR colostomy OR ileostomy OR stoma. Then four additional intervention search terms were added: "preoperative intervention*" OR "stoma site marking" OR "ostomy education" OR training. Finally, using eight outcome search terms: readmission OR dehydration OR ARI OR "acute renal insufficiency" OR ARF OR "acute renal failure" OR "ED visitation" OR "emergency department visit*." All grouped terms (population, intervention, and outcome) were combined by the Boolean Operator “AND” to search each database. The search was limited to the English language and peer-reviewed journals. The search years were limited to 10 years (2012-2022).

The search results were PubMed 155 articles, EMBASE 201 articles, and CINAHL 16 articles (N=372). The duplicates were removed (n=143 removed). Pediatrics, tracheostomy, gastric tubes, nephrostomy, and focusing on ostomy creation surgery techniques were excluded after reviewing the article title (n=182 removed). A total of 47 articles were further reviewed if the title included “stoma” or “ostomy” and “ostomy education” or “preoperative,” “site marking” or “length of stay,” or “training” or “readmission” for its relevance. After the screening, 19 articles were found eligible for further review (n=28 removed). Then nine articles were removed

after reading the abstract because those nine articles did not directly study the relationship between interventions (education, training, and SSM) to the outcomes of LOS, readmission, or ED visitation. As a result, the selection of 10 articles was the foundation of this DNP project (*n*=9 removed). Those 10 key studies were identified to provide support for preoperative SSM and ostomy education and training in relation to LOS, 30-day post-discharge readmission and ED visitation (see Figure 1). Among those 10 key studies, six are summarized in the Table of Evidence (TOE); two were excluded from the TOE since they are meta-analysis and systematic review studies, and two are specific to ileostomy, dehydration, and readmission (see Table of Evidence). Because research on preoperative ostomy interventions continues to evolve, PubMed Alerts and Google Alerts were set to identify newly published articles.

Figure 1: *PRISMA Diagram: Literature Search Strategy*



Literature Review

10 key studies were identified, and six studies are summarized in the table of evidence (TOE) format (see Table of Evidence). Four of the studies were pre/post-intervention clinical studies (Forsmo et al., 2016; Hughes et al., 2020; Stokes et al., 2017; Younis et al., 2012), two retrospective studies (Taneja et al., 2019; Van Butsele et al., 2021), two QI studies (Eid et al., 2022; Zganjar et al., 2021), and two systematic review and meta-analysis studies (Hsu et al., 2020; Kim et al., 2021). These articles focused on preoperative interventions, either SSM (Hsu et al., 2020; Kim et al., 2021) or education or training (Eid et al., 2022; Forsmo et al., 2016; Hughes et al., 2020; Stokes et al., 2017; Younis et al., 2012; Zganjar et al., 2021) or retrospectively collected data to be analyzed PSCs and readmissions (Taneja et al., 2019; Van Butsele et al., 2021). Even though most pre/post-intervention studies are not conducted in the U.S., those articles were the most relevant studies to this DNP project because their target populations, interventions, and outcome measures were very similar to the DNP project. In addition, no other recent U.S. studies have been available (see Table of Evidence).

The first study, by Forsmo et al. (2016), was a randomized controlled trial and a single-center study. The researchers investigated whether an ERAS program with ostomy specialists providing counseling and education reduces the LOS, readmission, and ostomy-related complications and improved health-related quality of life (HRQOL). The study aimed to compare LOS, readmission rate, stoma-related complications, and HRQOL in adult patients who received the intervention (n=61) to those who received traditional stoma education as part of the standard post-surgery pathway (n=61). The intervention group received 45-60 minutes of once or twice ostomy education and training one to three weeks before surgery by an ostomy specialist. The study was conducted from January 5, 2012, to March 4, 2015. Descriptive statistical

methods were used to characterize the sample. The result was shorter LOS, from nine days to six days, in the intervention group (p<0.001). There was no difference between the two groups regarding the other outcomes, such as readmission and stoma-related complications and improved HRQOL. The author concluded that preoperative and postoperative stoma education in an enhanced recovery program is associated with a shorter LOS.

The second study by Hughes et al. (2020) was a retrospective, single-site study, and the purpose was to assess the impact of preoperative stoma training on LOS. The total sample size was 123 adult patients. The intervention group (n=53) had a counseling session with the ostomy care specialist before surgeries, and the control group received standard care (n=70). The intervention group received preoperative education and training provided by an ostomy specialist seven days before surgery at an outpatient facility. The study was conducted between 2012 and 2016. The outcomes were LOS, morbidity, stoma-related morbidity, ERAS milestone achievement, and readmission rates. The intervention group had shorter LOS, from nine days to eight days in the intervention group (p=0.025). No significant difference existed in morbidity rates, stoma-specific morbidity, ERAS milestones, or readmission rates. The authors concluded that preoperative stoma training could reduce LOS and be employed routinely for patients planning colorectal surgery. Both studies by Forsmo et al. (2016) and Hughes et al. (2020) are appropriate for the DNP project because the intervention and outcome measures were very similar in these two studies. Even though these study settings were not conducted in the U.S. and differ from the average LOS, both studies showed differences in shorter LOS in the intervention groups: six days vs. nine days (Forsmo et al., 2016) and eight days vs. nine days (Hughes et al., 2020).

Stokes et al. (2017) studied postoperative complications (including stomal and peristomal complications), LOS, and readmission rates in adult patients undergoing fecal ostomy surgery (*n*=218). The patients were divided into an intervention group (*n*=124) and a control group (*n*=94). The intervention group received a preoperative two-hour stoma group education provided by certified wound ostomy & continence nurses (WOCNs). Three to six patients were in a class, and the implementation period was between September 2012 and August 2014. The control group experienced significantly more peristomal complications than the intervention group (44.7% vs. 20.2%, *p*=0.002); however, no significant differences were found in LOS and 30-day readmission between the intervention and control groups.

Taneja et al. (2019) carried out a retrospective study to examine the incidence and economic burden of PSCs following ostomy surgery. In this study, the sample of 168 patients who underwent a colostomy (*n*=108), ileostomy (*n*=40), cutaneous ureteroileostomy, or other external urinary diversions (*n*=20) were examined based on their electronic health records with evidence of PSCs within 90 days after ostomy surgery. The results revealed that 61 patients (36.3%) had evidence of PSCs within 90 days, and patients with PSCs had higher readmissions compared to patients without PSCs (55.7 % vs. 35.5%, *p*=0.011). There was no difference in LOS among patients with and without PSCs. However, patients with PSCs showed higher total healthcare costs over 120 days. The mean total healthcare cost of the patients with PSCs was $58,329, and for patients without PSCs $50,928.

Younis et al. (2012) conducted a pre/post-test in a single site setting. The target population was patients who underwent (control group) and undergoing (intervention group) elective anterior resection and creation of loop ileostomy. The control group was retrospectively reviewed (January 2006 to August 2008). The intervention group patients received ostomy

education and training prior to their surgery, which was conducted between September 2008 to October 2010. The outcome was measured by LOS. The researchers found that the average LOS was 14 days in the control group and eight days in the intervention group. In addition, the researchers found that hospital discharge was postponed due to stoma management in 17% in the control group and 0.8% in the intervention group ($p<0.0001$). The researchers concluded that preoperative ostomy education and training for patients undergoing elective ileostomy surgeries reduces LOS and increases the independence of stoma self-care.

Zganjar et al. (2021) conducted a longitudinal QI feasibility study in a single-site setting. This study differs from the other studies because the sample was all patients with urostomies. However, this study was applicable to the DNP project because the intervention was preoperative ostomy education (stoma boot camp). In addition, the study setting was in the U.S., where the healthcare system is similar to this DNP project. The sample size was 51 patients, and the intervention was a three-hour group education session within two weeks of the surgery. Residents and advanced practice providers provided a short presentation to patients regarding ostomy surgery, recovery, and postsurgical care, in addition to the ostomy care nurse demonstrating primary urostomy care. The intervention period was from February 2018 to February 2020. The objective of this study was to evaluate the feasibility and sustainability of implementing a preoperative comprehensive stoma education session. The other purpose was to evaluate if education improves patients' ability to care for their stoma postoperatively. The authors found that the patients had an average Ostomy Adjustment Scale (OAS) of 150.4 (95% CI 142.0, 158.8) at discharge, and these high OAS levels persisted throughout the 12 weeks of follow-up data. While not the primary objective, the study also reported on 30-day readmission related to stoma complications as one of the outcomes. Given the nature of the study and that

LOS, readmissions within 30 days, and unplanned stoma-related interventions were not the primary objectives, the researchers used descriptive data to report the findings. The average LOS was 5.24 days (SD − 2.44); the 30-day readmission rate was 25%, and the readmission due to ostomy-related complications was 0%. The authors concluded that structured preoperative ostomy education for patients undergoing radical cystectomy surgery is feasible, sustainable, and may be associated with improved ostomy adjustment and HRQOL.

Van Butsele and colleagues (2021) investigated risk factors for readmission in patients post rectal resection and loop ileostomy creation surgery. The retrospective study was conducted between 2011 and 2016 and used a retrospective database of adult patients who had undergone restorative proctectomy; the outcome measure was 90-day readmission. The researchers reported that the readmission after rectal resection was 25% of the cases, and most readmissions occurred within 30 days. They also reported that the main reasons for readmission were ARI (24%), small bowel obstruction (20%), anastomotic leakage (15%), and high output stoma (11%). Therefore, the researchers concluded that the ERAS protocols should include ostomy education and high output stoma prevention to decrease postoperative readmission.

Eid et al. (2022) conducted a single-center QI study between May 2017 and May 2019. The intervention was to implement these measures: a physician assistant to provide coordinated care, implement rehydration protocols, and educate nursing staff regarding fiber supplements for high output ileostomy patients. The researchers reported that the readmission rate among ileostomy surgery patients was high (>29%), and implementation of standardized oral rehydration therapies and dehydration prevention-focused patient education decreased readmission rates in patients with new ileostomies. Both studies (Eid et al., 2022; Van Butsele et

al., 2021) reported similar results and conclusions, which indicate that dehydration and ARI are common problems and one of the reasons patients are readmitted after ileostomy surgeries.

Kim et al. (2021) conducted a systematic review and meta-analysis of the preoperative SSM literature and shared its effectiveness in reducing complications and increasing self-care and HRQOL. The researchers reviewed a total of 1039 articles that were published between 1997 and 2019; 20 studies were included for review, 19 were used for quantitative synthesis, and the last search was conducted on June 2, 2019. Kim et al. (2021) supported the importance of preoperative SSM in relation to post-operative patient outcomes. The researchers reviewed 53 articles and included 19 articles for the meta-analysis. The researchers found that preoperative SSM reduces stoma-related complication rates, increases self-care independence, and improves HRQOL. This meta-analysis, published in 2021, summarizes many recent SSM studies.

Hsu and colleagues (2020) conducted a systematic review with meta-analysis. The researchers reviewed a total of 533 articles from the inception of each database (i.e., without publication year restrictions), until January 31, 2018, and 10 studies met inclusion and exclusion criteria. They reported similar findings as Kim et al. (2021) regarding preoperative SSM and postoperative ostomy-related complications. The researchers systematically reviewed the literature to determine whether the evidence indicates that preoperative SSM reduces postoperative stoma complications and PSCs. Hsu and colleagues (2020) reported that in patients who underwent preoperative SSM, SSM was associated with reduced ostomy complications and PSCs in all stoma types. Thus, the researchers concluded that recommending preoperative SSM should be a standard of preoperative care.

Synthesis of Literature Review

Preoperative Ostomy Interventions and Outcomes

The key studies reviewed indicate that providing preoperative ostomy education and training reduces LOS (Forsmo et al., 2016; Hughes et al., 2020; Younis et al., 2012). PSCs are the most common ostomy complication due to ostomy pouch leakages. The studies suggest that preoperative ostomy education reduces postoperative ostomy leakages and PSCs (Forsmo et al., 2016; Stokes et al., 2017); thus, it reduces readmission and healthcare cost (Taneja et al., 2019). Zganjar et al.'s findings (2021) also further supplement that preoperative ostomy education resulted in no readmission related to ostomy complications. The meta-analysis study by Kim et al. (2021) and systematic review with the meta-analysis study by Hsu et al. (2020) further support this argument by providing evidence that preoperative SSM improves postoperative patient outcomes by reducing ostomy-related complications. Therefore, the studies conclude that SSM should be a mandatory procedure for patients who are undergoing ostomy surgery.

The readmission rate after ileostomy creation surgery is 15-30%, and research has shown that readmissions are due to dehydration and obstruction (Eid et al., 2022; Van Butsele et al., 2021). Van Butsele et al. state that renal insufficiency is associated with readmission; thus, patient education on dehydration should be added to the ERAS guidelines. Eid et al. (2022) echo the findings of Van Butsele et al. (2021). The researchers focused on implementing rehydration therapy and improved patient education, and their interventions decreased readmission rates among new ileostomy patients.

Limitations of Current Studies

The limitations of these studies were: 1) using single sites, 2) study sites are in different countries and under different healthcare systems, and 3) retrospective reviews instead of

prospective studies. Identified gaps among the studies are no investigation of a direct correlation between the intervention such as SSM, preoperative ostomy education, and training to the outcomes such as LOS, readmission, or ED visitation. For example, the meta-analysis study by Kim et al. (2021) found that preoperative SSM reduces stoma-related complication rates, increases self-care independence, and improves HRQOL, yet did not examine SSM in relation to LOS, readmission, or ED visitation. However, the Taneja et al. (2019) study results suggest that one-third of new ostomy patients had evidence of PSCs within 90 days after ostomy surgery, and patients with PSCs had higher readmission rates and healthcare costs than non-PSCs patients. Taken together, these two studies by Kim et al. (2021) and Taneja et al. (2019) indicate that SSM reduces PSCs, thus reducing readmission and healthcare costs.

Despite those limitations and gaps, conclusions from the literature suggest marked advantages and benefits among patients receiving preoperative ostomy education, training, and SSM compared to patients without preoperative interventions. The identified benefits are preoperative stoma education and training to reduce LOS (Forsmo et al., 2016; Hughes et al., 2020), preoperative ostomy education to reduce ostomy pouch leakage and PSCs (Stokes et al., 2017); thus, reducing readmission and healthcare cost (Taneja et al., 2019). In addition, preoperative SSM improves postoperative patient outcomes by reducing ostomy-related complications (Hsu et al., 2020; Kim et al., 2021).

Despite these several benefits, most patients receive all ostomy education and training postoperatively as standard of practice. The DNP project implementation site had no standardized preoperative ostomy education, training, or SSM available to those patients. Therefore, implementing preoperative ostomy education, training, and SSM for patients with scheduled ostomy surgery was the first step toward achieving optimal postoperative patient

outcomes. The next step of this QI pilot project would be to initiate the second cycle of the PDSA cycle to keep improving the interventions. In addition, this DNP project's interventions should be standardized for use in other healthcare organizations to improve outcomes for patients with ostomies. Future research suggestions are to conduct studies with larger sample sizes focusing on preoperative ostomy care interventions and postoperative patient outcomes such as LOS, readmission, ED visitation, and associated healthcare costs. Moreover, the goal is to keep improving and revising the intervention based on this DNP project outcomes and standardize the use of the intervention in other organizations.

CHAPTER FOUR: METHODS

Project Design

This DNP scholarly project design was a QI pilot project based on evidence-based interventions. The project was a pre and post intervention design. The comparison group was measured before implementing the interventions, with the sample collected retrospectively through a review of existing medical records. The intervention group was measured prospectively for four months following the implementation of the interventions. The period of data collection spanned a total of five months.

Project Sample and Setting

This DNP scholarly project was a single-site project under the same organization but in two different locations. The DNP scholarly project was implemented at the colorectal surgeons' outpatient clinic. The data collection was conducted at a large community hospital in Los Angeles County, where ostomy creation surgeries were performed. The project's subjects were adult (18 years old and older) patients who had undergone (control group) or were undergoing (intervention group) scheduled colorectal surgery with new fecal ostomy creation.

Inclusion criteria were adult patients who are able to read, understand and follow directions in English or understand and follow directions in Japanese, interpreted by the DNP project lead WOC nurse practitioner. Exclusion criteria were age younger than 18 years, emergency ostomy surgeries, urostomy, or if the surgery was performed by non-colorectal surgeons or repeated surgery for ostomy. Additional exclusion criteria included those discharged to skilled nursing facilities or nursing homes, physically unable to perform ostomy self-caring tasks, had reduced cognitive function, and/or lacked the ability to communicate.

The sample was a nonrandomized, convenience sample due to the nature of the QI project. No written consent was obtained as this was a QI project, and the intervention was implemented as part of standard practice within the setting. HIPAA regulations were followed to ensure the protection of patients' privacy.

The project's feasibility was justifiable despite the expected small sample size since this was a QI project and involved implementing evidence-based interventions into standard practice. This was a DNP project; therefore, it was short, and a time of five months was planned to complete the interventions. The outpatient clinic where this QI project was conducted, and the hospital where the data was collected, the colorectal surgeons and the ostomy care team all agreed with conducting this project. Outcome measures and data were obtained through the subjects' EMR with the assistance of the information technology (IT) team. The expected cost of this project was inexpensive other than the labor cost of the person implementing interventions (DNP project lead) and the IT team. Specifically, the DNP project intervention cost was approximately $4, excluding labor costs (see Table 1). Patients scheduled for ostomy surgery received an ACS educational kit and a summarized brochure (see Appendix B) free of charge (ACS, 2021). There was minimal risk because these interventions are recommended as a current

standard practice for patients before ostomy surgeries (Burgess-Stocks et al., 2022; Kim et al., 2021).

Table 1: *DNP Project Preoperative Ostomy Care Interventions Pro-forma*

Expenses	Number	Unit price/cost	Total Cost
WOCN/NP student implementation	50 hrs.		$0
Information Technology person's labor cost	5 hrs.	$0	$0 (TMMC agreeable utilizing IT team to gather the data)
Gas mileage (round trip TMMC & surgeon's clinic)	5	0.585*	$3 ($2.93)
Clinical Space	5	1.5 hr.	$0 Free (no charge for using surgeon's outpatient space)
Medical Assistant	5	5 min	$0 Free (no charge for time)
Office manager/scheduler	5	10 min	$0 Free (no charge for time)
Brochure (Color print)	5	$0.2	$1
Ostomy training kit	5	$0	$0 Free (manufacturer provides them free of charge)
Total			**$4.00**

*** IRS: https://www.irs.gov/tax-professionals/standard-mileage-rates**

Implementation and Instruments

Post-operative education and training remained the same throughout the DNP project implementation. The independent variables were preoperative ostomy education, self-care hands-on training, and SSM. Patients who underwent ostomy surgery in the intervention group received one individual, in-person education, training, and SSM session at the colorectal surgeon's outpatient clinic 1 to 14 days before their scheduled surgery date. The intervention was a one-hour session that began with an introduction, followed by a review of the surgery and the creation of the ostomy and ostomy types. Patients were educated regarding lifestyle modifications, including but not limited to diet, hydration, clothing, and showering. Patients were then shown the pouching system and how to empty and apply the pouch. Return demonstration of the application of the pouch and pouch emptying was conducted using a simulation model of an ostomy included in an "Ostomy Home Skills Kit (ACS kit)" (American College of Surgeons [ACS], 2021). Finally, general education regarding peristomal skin care and resources on how to care for PSCs was presented.

The ACS developed the ACS kit as an education and training material for patients who undergo ostomy surgeries (ACS, 2021). Patients scheduled for ostomy surgery received an ACS kit colostomy and ileostomy version as appropriate to their scheduled surgery preoperatively. In addition, patients received the educational brochure (see Appendix B), developed by the DNP project lead specifically for this DNP scholarly project, which functions as a knowledge and skills checklist. The colorectal surgeons, hospital WOC nursing staff, nursing executive, Chief Operating Officer (COO), and public relations (PR) department director reviewed the educational brochure (see Appendix B) to ensure its content validity. In addition, the DNP project lead utilized the project educational materials to facilitate patient learning regarding their

ostomies before the surgery. Keeping the uniformity of education and ostomy care training, the summarized educational brochure (see Appendix B) was followed by the DNP project lead investigator. All patients were encouraged to do hands-on practices such as emptying the pouch, closing the pouch, measuring the stoma, and how to cut and apply a sample ostomy pouch to a stoma model, which was included in the ACS kit (ACS, 2021). At the end of the educational session, participants were encouraged to ask questions.

Following the ostomy education and training, the DNP project lead performed SSM to select the best location for the patient's new ostomy by utilizing an ACS kit. The SSM began with examining the patient's abdomen to identify the rectus muscle because the ostomy should be within the rectus muscle to avoid a future hernia. Ostomy location was selected based on the surgical consideration of colostomy on the left lower quadrant and ileostomy at the right lower quadrant. Then, any physical limitations were identified to avoid creating an ostomy in these areas, such as scarring, skin folds, wrinkles, waistline, and below pendulous abdomen or breast. In addition, the location of the ostomy was considered away from the possible midline incision, by approximately two inches. The DNP project lead marked the site on the skin with a marker and observed the patient in various positions, such as laying, standing, sitting, and bending forward, to ensure any change in abdominal habitus (Salvadalena et al., 2015). Finally, application of a sample ostomy pouch to the marked area was done followed by discussion of the patient's preference. If the patient agreed with the location, a thin adhesive film dressing was applied over the marked area to prevent fading the mark.

The primary dependent variables were hospital LOS in days, 30-day post-discharge readmission status, and 30-day post-discharge ED visit present or absent associated with ostomy issues, including dehydration, ARI, and ARF for patients with ileostomies. In addition, 30-day

post-discharge readmission status and 30-day post-discharge ED visit present or absent, associated with ostomy issues including ostomy pouch leakage or ill-fitting pouching, PSCs such as skin irritation, erosion, ulceration for patients with either colostomy or ileostomy were monitored (see Table 2).

Table 2: *Performance Outcome Metrics*

Metric	Organizational Definitions	Collection Source
LOS	· In days · LOS - Days of hospitalization after fecal ostomy creation surgery	· Data collection was via EMR · WOC NP (DNP project lead) was responsible for tracking the data with IT assistance
30-day post-discharge ED visitation	· Present or absent · ED visitation at TMMC only (no other organization ED visitation will count) · > 1 ED visitation within 30-day counts as 1 visit	· Data collection was via EMR · WOC NP (DNP project lead) was responsible for tracking the data with IT assistance · All ED visitation cases associated with ostomy issues including dehydration, ARI/ARF include ostomy issues associated with colostomies ED visits were recorded · Manually reviewed the EMR of ED visitation cases
30-day post-discharge readmission	· Present or absent · Readmission at TMMC only (no other organization readmission will count) · > 1 readmission within 30-day counts as 1 readmission	· Data collection was via EMR · WOC NP (DNP project lead) was responsible for tracking the data with IT assistance · All readmission cases associated with ostomy issues including dehydration, ARI/ARF were recorded · Manually reviewed the EMR of readmission cases

The definition of the LOS was the period from the day of admission up to and including the day of discharge. To avoid possible confounding, if the same patients were readmitted or visited the ED more than once within the 30-day post-discharge, it was counted as one case. If intervention group patients went to another healthcare organization, this would not be counted as ED visitation or readmission because there was no system to track that information accurately under the current EMR system. The data was collected via EMR with IT team assistance.

History effect was a concern because the coronavirus disease 2019 (COVID-19) surge may have affected the intervention group. Because of changes in family and friends' visitation patterns after patients were discharged home, family and friends' support after surgery may differ due to the COVID-19 pandemic, which may have affected the intervention group's outcomes. *Instrumentation* was a limited threat because of simple, objective, and straightforward outcome measures. The same clinician (DNP project lead) implemented the procedures such as ostomy education, training, and SSM which gave more consistency to the intervention implementation. However, the same clinician (DNP project lead) who implemented the intervention collected the outcome data, which was a concern for the possibility of bias. *Attrition* was a limited threat since elective colorectal surgeries with ostomy creation were limited to a 30 days postoperative mortality rate of less than 10% (Sheetz et al., 2014). In addition, all scheduled colorectal surgery patients were included in the study by colorectal surgeons and their office secretaries for the four-month project implementation period. However, there was a possibility some patients were discharged to skilled nursing facilities instead of being discharged to home.

The control group sample consisted of 26 patients retrospectively chosen through medical record review from January 2018 to December 2019 by reviewing their EMR. The intervention group of five patients was continuously monitored during the five months from December 2022

to May 2023. The data collection of the intervention group was conducted upon completion of all interventions. External validity was a threat to this QI project because the small sample size may not represent the population. In addition, the QI project setting was limited to a single testing site, which is also a threat to generalizability.

CHAPTER FIVE: RESULTS

The control and intervention groups were compared on demographic and patient clinical data (see Table 3). The two groups had no significant differences regarding age, sex, and race/ethnicity. The most common primary diagnosis for both groups was malignancies; the control group was 63.0%, and the intervention group was 80%. Both intervention and control groups had no Crohn's disease cases. The control group had 22.2% ulcerative colitis cases, unlike 0% in the intervention group. For the operative approach, the control group had the open abdominal approach at 11.6%, compared to 0% in the intervention group. Also, the laparoscopic/robotic-assisted approach was 61.5% in the control group and 40% in the intervention group. In the laparoscopic/robotic approach, the control group was 0%, compared to 40% in the intervention group. Regarding the colorectal surgeons, Dr. C is new to the project implementation site organization, and Dr. D reduced the operative cases at the project implementation site, which is reflected in the surgery case numbers. However, no surgeon performs disproportionally more than the others. Regarding the ostomy types, most ostomy types (92.3%) were ileostomies in the control group, compared to 60% ileostomies in the intervention group.

Table 3: *Comparison of Demographic and Patient Clinical Data in the Control and the Intervention Group*

Variable	Control Group (*n* = 26)	Intervention Group (*n* = 5)
Mean age, y	57.7	58.2
< 45	11.5 %	20.0 %
45 – 65	57.7 %	40.0 %
> 65	30.8 %	40.0 %
Sex		
Male	61.5 %	60.0 %
Female	38.5 %	40.0 %
Race/Ethnicity		
White	30.8 %	20.0 %
Black	3.8 %	0 %
Hispanic	23.1 %	40.0 %
Asian	30.8 %	20.0 %
Other	11.5 %	20.0 %
Primary Diagnosis		
Malignancy	63.0 %	80.0 %
Crohn's disease	0 %	0 %
Ulcerative colitis	22.2 %	0 %
Other	14.8%	20.0 %
Operative Approach		
Open	11.6 %	0 %
Laparoscopic/Robotic	0 %	40.0 %
Laparoscopic/Robotic-assisted	61.5 %	40.0 %
Single-site laparoscopic	26.9 %	20.0 %
Surgeon		
Dr. A	34.6 %	20 %
Dr. B	46.2 %	60 %
Dr. C	0 %	20 %
Dr. D	19.2 %	0 %
Stoma Type		
Colostomy	7.7 %	40.0 %
Ileostomy	92.3 %	60.0 %

Perioperative outcomes are shown in Table 4. Of note, the last two patients enrolled in the intervention group are excluded from the table except LOS because of a delay in the date for surgery and consequent inability to collect the 30-day ED visitation and readmission after discharge data prior to this writing of the DNP scholarly project. The average LOS in the control group was 7.2 days, and the average in the intervention group was 3.8 days. The total 30-day post-discharge ED visits were six cases in the control group (23.1%) and none in the intervention group (0%). Among those six patients who visited the ED, one case was due to ostomy pouch leakage or ill-fitting pouching and PSCs, and the other five were due to ARI. The total 30-day post-discharge readmissions were five cases in the control group (19.2%) and none in the intervention group (0%). Among those five readmitted patients, one case was due to ostomy pouch leakage or ill-fitting pouching and PSCs, which also had AKI. A total of five cases were readmitted due to ARI. All control group patients, who visited ED or were readmitted 30 days after discharge, were ileostomy patients. In spite of the small sample size, more than a three-days reduction of average LOS and a reduction of any readmission or ED visitation are clinically and financially meaningful findings.

Table 4: *Perioperative Outcomes in the Control Group and the Intervention Group*

Variable	Control Group (n = 26) Mean (SD) or number of occurrences	Intervention Group (n = 3) Mean (SD) or number of occurrences
LOS (Days)	7.2 (SD 3.61)	3.8 (SD 0.75) (n = 5)
30-day post discharge ED visitation	6	0
Ostomy pouch leakage or ill-fitting pouching & PSCs (skin irritation, erosion, and ulceration)	1	0
Dehydration, ARI/ARF	5	0
30-day post discharge readmission	5	0
Ostomy pouch leakage or ill-fitting pouching & PSCs (skin irritation, erosion, and ulceration)	1 (Also had AKI)	0
Dehydration, ARI/ARF	5	0

* The sample size (n = 3) for 30 days post discharge ED visitation & readmission due to follow-up interval prohibited the data collection

CHAPTER SIX: DISCUSSION

This QI pilot project examined the impact of preoperative ostomy education, training, and SSM for patients who undergo fecal ostomy creation surgery on LOS, 30-day post-discharge readmission, and 30-day post-discharge ED visits. Despite the small sample size and nonrandomized sampling, this pilot project provides supportive data for existing studies focused on the correlation between preoperative ostomy interventions and patients' outcomes. The general strength of the study was its feasibility because the project interventions were

economical, plus all stakeholders were agreeable to implementation of this project. The descriptive data show that the preoperative ostomy interventions utilized in this scholarly project had a positive impact on postoperative clinical outcomes for this small sample of ostomy patients. As such, the project provides valuable data for project sustainability and future clinical QI projects.

Despite the small sample size and the difference regarding the ostomy types among the control group and intervention group, the financial impact was noteworthy. A comparison of the control and intervention groups' healthcare costs is shown in Table 5. The average LOS in the intervention group was 3.8 days and was 3.4 days shorter than the control group. The average cost of hospital stay per day is $2,883 in the U.S. (Kaiser Family Foundation [KFF], 2023); thus, there is a potential health cost savings of $9,802.2 per patient by providing preoperative ostomy care. Hence, if patients (n = 26/2 years) all reduce the LOS in the intervention group, the potential healthcare cost savings would be approximately $254,857. The ED visitation was six cases in the control group for two years, and the average cost of an ED visit in the U.S. is $530 (Moore & Liang, 2020). Hence, there is a potential healthcare cost savings of $3,180 by implementing preoperative ostomy care within two years. There were five readmissions within two years in the control group, and the average readmission cost in the U.S. is $15,200 (Weiss & Jiang, 2021). Therefore, there is a prospective healthcare cost savings of $76,000 by applying preoperative ostomy care within two years. Altogether, the possible total healthcare cost savings for two years would be approximately $334,037 and is remarkable. It is premature to conclude that all ED visitations and readmissions are preventable or are prevented by implementing preoperative interventions. Moreover, there is a significant difference in ostomy types among the control and intervention groups. The control group had more patients with ileostomies compared

to the intervention group. Patients with ileostomies are prone to develop dehydration and AKI; consequently, the difference in ostomy types may contribute to favorable outcomes in the intervention group. Therefore, continuing the QI project to move on to the second PDSA cycle is recommended to delineate the financial impact.

Table 5: *Healthcare Cost Comparison*

	Control Group (n = 26)	**Intervention Group (n = 3)**	**Difference**	**Cost/day or case (US average)**	**Total Healthcare Cost savings (Per 2 years)**
LOS (days)	7.2	3.8 (n = 5)	3.4	$ 2,883/day	$ 9,802.2/patient $ 254,857.2 ($9802.2 x 26)
ED Visitations	6	0	6	$ 530/visit	$ 3,180
Readmissions	5	0	5	$ 15,200/case	$76,000
Total					**$ 334,037.2**

* The sample size (n = 3) for 30 days post discharge ED visitation & readmission due to follow-up interval prohibited the data collection

Limitations

The project's weaknesses were nonrandomized sampling, nonrandomization of groups, and a small sample size. The small sample size receiving preoperative ostomy education, training, and SSM may limit the validity and generalizability of the project findings. In addition, the findings may not be generalizable to the general population because it was a single-site

project. Prospective recording in the EMR by the researcher may have led to more familiarity with EMRs of the intervention group.

Nonetheless, this DNP project aimed to test whether an intervention was likely effective in routine practice by comparing the new practice against the current approach. Due to the time limitations, only one cycle of PDSA was completed. Therefore, a continuous project follow-up to repeat the PDSA cycles would be beneficial and recommended.

Implications for Practice and Research

This DNP project examined preoperative ostomy education, training, and SSM for patients who undergo fecal ostomy creation surgery on LOS, 30-day post-discharge readmission, and 30-day post-discharge ED visits. Despite the small sample size and nonrandomized sampling, this pilot project provided supportive data for existing studies focused on the correlation between preoperative ostomy interventions and patient outcomes. The general strength of the study was its feasibility because the project interventions were economical, and all stakeholders were agreeable to this study. Whether there was statistical significance or not, if the preoperative ostomy interventions show their positive impact on postoperative clinical outcomes for ostomy patients, this project provides valuable data for project sustainability and future clinical QI projects.

Implementing this DNP project on a broader scale in this setting will generate challenges. The first challenge is the lack of outpatient preoperative ostomy care space. Not all scheduled ostomy surgery patients are seen in colorectal surgeon outpatient practice sites; therefore, ideally, the hospital should provide the space for this service for all scheduled ostomy surgery patients. Second, there is a lack of WOC staffing for outpatient ostomy preoperative services. Third, there is a lack of a standardized referral process, communication, and scheduling system for this

service. Lastly, there is limited or no reimbursement for preoperative ostomy education, training, and SSM because preoperative interventions are under the global surgical reimbursement package. Therefore, implementing the project on a larger scale requires justifying the cost of providing this new service.

Regardless of the anticipated challenges, the project will gain additional support to move forward if larger-scale studies show a positive fiscal impact by reducing LOS, 30-day post-discharge readmission, and 30-day post-discharge ED visits. Therefore, further research with larger sample sizes to examine generalizability is important. In addition, there is a need for the project implementation site's leadership to provide financial support, clinical space, and labor to support the project's sustainability. Reducing readmission after a 30-day post-discharge by providing preoperative interventions may avoid unnecessary costs, and this data could be utilized for decision-making on whether to provide preoperative ostomy care. Undergoing ostomy creation surgery is a life-changing operation, and the health care providers must provide necessary ostomy care to achieve the best outcomes. This DNP scholarly project was the first step towards better care and serving patients who undergo ostomy surgeries.

CONCLUSION

This evidence-based QI pilot project aimed to determine the impact of providing preoperative ostomy care interventions such as education, care training, and SSM on patients undergoing scheduled fecal ostomy creation surgery in relation to LOS, 30-day post-discharge ED visitation and readmission. Current evidence supports that preoperative ostomy care interventions reduce LOS, ED visitation, and readmission rates. Changing care patterns to focus on prevention by providing preoperative ostomy care interventions may improve ostomy patients' post-surgical outcomes and reduce healthcare costs. Undergoing ostomy creation

surgery is a life-changing event, and it is the health care provider's obligation to provide essential ostomy care to achieve optimal outcomes. This DNP scholarly project is the introduction to better care and serving the population of patients who undergo ostomy surgeries.

APPENDICES

Appendix A: Glossary

Term	Definition
Enhanced Recovery After Surgery (ERAS) Protocol *	Multimodal perioperative care pathways designed to achieve early recovery after surgeries. The key elements are preoperative counselling, optimization of nutrition, standardized analgesic and anesthetic regimens and early mobilization.
Colostomy **	A large intestine is brought to the surface of the abdomen and a stoma is formed from the large intestine.
Ileostomy **	The entire colon, rectum, and anus are removed or bypassed. A part of the small intestine (ileum) is brought through the abdomen to create a stoma.
Ostomy (Stoma)**	Also **called a stoma**. Surgically created opening to reroute bodily waste (urine or stool) exits the body. An ostomy can be temporary or permanent. Ileostomy, colostomy, urostomy are different types of ostomies.
Ostomy Pouching System ***	The pouch (one-piece or two-piece, open end or closed end) attaches to the abdomen by the skin barrier and is fitted over and around the stoma to collect the diverted output, either stool or urine.
Peristomal Skin **	The external skin that is around the stoma. Having healthy peristomal skin is important for quality of life. Ongoing pouch leakage can damage peristomal skin.
Stoma (Ostomy)**	A portion of the large or small intestine that has been brought through the abdominal wall and then folded back like a sock cuff. A stoma provides an alternative path for urine or stool to evacuate the body.
Stoma Site Marking (SSM) ***	To select an appropriate location of the abdomen for the surgical creation of a stoma. Selection of stoma location before surgery will prevent ostomy pouch leakage and promote post-surgical self-care. Colorectal surgeons and certified WOC nurses are the optimal clinicians to select and mark stoma sites.
Wound, Ostomy and Continence (WOC) Nurse **	A registered nurse who specializes in caring for and teaches ostomy patients. A special training course is required for certification.

* Melnyk et al. (2011)

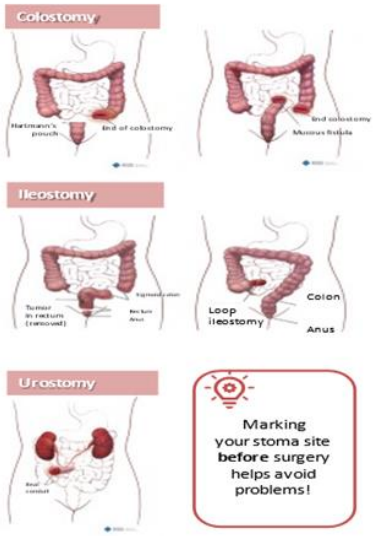
** United Ostomy Associations of America (UOAA), Inc. (2022)

*** Salvadalena et al. (2015)

Appendix B: Stoma Basics: What You Need to Know Before Your Surgery

Your Stoma Type

- ❑ **Colostomy** [Colon – drains stool]
- ❑ **Ileostomy** [Ileum, small intestine – drains more liquid stool]
- ❑ **Urostomy/Ileal conduit** [Piece of bowel used as a small "bladder" – drains urine]



What does a healthy stoma look like?

Inspect stoma and skin with each change:

- ❑ Red
- ❑ Moist
- ❑ Round or oval shape
- ❑ Elevated above skin surface
- ❑ Skin around stoma is dry & free from ulcers or rash

If any skin problems around your stoma, go to the website below and answer the questions. Follow suggested solutions at the end. Also, watch the removing a pouch video.

https://psag-consumer.wocn.org/#ready

Contact Information

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Stoma Basics

What you need to know before your surgery

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Check Lists

❖ **Know your stoma type – Pre-surgery mark the site** (helps avoid problems) [Knowledge]
- ❑ Colostomy
- ❑ Ileostomy
- ❑ Urostomy

❖ **When do you need to empty your stoma pouch** (check all that apply)**?** [Knowledge]
- ❑ 1/3 full
- ❑ 3/4 /full
- ❑ Totally full
- ❑ As needed

Wash your hands! Before & After!

❖ **Measure & cut a stoma opening** [Practice]
- ❑ **Measure the stoma** using a stoma model and measuring guide
- ❑ **Trace the correct size** on the stoma barrier or pouch
- ❑ **Cut the opening** for the stoma
- ❑ **Fit opening closely** to the stoma (only 1-2mm larger than the stoma – too big can cause skin breakdown)

❖ **Apply the pouch** [Practice]
- ❑ **Remove the covering backing** from the skin barrier
- ❑ **Apply the barrier** to the skin around the stoma
- ❑ **Press** down on all sides for **30 to 60 seconds** (help adhere)

❖ **Empty the pouch** [Practice]
- ❑ Wash hands before & after
- ❑ **Open** the pouch outlet
- ❑ **Empty** the contents
- ❑ **Clean** the pouch outlet
- ❑ **Close** the pouch outlet

Types of Stoma Pouches

❑ **1-piece** - Barrier and pouch are connected

❑ **2-piece** - Barrier and pouch can separate.

❑ **Open-end pouch** - Need to empty, clean and reclose from the bottom

❑ **Closed-end pouch** – disposable; no emptying necessary.
Comes in 2 -piece & 1-piece styles.

Closed -end 2-piece pouch | **Closed -end 1-piece pouch**

Steps to **Empty the Pouch** [When 1/3 full & as needed]

1. Wash hands
2. Raise and open the pouch outlet
3. Lower the opening into toilet and empty contents
4. Wipe the opening using toilet tissue or baby wipes before closing
5. Flush contents down toilet
6. Wash hands

Steps to **Change the Pouch** [Every 3-7 days or if leaking]

1. Wash hands
2. Remove old pouch downward from the top edge
3. Gently wash stoma site and skin with warm water and wash cloth: Inspect stoma and skin (see back of brochure)
4. Pat skin dry with a clean washcloth/towel
5. Measure the stoma for size
6. Draw the line on the pouch opening (1-2mm larger than stoma)
7. Cut the opening along the line
8. Remove paper backing from the pouch
9. Apply the pouch to the dry skin
10. Press down on all sides for 30 seconds
11. Dispose the old pouch in trash
12. Wash hands

TABLE OF EVIDENCE

CITATION	PURPOSE	SAMPLE/SETTING	METHODS (Design, Interventions, Measures)	RESULTS	DISCUSSION, INTERPRETATION, LIMITATIONS
Forsmo, H. M., Pfeffer, F., Rasdal, A., Sintonen, H., Korner, H., & Erichsen, C. (2016). Pre- and postoperative stoma education and guidance within an enhanced recovery after surgery (ERAS) programme reduces length of hospital stay in colorectal surgery. *International Journal of Surgery*, *36*(PtA), 121-126. https://doi.org/10.1016/j.ijsu.2016.10.031	To investigate whether an ERAS program with dedicated ERAS and stoma nurse specialists counselling and stoma education reduce the LOS, readmission, and stoma-related complications and improve health-related quality of life (HRQOL)	Sample: Adult patients undergoing scheduled colorectal resection Exclusion: Patients who had a stoma before the operation Sample size: *N*=122 patients Setting: Single-center study at Haukeland University, Norway.	Design: Randomized controlled trial Procedure: ERAS group had 45-60 min, 1-2 times education and training before surgery by stoma specialist (both groups, stoma site marking was done) Measurement: LOS, morbidity, mortality, early stoma-related complications, re-admission rate, and HRQOL Statistical Analysis: Descriptive statistical methods, Chi-square test, *t*-test, Mann Whitney U test, paired sample t-test, ANOVA regression	1) LOS: Shorter in the ERAS group: median range, 6 days (2-21days) vs. 9 days (5-45 days); $p<0.001$ 2) Morbidity, readmission and 30-day mortality: No significant differences 3) Stoma complications: 38% in the ERAS group and 51% in the standard group	Conclusion: Preoperative stoma education and training can reduce LOS and optimize recovery Discussion: Study strength was a randomized trial study Limitations: Did not measure days to stoma independence and proficiency

CITATION	PURPOSE	SAMPLE/SETTING	METHODS (Design, Interventions, Measures)	RESULTS	DISCUSSION, INTERPRETATION, LIMITATIONS
Hughes, M. J., Cunningham, W., & Yalamarthi, S. (2020). The effect of preoperative stoma training for patients undergoing colorectal surgery in an enhanced recovery programme. *Annals of The Royal College of Surgeons of England, 102*(3), 180–184. https://doi.org/10.1308/rcsann.2019.0145	To assess the impact of preoperative stoma training on length of stay (LOS)	Sample: Patients undergoing elective colorectal resection with colostomies & ileostomies within an ERAS - Exclusion: none Sample size: *N*=123 patients - Intervention (training) group: *n*=53 - Control (no training) group: *n*=70 Setting: The Victoria Hospital in Kirkcaldy, UK	Design: Retrospective analysis Procedure: Patient details, perioperative data and postoperative outcomes were recorded prospectively by a dedicated data collector. Intervention: Undergo a counselling session with the stoma nurse seven days before stoma surgeries Measurement: LOS, morbidity, stoma related morbidity, ERAS milestone achievement and readmission rates Statistical Analysis: The Prism® version 7.0, paired or unpaired *t*-tests, Mann–Whitney U test and Chi-squared test	Results: 1) LOS - The median length of stay was improved in the patients receiving preoperative stoma training (8 days [interquartile range: 6–10] vs 9 days [interquartile range: 7–19.5], *p*=0.025). 2) Overall morbidity rates, stoma specific morbidity, ERAS milestones or readmission rates - No significant differences	Conclusion: Preoperative stoma training can reduce LOS Discussion: Strength of study was both groups were homogenous (fair comparison) Interpretation: Preoperative counselling and training can optimize recovery Limitations: Retrospective study, LOS is less sensitive indicator for recovery, time to achieving stoma selfcare was not recorded

CITATION	PURPOSE	SAMPLE/SETTING	METHODS (Design, Interventions, Measures)	RESULTS	DISCUSSION, INTERPRETATION, LIMITATIONS
Stokes, A. L., Tice, S., Follett, S., Paskey, D., Abraham, L., Bealer, C., Keister, H., Koltun, W., & Puleo, F. J. (2017). Institution of a preoperative stoma education group class decreases rate of peristomal complications in new stoma patients. *Journal of Wound Ostomy & Continence Nursing*, *44*(4), 363–367. https://doi.org/10.1097/WON.0000000000000338	To compare postoperative complications (including stomal and PSCs), hospital length of stay (LOS) and readmission rates in an intervention group and nonintervention group.	Sample: Patients who underwent fecal ostomy creation surgery Sample size: *N*=218 Exclusion: Emergent procedures &/or had previous stoma Setting: Single care center in the Northern United States.	Design: Retrospective, comparison cohort study Procedure: A preoperative 2-hour stoma education led by Wound Ostomy Continence Nurses (WOCNs) Intervention: Education (3-6 patients/class) on management of new ostomies & hands on practice stoma care skills using the ACS kit & PowerPoint presentation Measurement: LOS, stoma related complications & readmission within 30 days Statistical Analysis: Multi variable logistic regression analysis, *p* value of .2 =/<, χ^2 test or student *t* test	Results: 1) Peristomal complications: Intervention group experienced significantly fewer peristomal complications than the control group patients (44.7% vs. 20.2%, *p* = .002) 2) LOS: No significant difference of LOS (Median 6 days vs 5 days, *p* = NS) 3) 30-day readmission: No significant difference (20.2% vs 15.3%, *p* = NS)	Conclusion: Perioperative stoma education group class reduces the ostomy pouch leakage and PSCs Discussion: Group education may enhance the psychological benefit and reduced anxiety. Education alone may not influence LOS. Limitations: Retrospective and data accuracy (some PSCs may not be reported or documented)

CITATION	PURPOSE	SAMPLE/SETTING	METHODS (Design, Interventions, Measures)	RESULTS	DISCUSSION, INTERPRETATION, LIMITATIONS
Taneja, C., Netsch, D., Rolstad, S. B., Inglese, G., Eaves, G., & Oster, G. (2019). Risk and economic burden of peristomal skin complications following ostomy surgery. *Journal of Wound, Ostomy, and Continence Nursing, 46*(2), 143-149. https://doi.org/10.1097/won.0000000000000509	To examine the incidence and economic burden of peristomal skin complications (PSCs) following ostomy surgery.	Sample: - Patients >/= 18 years and underwent colostomy ileostomy or other urinary diversion - Members of Geisinger Health Plan (health maintenance organization) Exclusion: Patients <18 years old Sample size: *N*=168 patients Setting: Single site study at central and northeastern Pennsylvania, United States.	Design: Retrospective cohort study Procedure: Scanned electronic health records (EHR) of sample with evidence of PSCs within 90 days after ostomy surgery Intervention: 2 certified Wound, Ostomy and Continence Nurse (CWOCN) independently reviewed study subjects' EHR and if 2 CWOCN agreed with a PSC status, study subject was included Measurement: PSC, LOS, costs of care, readmission Statistical Analysis: One-way analysis of variance, *t* statistic & χ^2 statistic **(**test for differences in categorical measures)	Results: - 61 patients (36.3%) had evidence of PSCs within 90 days - Mean LOS had no difference among patients with and without PSCs. - Patients with PSCs had higher readmission (55.7 % vs. 35.5%, p = .011). - Total healthcare cost over 120 days: With PSCs $58,329 (Median $49,361) No PSCs $ 50,928 (Median $36,818).	Conclusion: One-third of patients had evidence of PSCs within 90 days after ostomy surgery; Patients with PSCs had higher readmission rate; Patients with PSCs had $7400 higher healthcare costs than non-PSCs patients Limitations: Small sample size, variability of complications, retrospective chart review

CITATION	PURPOSE	SAMPLE/SETTING	METHODS (Design, Interventions, Measures)	RESULTS	DISCUSSION, INTERPRETATION, LIMITATIONS
Younis, J., Salerno, G., Fanto, D., Hadjipavlou, M., Chellar, D., & Trickett, J. P. (2012). Focused preoperative patient stoma education, prior to ileostomy formation after anterior resection, contributes to a reduction in delayed discharge within the enhanced recovery programme. *International Journal of Colorectal Disease*, *27*(1), 43–47. https://doi.org/10.1007/s00384-011-1252-2	To promote postoperative independent stoma management to expediting hospital discharge.	Sample: Patients undergoing and underwent elective anterior resection with a creation of ileostomy surgeries. Exclusion: patients who underwent nonscheduled loop ileostomy surgery Sample size: *N*=240 patients *n*=120 control group *n*=120 intervention group Setting: UK, single site study	Design: Pre & post two group comparison study Procedure: Preoperative Enhanced recovery programme (ERP) with patient education and training on application and emptying ostomy pouch including educational DVD. Measurement: LOS & prolonged hospital stay (LOS >5 days) due to stoma management Statistical Analysis: Descriptive data χ^2 statistic	Results: Average LOS was 14 days (range 7-25 days) in control group and 8 days (range 3-17 days) in intervention group (p=0.17). Hospital discharge was postponed due to stoma management in 21 patients (17%) in control group and 1 patient (0.8%) in intervention group (p<0.0001). No readmission related to stoma management issues in control & intervention groups	Conclusion: Preoperative ostomy education and training for patients undergoing elective creation of ileostomy surgeries reduced LOS and increase independent stoma self-care Discussion: Patients with stoma's LOS is reduced by preoperative education is not consistent finding in the literature Limitations: Limited generalizability

CITATION	PURPOSE	SAMPLE/SETTING	METHODS (Design, Interventions, Measures)	RESULTS	DISCUSSION, INTERPRETATION,LIMITATIONS
Zganjar, A., Glavin, K., Mann, K., Dahlgren, A., Thompson, J., Wulff-Burchfield, E., Wyre, H., Lee, E., Taylor, J., Holzbeierlein, J., & Mirza, M. (2021). Intensive preoperative ostomy education for the radical cystectomy patient. *Urologic Oncology: Seminars and Original Investigations, 00*, 1-6. https://doi.org/10.1016/j.urolonc.2021.04.025	To evaluate the feasibility and sustainability and outcomes of implementing a preoperative comprehensive stoma education session (stoma bootcamp) for patients undergoing a radical cystectomy and ileal conduit (RCIC) To evaluate LOS, readmissions, and unplanned clinic visits	Sample: Patients undergoing a RCIC Exclusion: patients who are <18 years old & undergoing cystectomy for any reason other than bladder cancer Sample size: *N*=51 patients Setting: University of Kansas Health System, United States.	Design: Longitudinal, quality improvement feasibility study Procedure: Stoma boot camp consisted of a 3-hour, 2-4 patients group session (education, hands on training and inpatient unit tour) within 2 weeks of the surgery date. Measurement: Health-related quality of life (HRQOL), ostomy-specific adjustments, morbidity, ERAS milestone achievement, LOS, unplanned stoma-related interventions & re-admissions within 30 days Statistical Analysis: Descriptive data	Results: Average LOS was 5.24 days (SD−2.44); 30-day readmission rate was 25% (0% related to stoma complications); one patient had an unplanned stoma-related clinic visit; phone calls from 6% of the patients with stoma-related questions; an average ostomy adjustment score (OAS) of 150.4 (95% CI 142.0,158.8) at discharge & throughout the 12 weeks of follow-up data 148.7 (95% CI 141.3, 156.2)	Conclusion: Preoperative ostomy education for patients undergoing RCIC is feasible, sustainable Discussion: Creating a group environment is positive for preoperative ostomy education; The stoma bootcamp service is billable ($25) Limitations: No control group to compare; predominantly male & Caucasian

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