

Impact of Enhanced Recovery Pathway Application Outcomes on Nurses and Women Undergoing Cesarean Section

Nadia Hussien Ahmed Ismail⁽¹⁾, Eman Seif Ashour⁽²⁾, Samah Mohamed Elhomosy⁽³⁾

(1) Assistant professor in obstetric and gynecological nursing, faculty of nursing, Assuit University

(2 and 3) Assistant Professors of Maternal and Newborn Health Nursing, Faculty of Nursing, Menoufia University, Egypt

Abstract

Enhanced recovery after surgery is a structured, interdisciplinary strategy for caring for patients with the goal of reducing the length of time patients spend in the hospital and receiving care without compromising the quality of care they receive or the outcomes they experience. **Aim:** To investigate the impact of enhanced recovery pathway application outcomes on nurses and women undergoing cesarean sections. **Design:** A quasi-experimental design was used in this study (pre- and post-tests were given to maternity nurses and women undergoing caesarean sections). **Settings:** The obstetrics and gynecology units of University Hospital and Shebin El-Kom Teaching Hospital in the Egyptian province of Menoufia were used as the research settings for this study. **Sample:** A convenient sample of fifty maternity nurses who had worked in the previous settings and a purposive sample of two hundred and fifty women who had undergone caesarean deliveries were recruited in this study. **Instruments:** The data was gathered with the help of a structured interview questionnaire, a knowledge assessment instrument, an observation checklist, and a numeric pain intensity scale for the mothers. **Results:** There was an increase in the overall knowledge and practice scores achieved by the maternity nurses in relation to the adoption of the enhanced recovery pathway application. Also, its application following CS had a greater effect on relieving the women's postoperative problems, especially pain, than those who received merely standard hospital care. **Conclusion:** The enhanced recovery pathway significantly reduces postoperative complications, especially pain and length of hospital stays, and improves the maternity nurses' knowledge and practice scores post-caesarean. **Recommendation:** An enhanced recovery pathway should be applied during cesarean section operations for better results and fewer complications.

Key words: Enhanced recovery pathway, Cesarean section, nursing care

Introduction

Integrating advancements into standard medical care is a significant obstacle for nursing. Enhanced Recovery After Surgery (ERAS) is an organized preoperative care method that has been well-established in several medical disciplines, including gastrointestinal, urinary, gynecological, and hepatobiliary care. The ERAS benefited both patients and the health-care system (shorter hospitalization, fewer complications, and lower hospital readmission rates) (cost reduction) (Steenhagen, 2016; Elias, 2017).

It provides a consistent increase in inpatient care by standardizing preoperative care. A preliminary investigation of ERAS procedures in colorectal medicine indicated improved patient satisfaction, shorter hospital stays, and fewer complications after surgery. Although the components of ERAS procedures vary by surgical specialty and organization, the essential principles are the same. Preoperative, intraoperative, and postoperative interventions are covered by such criteria. It tackles typical factors that cause patients to take longer to recover following

surgery and stay in the hospital, like insufficient analgesia, a sluggish return of bowel movements, and delayed ambulation (Nicholson et al., 2014; Aluri & Wrench, 2014).

In patients experiencing cesarean delivery (CD), recognition of the benefits of ERAS has been sluggish. With the rising demand for maternity care, numerous European centers have begun to adopt ERAS guidelines for planned cesarean sections. So, this approach has just started to gain appeal worldwide (Benhamou & Kfoury, 2016). One of the most prevalent types of surgical procedure is the caesarean section (CS). The worldwide rate of caesarean sections has increased dramatically and now exceeds 30%. A whopping 52% of Egyptians are considered to be on the CS (WHO, 2015).

One of the most significant barriers to implement these pathways is the lack of systematic patient education. It includes prioritizing euvoletic and no-euvoletic states, patient goals for surgery, avoiding preoperative fasting and bowel planning, early oral intake, limiting drains and catheters, multimodal

analgesia, early ambulation, etc. To enhance surgical outcomes, multiple procedures from each of these groups are combined into a single, comprehensive standard operating procedure (Teigen et al., 2019).

The enhanced recovery route (ERP) that obstetric nurses might use during these procedures significantly improves patient outcomes. It includes a faster return of gastrointestinal function, better pain management with fewer narcotic prescriptions, and a shorter stay in the hospital (Wilson et al., 2018; Peahl et al., 2019).

Significance of the study

Over half of all childbirth in middle-income regions, especially Egypt, is now done via CS. A recent examination of health records on all deliveries in 13 government hospitals in Egypt's four governorates (Cairo, Alexandria, Assiut, and Behera) in April 2016 indicated average CS rates of 54.2 percent, varying from 22.9 to 94.3 percent between the different facilities (Bollag et al., 2020). Cesarean sections are indicated in instances like recurrent CD (50 percent), protracted or obstructed labor, fetal distress, or malpresentation. Nevertheless, CSs involve the same hazards as any other operation. The possible side effects include excessive bleeding, infections, delayed recovery times after deliveries, a delay in initiating breastfeeding as well as skin-to-skin contact, and a higher risk of complications in subsequent pregnancies. As a result, it appears critical that any action that improves outcomes be taken. So, more research is necessary to determine which ERAS interventions are most effective in the case of cesarean birth.

The ERAS are an interdisciplinary, evidence-based strategy to enhance clinical services throughout the perioperative period. The goal of ERAS is to reduce the physiologic response throughout the operation to improve patient outcomes while decreasing postoperative problems (Caughey, et al., 2018). The ERAS Association guidelines were established to support the CS as it is the most common surgical operation in the advanced industrial health field. There has been little research on the impact of implementing ERAS for women undergoing CS. By implementing this intervention, the researchers hoped to bridge the gap in the continuity of care and improve the nursing care.

The aim of the study

- To investigate the impact of enhanced recovery pathway application outcomes on nurses and women undergoing cesarean section.

Research hypotheses

- After the application of the ERAS, maternity nurses will have higher scores both in terms of their knowledge and their practice than before.
- Women who had a caesarean section and received the ERAS had higher knowledge scores about post-cesarean section care than women who received standard hospital nursing care.
- Women who underwent a caesarean section and received the ERAS experienced fewer postoperative complications than women who received standard hospital nursing care.
- Women who had a caesarean section and received the ERAS improved faster than women who received standard hospital nursing care in terms of indicators and marker.

Theoretical and operational definitions

Impact: refers to the change in the knowledge score and level of practice of women undergoing cesarean sections regarding the enhanced recovery pathway application. This change was measured using a knowledge assessment instrument, an observational checklist, and a numeric pain intensity scale.

The Enhanced Recovery After Surgery (ERAS) framework incorporates numerous aspects of perioperative care that have been shown to hasten patients' recoveries (Nicholson et al., 2014). Women who underwent CS were able to leave the hospital sooner and spend less time recovering from anesthesia thanks to the implementation of systematic guidelines designed to improve maternal and infant health care. These guidelines focused on reducing nausea and vomiting after surgery, getting people up and moving as soon as possible, controlling pain right away, and easing the nausea and vomiting that often happen after anesthesia.

Implications of the ERAS application for nurses and other women in health care: the use of ERPs has been linked to improvements in pain scores, GI function, length of hospital stays, rates of complications after surgery, quality of care, and clinical outcomes.

Method

Design of the Study: The study used a quasi-experimental design, with a pre-post-test for the maternity nurses and a study/control group for the women having caesarean sections.

Research Settings: This investigation took place in the obstetrics departments of University Hospital and Shebin El-Kom Teaching Hospital in the Egyptian province of Menoufia Governorate.

Sample: Subjects were selected from a convenient sample of all eligible participants (50 maternity nurses and 250 women experiencing caesarean delivery). The women were randomly assigned to either a study group that got post-operative ERP in addition to standard hospital care or a control group that did not. Under the following **inclusion criteria:**

- Women were having caesarean sections and had no complications during the procedure.

Sample Size Determination: The researchers utilized the open-source Statistics for Public Health application Epi to determine the optimal sample size. The assumptions were as follows: a two-sided confidence level of $95\% = 1 - \alpha$; a power of $1 - \beta$ or (% probability of detecting) of 80% ; and an unexposed (control) / exposed (study group) sample size ratio of 1% of unexposed with a result of 5% .

Instruments for data collection:

Instrument 1: A structured interviewing questionnaire for nurses. The researchers prepared it after reviewing the most recent studies in the field (Habib, 2018; Abd El-Ati, Mostafa, & Baraia, 2019). It is made up of two sections: **Section 1** included demographic information on the participants, including their ages, educational backgrounds, occupations, and years of professional experience. **Section 2:** It contained questions to test the maternity nurses' understanding of ERP in the context of CS both before and after the intervention. It covered topics like the meaning and significance of ERP in CS, as well as its constituent parts and the nurses' role in implementing them.

Scoring system

Score	Maternity nurses' knowledge
2	correct and complete answers
1	correct and incomplete answers
0	incorrect answers

Total score: Gooda et al. (2020) suggested that the overall score was divided into three main categories.

- Poor < 60.0%
- Average: 60 to 75%
- Good > 75.0%

Instrument II: An observational checklist for nurses (before and after intervention): The researchers came up with it after conducting a recent review of the relevant literature (Hübner et al., 2015; Habib, 2018; Mostafa, 2019) to assess the maternity nurses' practice regarding pre-, intra-, and post-CS care. It included 22 questions concerning the preoperative, intraoperative, and postoperative pathways, as well as 9 questions concerning newborn care before and after ERP application.

Scoring system

Score	Maternity Nurses' Scoring of practice
1	Done correctly
0	Done incorrectly

The total score practice: There were two primary divisions used to classify the overall score (Gooda et al., 2020):

- Satisfactory $\geq 75.0\%$.
- Unsatisfactory < 75.0% .

Instrument (III): A questionnaire based on structured interviews that pertains to women undergoing CS. Following a thorough examination of the relevant previous studies, the researchers conceived of it (Qiang, Jia, and Long 2020). It was used for the women in both groups. It consisted of two distinct components:

Part I consisted of demographic data, which asked for information such as a person's name, address, age, education level, occupation, annual income, and telephone number.

Part 2: Figuring out how ERP affects the mother's ability to understand and follow post-surgery care plans, which include care for the incision, pain control, bowel habits, signs to call the surgeon, activities/exercise, diet, and medications.

Scoring system:

Score	impact of enhanced recovery pathway on the mother's knowledge
2	correct and complete answers.
1	correct and incomplete answers.
0	incorrect answers.

Total score: The entire score was broken down into three distinct sections (Gooda et al., 2020):

- Poor < 60.0% .
- Average: 60 to 75% .
- Good > 75.0% .

Instrument (IV): An observational checklist for the women undergoing CS (for both groups): The researchers constructed it on the basis of a recent literature review (Abd El-Ati,

Mostafa, & Baraia 2019) and utilized it with mothers in both groups to keep track of postoperative progress indicators such as pain level, time to first ambulation, bowel mobility, breastfeeding, and emotional interaction. In addition, women in the enhanced recovery pathway group and the routine care group reported symptoms such as nausea, vomiting, retention of urine, vaginal bleeding, wound bleeding, pulmonary complications, abdominal distension, and constipation at two to four hours, three days, and two weeks following caesarean delivery.

Instrument V: The Numeric Pain Intensity Scale is popular and effective, pain assessment using the 0–10 scale is the norm (Childs et al., 2005).

Total scoring system

Scoring system	Intensity of postoperative pain
0	no pain.
1-3	mild pain.
4-6	moderate pain.
7-10	severe pain.

Validity and reliability

Five experts looked over the instruments to ensure they were valid in terms of content (3 professors in the Obstetrics and Gynecology department, Faculty of Medicine, Menofia University, and 2 professors in the Maternal and Newborn Health Nursing Department, Faculty of Nursing, Menofia University). To ensure accuracy and comprehensiveness, modifications were made where needed. Test-retest reliability was employed. Using Cronbach's alpha, we determined the instruments' reliability. Cronbach's alpha values for the study instruments showed that they were reliable at 0.861 for instrument 1, 0.742 for instrument 2, 0.82 for instrument 3, 0.628 for instrument 4, and 0.627 for instrument 5.

Administrative Approval: Prior to initiating the study, a letter asking permission to conduct the study was sent from the Dean of the Faculty of Nursing at Menoufia University to the Directors of each study location. The goal of the letter was to explain the purpose of the study so that people would agree to and help with data collection.

Ethical considerations: Before beginning the study, the researchers obtained the consent of both the maternity nurses and the ladies who were having CS, as stated by the Committee of Hearing

and Ethics from the Faculty of Nursing at Menoufia University. They were reassured regarding the privacy, safety, and confidentiality of the data that was gathered.

A **pilot study** was done on 10% of the whole sample, which included 5 nurses and 25 women receiving CS. This was done to make sure that the instructions were clear, the task was relevant, and it took the right amount of time to finish.

Procedures for the collection of data: The research was conducted in four stages, which are as follows:

Interviewing phase

Beginning in January 2021 and continuing through the end of June of the same year, the real fieldwork was carried out. The researchers were present in the study settings three times per week throughout the morning shift, which lasted from 8:00 a.m. to 2:00 p.m. local time. The researchers presented themselves to the members of the medical and nursing staff working in the various settings that were discussed before. In addition to that, the nature of the study was broken down for them. The researchers talked to every maternity nurse in order to collect their demographic information and evaluate their level of expertise and experience with ERP before its deployment. This was done with women who had CS.

Planning phase:

The researchers created instructional material about ERP that covered the phases of care that were introduced for the maternity nurses during the phase of planning. A recent review of the literature (Hübner et al., 2015; Habib, 2018; Mostafa, 2019) found that it included care before, during, and after surgery, as well as care for newborns.

Implementation phase: -

After collecting data concerning the personal, professional, and pretest experiences of the nurses, the researchers held two instructional sessions (each session lasted for forty-five minutes) for the maternity nurses about the ERP of CS and gave them an illustrated booklet. It included such topics as definition, significance, components, and the function of nurses. In each session, there were between five and seven nurses who were in charge of providing care to the women who were having CS. Following the completion of the ERP training for all of the nurses, the researchers carried out the ERP training on 25 women who were having CS.

These women were considered for the pilot study but were not included in the sample of women. Following that, the maternity nurses put the ERP into action for the study group of women in front of the researchers by carrying out each step.

The participants were randomly divided into these two groups to ensure that both groups had an equal number of participants. Group A (the study) consisted of 125 women who were given the ERAS caesarean section in addition to routine hospital care, and Group B (the control) consisted of 125 women who were given routine hospital care only. The researchers began with the group that served as a control. The objective of the study as well as the nature of the study were each individually described to each woman. The researchers started to fill out the interview questionnaire sheet to assess women's socio-demographic characteristics and their knowledge

Supportive material regarding ERP for cesarean delivery (educational booklet) included three parts: pre-operative, intraoperative and post-operative CS care



Figure 1: Components of the ER Protocol for Cesarean Delivery

Reference: Lucas DN, & Gough KL (2013); Enhanced recovery in obstetrics-a new frontier? *International Journal of Obstetric Anesthesia*, 22(2), 92–5.

Pre-operative preparation, which included:

1: preoperative maternal education, which included

a- The day before CS

The day before the CS, the woman consumes a regular diet. Additionally, she may eat solid foods until 8 hours before her scheduled CS. Women should cleanse their abdomen area after taking a shower or bath. For at least 48 hours before the CS, she should not shave or wax the region below the umbilicus. Prescribed medicines should be taken according to the obstetrician's or nurse's instructions.

On this day, ERP goals were also reviewed with women who were having CS, which included improved post-operative outcomes, early

regarding cesarean section care and home care instruction. All the women's data is on the questionnaire sheet. It took from 10 to 15 minutes. The researchers observed the women in the control group after routine hospital care for improvement indicators and complications during their hospital stay, then followed them by telephone after discharge. Women in the study group were also observed after submitting an ERAS application.

Routine hospital nursing care for CS

For post-operative pain control, Ketolac (50 mg, 4×1) and non-steroid anti-inflammatory medicine were administered IV. Patients were encouraged to begin early breastfeeding and to begin ambulation after delivery if they were not hypotensive and their uterine bleeding was under control.

gastrointestinal function return, and excellent pain relief with a reduction in the need for opioids and a reduction in the length of stay in the hospital. The researchers created a nursing handout that was sent to all nurses and women in the trial group to help them learn more about CS and how to provide it. It addressed the definition, different types, indications, and possible complications, as well as self-care, food, workouts, wound care, breastfeeding, and how to treat minor postoperative discomforts.

The morning of the CS, the women should not wear makeup, take off all jewelry, and refrain from painting their fingernails or using nail polish. The nurse asked the women to change into hospital gowns.

Intraoperative ERP

An IV catheter and a tube were inserted; the woman met with members of the anesthesia team and reviewed the anesthetic strategy; she was also seen and spoke with the obstetrician; and the nurse administered various medications ordered by the medical team. These medicines assist in reducing the risk of infection following CS by reducing pain, nausea, and vomiting.

Operating Room

The woman was given a localized anesthetic, either an epidural or a spinal, which allowed her to remain awake during the CS while experiencing no discomfort in her lower body. In most cases, both the mother and the infant will be less at risk. A catheter is placed after a regional anesthetic. Apgar score, cord clamp delay for at least one minute, maintaining the newborn's body temperature between 36.5 and 37.5 degrees Celsius after birth, skin-to-skin contact, weight, newborn metabolic screening, physiological health, head-to-toe assessment to rule out any complications or abnormalities, and behavioral assessment were all components of the newborn's care. Following the delivery, the mom and her newborn were taken to the recovery room, where they remained until the night shift began.

Post-operative care

The nurse's role included checking the mother's vital signs, abdomen, uterine contractility, lochia, and catheter. She provided comfort and warmth to the mother and encouraged the woman to chew gum. The catheter should be removed as soon as the woman regains the ability to move. The important goal post-operatively is to keep the mother's pain at or below a score of 4 out of 10. Instead of eating in bed, you should be seated on a chair as you consume the meals. Four to five times per day, mothers should be assisted in getting out of bed and strolling down the corridor.

The day of cesarean section.

- 1- **Pain control:** Long-acting painkillers like acetaminophen and ibuprofen were given to the women after the CS procedure to keep the pain under control.
- 2- **Activities:** While the mother is awake, perform leg exercises four to five times every hour. On the day of the mother's surgery, the nurse ought to have insisted that she take a stroll down the corridor.

3- **Eating and drinking** liquids during the first four hours after surgery. If the women are unable to eat or drink, they should chew sugar-free gum for thirty minutes, three times a day. It has been shown that the bowels are able to recover to normal much faster after surgery. The nurse should have taken measures (medication and non-medication) to prevent the patient from experiencing nausea and vomiting after the CS procedure.

4- **Tubes and Lines:** The majority of patients who undergo ERAS have their IV disconnected once they are able to get out of bed and drink fluids on their own.

Goals for discharge

Uncomplicated cases of ERP are discharged within a period of twelve hours. The following signs and symptoms are evaluated to establish whether or not the mother is prepared to return home. The capacity to consume a diet without having any feelings of nausea or throwing up as a result of doing so. Getting out of bed and walking without assistance is an accomplishment.

Post-Operative Day 1

1. Pain Control

After the patient is discharged, they may continue taking these medications as part of their regular plan for a total of seven days. Aside from that, non-pharmacological methods of pain relief should be applied.

2. Activities

It is recommended that the mother remain awake and active for a total of eight hours throughout the course of the day. Walk down the hallway four to five times every day, asking for assistance if necessary. Always take a seat at the table as you eat. Feed the infant while sitting in the room's chair.

3. Eating and Drinking

Drink lots of water. The woman must consume solid meals. Fruit, vegetables, milk, and calories are the best choices for supporting breastfeeding and preventing constipation (fruits, vegetables). If she does not eat or drink on a consistent basis, she should chew gum for thirty minutes, three times a day.

Day 2 after the procedure:

1. Managing the pain

The woman continued to take the prescribed medications, such as acetaminophen (Tylenol) and ibuprofen (Motrin), to ease the pain she was feeling.

2. Activities

The woman should get out of bed and eat her meals on a chair. Today, walk through the hallway 5 times, using assistance if necessary. While seated on the chair, feed the baby. While conversing with the guests, either sitting in the chair or walking around the hallway.

3. Consuming food and drink

Consume liquids and solids to the extent that the woman can tolerate them. If she didn't eat or drink regularly, chew gum for 30 minutes three times a day.

Home care instructions

1. Incision care

Showering is recommended for women. Allow the water to gently flow over the incision while gently washing the area. If the mother had stitches or staples, these were removed during the first doctor's appointment. Do not scrape the surface or apply pressure to it.

2. Pain

After the CS, the woman was told that minor pain may last for a few weeks. Medications for pain relief may be continued if the doctor so orders. The nurse kept track of how much pain I was in and what medications I was taking at home. Pain relief that is not pharmaceutical should be used.

3. Bowel Habits

A woman should drink 8-10 glasses of water daily, exercise, and use stool softeners if the doctor tells her to do so. Bowel patterns may change after a CS.

Danger indications that warrant a call to the surgeon include not passing gas for more than 12 hours, considerable diarrhea, and increased nausea or vomiting. The lady should advise the patient about these warning signs.

2. Activities

The women were instructed about post-partum exercises over a period of six weeks. These included walking, pelvic floor exercises, practice good posture, and light stretches. The women were told to avoid lifting heavy objects for 2-3 weeks after surgery.

5. Diet

There is no requirement for a specific diet unless it is specified by the healthcare staff. Get back to eating a clean, well-balanced diet.

Evaluation phase:

After using ERP for CS, the researchers conducted an analysis to determine the level of knowledge and practice held by maternity nurses. The researchers analyzed the results of EPR (improving indicators and complications) in the

study group and compared them to the results obtained by the control group, which was given the standard hospital treatment.

Data Analysis

Review of the acquired data, coding of the data, tabulation of the data, analysis of the data, and presentation of the data using descriptive statistics, presenting qualitative variable frequencies and percentages. In addition to that, we employed the Mann-Whitney test, Fisher's exact test, and the Chi-Square test. Where: a statistically significant difference with a P value of less than 0.05.

Results

Table 1 showed the study nurses' demographic characteristics. Almost half of the nurses (52%), whose ages ranged between 20 and 30 years old. In addition, about half of them held a bachelor's degree in nursing education, accounting for 48% of the total. It also indicated that half of them (50%) had less than 5 years of expertise.

In addition to this, it revealed that fifty percent of them had experience that was lower than five years.

Table 2 displayed the maternity nurses' prior and subsequent knowledge of the ERP application. All aspects of the enhanced recovery pathway (definition, importance, components, and nursing role) are better understood by the nurses after the application than they were before; it is highly statistically significant ($p < 0.000$). As can be seen from the table, a high percentage of nurses answered all items regarding ERP correctly after the application (92 percent, 94 percent, 98 percent, and 96 percent, respectively).

Figure 1 showed that after implementing the ERP, a greater percentage of maternity nurses were knowledgeable about it than they had been previously, as 98% of them had good knowledge versus 6%.

Table 3 depicts maternity nurses' CS care practices prior to and after ERP implementation. Study nurses' pre, intra, and post-CS care procedures differed significantly before and after the implementation of ERP ($p < 0.001$).

Table 4 showed the maternity nurses' practice with regard to the care of newborns both prior to and following the implementation of the enhanced recovery pathway. It indicated a highly significant statistical difference between the practices of the study nurses in regard to the care of newborns before and after its implementation ($p < 0.001$).

Figure 2 shows the practice scores of the maternity nurses toward CS care and newborn care before and after ERP application. The results show that after implementing the enhanced recovery pathway, 86% of the maternity nurses are able to competently practice CS. After implementing the ERP, 84% of maternity nurses can competently practice newborn care, up from 10% previously, and the difference between these two groups is highly statistically significant ($p < .001$).

Table 5 illustrates the demographic features of the women undergoing CS, broken down by frequency and proportion. There was no discernible difference between the two groups of women ($p < 0.05$).

Table 6 displayed the level of knowledge about post-CS home care among the women undergoing CS. Compared to the control group, the women in the study group had a greater level of knowledge of incision care, pain control, preventing elimination discomforts, activities/exercise, food, and prescription drugs (87.2%, 76.0%, 92.8%, 84.0%, 34.4%, and 3.2%, respectively). This distinction had a statistically significant p-value ($p = .000$).

Table 7 showed the frequency and percentage distribution of post-cesarean section improvement markers among the women in both groups. In terms of the intensity of pain experienced by women undergoing CS on the first, third, and second weeks, the table revealed that (22.4, 91.2, and 98.4 percent, respectively) of the women in the study group experienced mild pain compared to (5.6, 4.0, and 98.4 percent, respectively) in the control group. This distinction had a p-value of .000 (statistically significant).

Furthermore, the women in the study group had shorter median times to their first bowel sound, first passage of flatus, and first passage of stool following caesarean section (3.7 ± 9.0 , 6.9 ± 1.1), (6.3 ± 1.0 , 13.2 ± 1.4), and (10.5 ± 1.9 , 27 ± 2.4 hours, respectively). The differences between the two groups were statistically significant ($p < 0.001$).

Meanwhile, there were statistically significant differences between the study group and the control group, with 100% of the study women getting out of bed and walking around within the first 6 hours after surgery, as opposed to only 60.0% of the women in the control group ($p < 0.001$). Also, almost half of the women in the study group (48%) started breastfeeding early

(within 2 hours following C/S), compared to 6.4% in the control group. Furthermore, there was a statistically significant difference between the groups in the amount of emotional contact they had with their newborns ($P < 0.0001^*$).

Moreover, the women in the experimental group were also more likely to begin taking oral fluids within the first 10 hours following surgery than those in the control group were (5.4 ± 1.0 vs. 15.8 ± 8.3 respectively). A statistically significant disparity was found between the two groups' dietary practices: 96.8% of those in the study group resumed a normal diet within the first 24 hours after surgery, while just 22.8% of those in the control group did so ($P < 0.0001$). Also, women in the control group had a statistically higher mean period of hospitalization (1.8 ± 0.6 days) than the study group (1.2 ± 0.5 days).

Table 8 revealed the post-cesarean section complications encountered by women in both groups. With a p-value of 0.0001*, it demonstrated that nausea and vomiting as signs of hypotension were more common in the control group (83.6 % and 38.4 %, respectively) than in the study group (60.9 % and 24.0 %, respectively). DVT (2.4 % vs. 0.0 %) in the study group and urine retention (1.6 % vs. 0.0 %) in both groups showed a statistically significant difference in the control group.

Both the study and control groups experienced breast engorgement and vaginal hemorrhage (12.8% vs. 4.8% and 6.8% vs. 4.8%, respectively), when compared to abdominal distension and constipation (73.6 % vs. 32.8 %) and hemorrhoids (4.0 % vs. 1.6 %) on the first day. Differences in the problems reported by women having CS in the improved recovery and regular care groups were found during the second week of follow-up. It indicates that there were statistically significant differences ($P = 0.47$) between the two groups in terms of wound infection and puerperal sepsis (0.8 % vs. 0.0 % respectively), constipation (12.0 percent vs. 9.0 percent), and the like.

Table 9 shows a correlation between the total practice score and post-cesarean section complications experienced by the studied women. The table showed that there was a positive correlation between the total practice score and post-cesarean section complications experienced by the studied women. This means that there was a statistically significant difference between the total practice score and the post-cesarean section

complications experienced by the studied women after the application. Also, there was a negative correlation between the total practice score and the post-cesarean section complications experienced by the studied women. This means

that there was no statistically significant difference between the total practice score and the post-cesarean section complications experienced by the studied women.

Table 1: The demographics of the study's nurses as a frequency and percentage distribution (N = 50)

Variables	The study Nurses	
	No.	%
Age / years:		
-20 – <30	26	52.0
-30 – <40	17	34.0
-40 – <50	5	10.0
-50 – 60	2	4.0
X±SD	30.5 ± 8.99	
Educational level:		
-Secondary school (diplome).	16	32.0
-Technical Institute of Nursing.	8	16.0
- Bachelor degree.	24	48.0
- Master Degree.	2	4.0
- Doctorate Degree.	0	0.0
Years of experience		
- <5 years	25	50.0
- 5-10 years	15	30.0
- >10 years	10	20.0

Table (2): Maternity Nurses' knowledge regarding the Enhanced Recovery Pathway Items before and after its application (N= 50)

Variables	The study Nurses				χ ²	P value
	Pre		Post			
	No	%	No	%		
Definition of enhanced recovery pathway of cesarean section: -					88.67	.000
- Correct & complete	0	0.0	46	92.0		
- Correct & incomplete	0	0.0	3	6.0		
- Incorrect	50	100.0	1	2.0		
Importance of enhanced recovery pathway of cesarean section for mothers and newborn care: -					96.07	.000
- Correct & complete	0	0.0	47	94.0		
- Correct & incomplete	0	0.0	1	2.0		
- Incorrect	50	100.0	2	4.0		
Components of enhanced recovery pathway of cesarean section: -					138.62	.000
- Correct & complete	0	0.0	49	98.0		
- Correct & incomplete	2	4.0	0	0.0		
- Incorrect	48	96.0	1	2.0		
Nurses' role in enhanced recovery pathway application: -					100.02	.000

- Correct & complete	0	0.0	48	96.0		
- Correct & incomplete	2	4.0	0	0.0		
- Incorrect	48	96.0	2	4.0		

Figure (1): Total Knowledge Scores of the maternity nurses Regarding ERP on CS. Care (Pretest and Posttest) (N=50)



The statistically significant test was $\chi^2 = 138.62$

Table (3): Maternity nurses' practice regarding cesarean section care before and after implementing the enhanced recovery practice (N = 50)

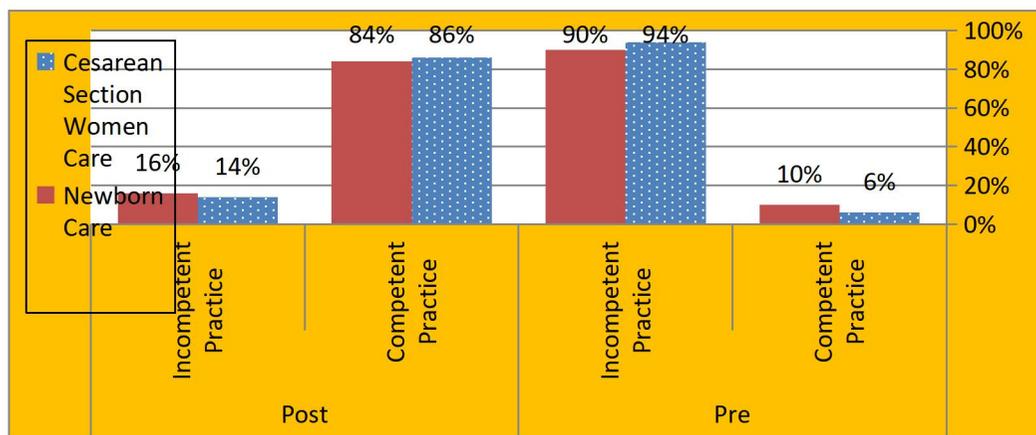
Variables	The study Nurses								χ^2	P value
	Pre				Post					
	Done Correctly		Done Incorrectly		Done Correctly		Done Incorrectly			
	No	%	No	%	No	%	No	%		
Pre-operative care									88.12	0.001*
- Maternal education	10	20.0	40	80.0	50	100.0	0	0.0		
- Available of printed educational materials	9	18.0	41	82.0	49	98.0	1	2.0		
- Assessment for diet, nutrition, and time of fasting	11	22.0	39	78.0	50	100.0	0	0.0		
- Assessment for pre-operative medications and investigations	20	40.0	30	60.0	50	100.0	0	0.0		
- Bowel preparation	19	38.0	31	62.0	50	100.0	0	0.0		
- Bathing	15	30.0	35	70.0	50	100.0	0	0.0		
- Contact with the patient the day before the delivery to review ERAS goal	13	26.0	37	74.0	50	100.0	0	0.0		
Intraoperative pathway									20.41	0.001*
- Prophylactic antibiotics	15	30.0	35	70.0	50	100.0	0	0.0		
- Thrombo-prophylaxis	9	18.0	41	82.0	49	98.0	1	2.0		
- Fluids and blood pressure management	4	8.0	46	92.0	48	96.0	2	4.0		
- Skin preparation	2	4.0	48	96.0	50	100.0	0	0.0		
- Hypothermia prevention	5	10.0	45	90.0	50	100.0	0	0.0		
- Oxytocin management	50	100.0	0	0.0	50	100.0	0	0.0		
post-operative pathway									49.93	0.001*
- Pain control	50	100.0	0	0.0	50	100.0	0	0.0		
- Early oral intake	50	100.0	0	0.0	50	100.0	0	0.0		
- Measures for Prevention and recognition of potential	50	100.0	0	0.0	50	100.0	0	0.0		

Variables	The study Nurses								χ^2	P value
	Pre				Post					
	Done Correctly		Done Incorrectly		Done Correctly		Done Incorrectly			
	No	%	No	%	No	%	No	%		
complications										
- postoperative nausea and vomiting prophylaxis	15	30.0	35	70.0	50	100.0	0	0.0		
- Early mobilization	10	20.0	40	80.0	50	100.0	0	0.0		
- Timely removal of tubes and drains	2	4.0	48	96.0	50	100.0	0	0.0		
- lactation education	10	20.0	40	80.0	50	100.0	0	0.0		
- Record outcomes or complications if present	2	4.0	48	96.0	50	100.0	0	0.0		

Table (4): Frequency and Percentage Distribution of the Maternity Nurses’ Newborn Care Practices Before and After ERP (N = 50)

Variables	The study Nurses								χ^2	P value
	Pre				Post					
	Done Correctly		Done Incorrectly		Done Correctly		Done Incorrectly			
	No	%	No	%	No	%	No	%		
Apgar score.	2	4.0	48	96.0	42	84.0	8	16.0	64.93	.000
Delay cord clamp for at least one minute.	7	14.0	43	86.0	50	100.0	0	0.0	75.43	.000
Maintain the newborn’s body temperature between 36.5 °C and 37.5 °C after delivery.	1	2.0	49	98.0	30	60.0	20	40.0	61.92	.000
Avoid airway suctioning unless obstruction present.	7	14.0	43	86.0	42	84.0	8	16.0	51.45	.000
skin to skin contact.	12	24.0	38	76.0	48	96.0	2	4.0	54.40	.000
Weight.	10	20.0	40	80.0	45	90.0	5	10.0	50.54	.000

Figure (2): Total Practice Score of the Maternity Nurses toward Cesarean Section care and Newborn Care before and after Enhanced Recovery Pathway Application



The statistical significant test was $\chi^2=96.07$

Table (5): Frequency and Percentage Distributions of the Demographic Characteristics of the Women Who Were Undergoing CS (N = 250)

Variables	The Studied Women				χ^2	P value
	Study group (N=125)		Control group (N=125)			
	No	%	No	%		
Age (years):						
< 25	29	23.2	17	13.6	2.52	0.073
25-30	62	49.6	44	35.2		
>30	34	27.2	64	51.2		
Mean \pm SD	73.97 \pm 13.3		77.65 \pm 14.07			
Educational Level:						
Read and write	15	12.0	18	14.4	5.24	0.231
Secondary	60	48.0	69	55.2		
University	50	40.0	38	30.4		
Income:						
Enough	67	53.6	62	49.6	1.09	0.723
Not enough	58	46.4	63	50.4		

Table (6) Women Undergoing Cesarean Section' Level of Knowledge regarding the Post-Cesarean Section Home Care (N=250)

Variables	Study group (N=125)		Control group (N=125)		χ^2	P value
	No	%	No	%		
Incision care:						
- Good	109	87.2	32	25.6	83.71	.000
- Average	14	11.2	33	26.4		
- Poor	2	1.6	60	48.0		
Pain control measures:						
- Good					30.21	.000
- Average	95	76.0	57	45.6		
- Poor	28	22.4	35	28.0		
	2	1.6	33	26.4		
Measures to prevent elimination discomforts:						
- Good					84.06	.000
- Average	116	92.8	38	30.4		
- Poor	4	3.2	53	42.4		
	5	4.0	34	27.2		
Activities/exercise:						
- Good	105	84.0	29	23.0	79.16	.000
- Average	12	9.6	34	27.0		
- Poor	8	6.4	62	50.0		
Diet:						
- Good	105	84.0	29	23.2	79.16	.000
- Average	12	9.6	34	27.2		
- Poor	8	6.4	62	49.6		
Prescribed medications:						
- Good					70.862	<.0001
- Average	43	34.4	4	3.2		
- Poor	78	62.4	25	20.0		
	4	3.2	96	76.8		

Table (7): Frequency & Percentage Distribution of Post-cesarean Section Improvement Indicators Markers among the women in both Groups (N=250)

Items	Study group (N=125)		Control group (N=125)		χ^2	P value
	No	%	No	%		
Intensity of pain on first day:						
- Mild	28	22.4	7	5.6	45.332	< 0.001*
- Moderate	73	58.4	40	32.0		
- Severe	24	19.2	78	62.4		
Intensity of pain on third day:						
- Mild	114	91.2	5	4.0	193.18	< 0.001*
- Moderate	10	8.0	108	86.4		
- Severe	1	0.8	12	9.6		
Intensity of pain on 2nd week:						
- Mild	123	98.4	117	93.6	0.029	< 0.001*
- Moderate	2	1.6	8	6.4		
- Severe	0	0.0	0	0.0		
First time of ambulation out of bed after cesarean section (hours):						
- < 6 hours	125	100.0	75	60.0	23.378	< 0.001
- 6-12 hours	0	00.0	43	34.4		
- > 12 hours	0	00.0	7	5.6		
Bowel mobility (hours)					T	
- The first bowel sound	3.7±9.0		6.9±1.1		79.143	< 0.001
- The first flatus passage	6.3±1.0		13.2±1.4			
- The first stool passage	10.5±1.9		27±2.4			
Onset of breast feeding:						
< 2 hours from C/S	60	48.0	8	6.4	103.306	<0.0001*
> 2 hours from C/S	57	45.6	103	82.4		
No breast feeding	8	6.4	14	11.2		
Onset of emotional contact:						
No contact	8	6.4	87	69.6	1.211	0.41
<2 hours from C/S	92	73.6	10	8.0		
2+ hours from C/S	25	20.0	28	22.4		
Initiation of oral fluids (hour):						
- < 4	75	60.0	7	6.0	48.913	< 0.001
- 4-20	50	40.0	59	47.0		
- > 20	0	0.0	59	47.0		
- Mean ± SD	5.4 ± 1.0		15.8 ± 8.3		9.279*	< 0.001
Initiation of regular diet (hour):						
- < 12	43	34.4	4	3.2	70.862	< 0.001
- 12-24	78	62.4	25	19.6		
- > 24	4	3.2	96	77.2		
- Mean ± SD	14.6 ± 5.2		37.3 ± 17.9		9.154*	< 0.001
Hospitalization duration (days)						
Mean ± SD	1.2±0.5		1.8±0.6		Z=4.911	<0.0001*

Z: Mann Whitney test

Table 8: Frequency & Percentage Distribution of Post -Cesarean Section Complications Experienced by the studied women (N=250)

Complications	Study group (125)		Control group (125)		χ^2	P-value
	No.	%	No.	%		
On 1st day						
Nausea	76	60.9	105	83.6	6.146	<0.0001*
Vomiting	30	24.0	48	38.4	193.14	<0.0001*
Retention of urine	0	0.0	2	1.6	FEP=0.498	<0.0001*
Vaginal bleeding	6	4.8	8	6.8	1.211	0.41
Wound bleeding	0	0.0	2	1.6	FEP=0.498	<0.010*
Pulmonary complications	0	0.0	4	3.2	FEP=0.122	<0.010
Abdominal distension and Constipation	41	32.8	92	73.6	23.56	0.0001*
Hemorrhoids	2	1.6	5	4.0	FEP=0.446	-
On 3rd day						
UTI	0	0.0	1	0.8	FEP=1.0	-
Wound bleeding	0	0.0	2	1.6	FEP=0.498	-
Breast engorgement	6	4.8	16	12.8	4.98	0.026*
Abscess	2	1.6	2	1.6	FEP=1.0	-
D.V.T	0	0.0	3	2.4	FEP=0.029*	-
Pulmonary complications	0	0.0	3	2.4	FEP=0.247	-
Constipation	28	22.4	59	47.2	13.03	0.0001*
Hemorrhoids	18	14.4	22	17.6	0.476	0.49
On 2weeks						
Breast Abscess	2	1.6	2	1.6	FEP=1.0	-
Wound infection	0	0.0	1	0.8	FEP=1.0	-
Puerperal sepsis	0	0.0	1	0.8	FEP=1.0	-
Constipation	12	9.6	15	12.0	FEP=0.446	-
Hemorrhoids	1	0.8	5	4.0	21.54	0.0001*

FEP: Fisher's Exact test

Table (9): Correlation between total Practice score and Post -Cesarean Section Complications Experienced by the studied women

Post -Cesarean Section Complications	Total Practice score			
	Pre (N=50)		Post (N=50)	
	r	P value	r	P value
On 1 st day	0.213	0.187	0.051	0.754
On 3 rd day	0.252	0.116	0.357	0.024*
On 2 nd week	0.038	0.815	0.347	0.028*

* Significant

Discussion

Clinical pathway (CP) has been asserted to lead to care improvement and positive outcomes in many clinical situations, especially in the maternity field (Abd El-Ati et al., 2019). As a result, the purpose of this study was to investigate the impact of ERP application outcomes on nurses and women undergoing cesarean sections. The results of the current study confirmed the hypotheses and showed that the implementation of ERP improved nurses' practice and women's outcomes after it was used, which led to better care for women and newborns after CS.

Part I: Findings related to studied maternity nurses that provide ERAS for CS.

The current study's findings indicated that the nurses' knowledge of ERP (what it is, how important it is, what its parts are, and what their role is) significantly increased following the implementation of the intervention, as compared to how much they knew before the intervention.

According to the researcher, the nurse is critical to the success of ERP. As a result, teaching all ERP items to maternity nurses is critical.

The findings of this current study are corroborated by the findings of Hübner et al. (2015), who indicated that the nurses are the key to the success of an ERP. As a result, it is extremely vital for the nurses to become familiar with it in order to educate the patients.

The current study demonstrated that there was a statistically significant difference between the maternity nurses' practice of cesarean section care prior to and after the clinical ERP application. The majority of the nurses were able to adequately complete all aspects of CS care (pre, intra, and post-operative) following the implementation of the ERP system.

The point of view of the researchers about this finding is that the study was successful in teaching the maternity nurses all aspects of the ERP addressing CS care. This is significant because nurses play a vital role in multidisciplinary teams. It is not an easy task to have the willingness to study and apply new concepts that are not the old ones. It is also important to cultivate an atmosphere in which the

benefits of the practice are more likely to be realized.

This finding was supported by Console et al. (2018). In their study publication, they claimed that they concentrated on presenting the ERAS program and underlined the role that nurses play in the process. Additionally, Crosson (2018) stated that the nurse role was important during the implementation of the ERAS program. In addition to developing guidelines to direct nursing care, Crosson stated that the nurses should improve their practice by participating in the training that was a component of the program. In a similar manner, provide training to other nurses.

When comparing how maternity nurses cared for newborns before and after ERP implementation, the data showed a statistically significant increase in the proportion of nurses who provided competent care for the newborns after ERP implementation.

The researchers' point of view about this result is that the evidence and planned newborn care provided by maternity nurses improve maternal satisfaction and mother-infant bonding. Also, it is the core role of maternity nurses.

The ERAS of caesarean birth recommended waiting 30 seconds before clamping the umbilical cord. Delaying cord clamping has been associated with higher hemoglobin concentration and iron reserves up to six months after birth, according to a meta-analysis of 15 research studies (McDonald et al., 2018).

Concerning skin-to-skin contact, the current study stated that skin-to-skin contact is an important item of newborn care. Early separation from the mother may be harmful for the newborn, but early skin-to-skin contact is good for both the mother and the newborn. It has been linked to higher breastfeeding rates and duration, as well as a reduction in mother anxiety and postpartum depression (Conn et al., 2018).

Part II: Findings related to the studied women who were undergoing CS

According to post-cesarean section improvement markers in terms of the intensity of pain experienced by women undergoing CS on the primary day, the third day, and the second

week, based on the results of this study, the pain that the study group felt on day three was much less severe than the pain that the control group felt.

Based on this finding, the researchers think that one of the goals of ERAS protocols is to improve pain management, since a mother who is in a lot of pain is more likely to have trouble bonding with the newborn and breastfeeding.

It has been shown that patients who don't get enough pain relief after surgery are more likely to get sick, die, be readmitted to the hospital for pain management, stay longer in the hospital, and take longer to get back to their normal activities. All of these things add to the overall cost of care (Abd El-Ati et al., 2019).

The researchers discovered that on the first day after CS, the mean pain scores were significantly lower in ERAS patients than in the control group (5 vs. 3.7, $p < 0.001$; difference between groups), which was consistent with the findings of Modesitt et al. (2016). Meyer et al. (2018) discovered no significant differences in the pain scores with and without ERAS protocol implementation (P value = 0.80), while, Elgohary et al. (2017) compared the pain scores between ERAS and conventional care in elective colorectal surgery and also discovered significant differences between both groups of their study ($p < 0.001$).

The current study findings found that after surgery, women in the study group were more likely to begin ingesting fluids orally within 4 hours than women in the control group. Less vomiting as well as easier elimination were observed in the experimental group than in the control group ($P = < 0.0001^*$). This is quite plausible, as demonstrated by Guo et al. (2015), who compared delayed oral feeding with early oral feeding and found that early oral feeding supported a speedy restart of intestinal sounds, flatus, bowel movements, and regular oral intake.

According to Huang et al. (2016), early oral hydration has been shown to improve the return of gastrointestinal functions, and early ambulation has been shown to decrease the risk of infection, as well as the amount of time that passes between the beginning of breastfeeding and the length of the patient's hospital stay. Women who underwent CS were more likely to have shorter mean times for the first bowel sound, the first

passage of flatus, and the first passage of a stool after the procedure.

Similarly, Abd El-Ati et al.'s (2019) research on the effects of a postpartum ERP intervention on the incidence of postoperative complications in primiparous women undergoing elective CS found that women in the study group had significantly shorter mean times for first bowel sounds, first passage of flatus, and first defecation after surgery, with a median value of three hours compared to six-point-five hours in the control group.

According to the findings of the current study, all of the women in the study group had begun walking from the bed within the first six hours after the procedure, while only two-thirds of the women in the control group had done so. This represents a statistically significant difference between the two groups ($P < 0.001$).

From the point of view of the researchers, who thought that early mobilization would improve a patient's lung function, tissue oxygenation, and overall recovery, this means that patients spend less time in the hospital.

In addition, as pointed out by Mullman et al. (2020), it shortened patients' hospital stays and cut down on their chances of developing thromboembolism. This study's findings corroborated those of Lee et al. (2018), who reported that when ERAS protocols were applied to women undergoing elective CS, the proportion of early ambulation increased dramatically. Regarding initiation of breastfeeding, almost half of the women in the study group started breastfeeding early (within two hours following C/S) compared to the control group. Furthermore, they differed significantly in the emotional contact they had with their newborn.

According to Qiang, Jia, and Long (2020), efforts to encourage post-operative recovery may help to enhance bonding and breastfeeding while reducing the incidence of postpartum depression. In addition, Habib (2018) said that the ERAS procedure for cesarean birth is successful and that measures should be taken to encourage early breastfeeding. The findings of the current study suggested that, when it came to the length of stay (LOS), the women who were in the control group had a statistically longer mean term of

hospitalization compared to the women who were in the study group.

The researchers' point of view, shorten hospital stay reflect early improvement and reduction of post-operative complications. Also, ERAS program was effective in improving women condition than routine care hospital.

The duration of a patient's stay in the hospital can be shortened by implementing ERAS protocols. This was corroborated by findings published by Pilkington et al. (2016), who found that patient stays in the hospital decreased from an average of six days before the application of ERAS procedures to an average of two days following their implementation. The proportion of patients discharged home on the first day following surgery has increased This finding is consistent with the findings of the study by Wrench et al. (2015).

Conclusion

The results of this study showed that after implementing the ERP, maternity nurses scored significantly higher on measures of both their knowledge and their ability to put that information into practice. This supported the first study hypothesis. Women who had a caesarean section and received ERP post-caesarean section home care showed a greater and more statistically significant increase in total knowledge scores than those who received the hospital's routine nursing care. This supported the second study hypothesis. The current study also demonstrated that women who got ERP nursing care after CS saw a statistically significant improvement in their postoperative problems compared to women who received only standard hospital nursing care. This supported the third study hypothesis. Furthermore, when compared to women who received only standard hospital nursing care, the use of ERP nursing care following CS was effective and highly statistically significant in relieving the women's postoperative pain. This supported the fourth study hypothesis. Therefore, the study hypotheses are accepted.

Recommendations:

The following suggestions and implications were made on the basis of these findings.

1. During caesarean section surgeries, an enhanced recovery pathway should be used to help patients do better and reduce complications.

2. In cases of obstetric emergencies, all maternity nurses are told to follow a standard set of approved rules for a faster path to recovery.
3. Conducting a similar study on a large sample in different maternity settings so that the results can be applied to all population.

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