

ORIGINAL RESEARCH ARTICLE

Effects of early rehabilitation on enhanced recovery after caesarean section

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Abstract

The objective of this study was to evaluate the impact of improved rehabilitation on the average length of stay after a scheduled caesarean section under neuraxial anaesthesia, it is a descriptive, monocentric study with prospective recruitment. Our protocol was based on neuraxial anaesthesia with intrathecal morphine, multimodal analgesia, with oral analgesics postoperatively, prevention of postoperative nausea and vomiting (PONV), rapid demedicalization, refeeding and mobilisation. We included 99 patients. The mean length of stay (LOS) for the current caesarean section was 1.97 days versus a LOS for previous caesareans of 4.14 days. On the day of discharge, the mean satisfaction with overall management was 8.97 \pm 1.35. At six weeks, 92.6% wanted to have the same protocol for a future caesarean. Early rehabilitation after caesarean section is quite applicable to the Algerian context. It offers a quick functional recovery with patient satisfaction, as well as a reduction of the length of stay. (*Afr J Reprod Health* 2023; 27 [9]: 134-142).

Keywords: Enhanced rehabilitation; neuraxial anaesthesia; caesarean section; average length of stay; satisfaction

Résumé

L'objectif de ce travail est d'évaluer l'impact de la réhabilitation améliorée sur la durée moyenne de séjour après une césarienne programmée sous anesthésie neuraxiale. C'est une étude descriptive, monocentrique, avec recrutement prospectif. Notre protocole a reposé sur une anesthésie neuraxiale avec morphine intrathécale, une analgésie multimodale, avec des antalgiques par voie orale en postopératoire, une prévention des nausées vomissements postopératoires, une démedicalisation rapide, une réalimentation et une mobilisation rapide. Nous avons inclus 99 patientes. La durée moyenne de séjour (DMS) de la césarienne actuelle était de 1.97 jours vs une DMS des césariennes antérieures de 4.14 jours. Le jour de sortie de l'hôpital, la moyenne de satisfaction de la prise en charge globale était de 8.97 \pm 1.35. A six semaines, 92.6% souhaitaient, avoir le même protocole lors d'une prochaine césarienne. La réhabilitation précoce après césarienne est tout à fait applicable au contexte Algérien, elle offre une récupération fonctionnelle rapide avec une satisfaction des patientes, ainsi qu'une réduction de la durée de séjour. (*Afr J Reprod Health* 2023; 27 [9]: 134-142).

Mots-clés: Réhabilitation améliorée ;anesthésie neuraxiale ; cesarienne ; duree moyenne de sejour ; satisfaction

Introduction

Enhanced recovery after surgery (ERAS) is a multidisciplinary approach to the management of perioperative patients, based on recommended best practice¹. It includes all factors that improve recovery process, namely, patient information, psychological preparation, optimisation of vital functions, reduction of metabolic stress, normothermia, early post-operative feeding, multimodal analgesia, as well as the prevention of nausea and vomiting^{2,3}.

Overall, the authors report that enhanced recovery does not lead to more complications than a conventional surgical method but may lead to a reduction in length of stay (LOS) in the hospital^{4,6}.

Despite the development of ERAS in various surgical specialties, it is struggling to spread to the field of obstetrics^{7,8}. However, early rehabilitation seems to be particularly interesting for obstetric indication. Indeed, it concerns a very sensitive period where two important events intersect, on the one hand the surgical intervention weakens the mother, and on the other hand, the birth

requires efforts on the part of the patient, who has to breastfeed and look after her child. Moreover, the increase in the rate of caesarean sections worldwide is a real public health problem.

In Algeria, during 2017, according to data from the National Statistics Office, the birth rate was 25.40 per thousand inhabitants, which corresponds to a total number of births exceeding one million per year. An estimated 38-40% of live births were caesarean deliveries.

This increase encourages a logic of care optimisation, which allows the reduction of the workload of the carers, simplifying procedures, promoting, and stimulating patient's autonomy⁹. This results in a reduction in morbidity, average length of stay (LOS)¹⁰ and therefore a reduction in healthcare costs.

The aim of this study is to evaluate the impact of improved rehabilitation on the average length of stay after a scheduled caesarean section under neuraxial anaesthesia. Our reflection was mainly based on two questions: does early post-caesarean rehabilitation reduce the LOS? And does it bring greater patient satisfaction compared to a classic protocol?

Methods

This study is a descriptive, single-center research conducted at the gynecology-obstetrics clinic of Bab-El-Oued University Hospital in Algeria. The study utilized prospective recruitment and was conducted over the period from September 2016 to September 2018.

We included every patient aged over 18 years, without major comorbidity, without medical-surgical contraindications to neuraxial anaesthesia and consenting to adhere to this protocol. And having had at least one caesarean delivery in her history in our department with a medical record in the archives. We chose at least one previous caesarean section in order to compare the impact of ERAS mainly on two items, the LOS and the global satisfaction of the patients. The patients were divided into two groups:

"Rehabilitated group": This group consisted of patients who underwent the current caesarean section and followed the Enhanced Recovery After Surgery (ERAS) protocol. "Non-rehabilitated group": This group included the same patients, but during their previous caesarean sections, they did not

receive the Enhanced Recovery After Surgery (ERAS) protocol.

In the rehabilitated group (current caesarean section), the participants were provided with information about the procedure during the pre-operative anaesthesia visit. They were also given the opportunity to provide their informed consent before participating in the study. The patients were admitted to the hospital on the morning of the surgery. We followed a minimum preoperative fasting period of 6 hours. The choice between spinal anaesthesia or combined spinal-epidural anaesthesia was primarily based on surgical considerations, such as the surgeon's expertise and the presence of a high risk of adhesion.

For spinal anaesthesia, we used 25-27G needles, a combination of isobaric bupivacaine (0.8 to 10 mg), sufentanil (2.5 micrograms), and morphine (100 micrograms). For combined spinal-epidural anaesthesia, we injected isobaric bupivacaine (6 to 7 mg), sufentanil (2.5 micrograms), and morphine (100 micrograms) intrathecal, with the possibility of extending the block by injecting local anesthetics or saline solution into the epidural space.

A vascular co-loading with physiological saline solution at 0.9%, limited to a maximum of 1000 ml, combined with ephedrine at a dosage of 60 mg in the vascular loading solution infusion, was performed concurrently with the spinal anaesthesia. Additional ephedrine bolus IV doses were administered, if necessary, based on the hemodynamic status (presence of sympatholysis manifestations).

Prevention of postpartum haemorrhage was performed using an infusion of 15 IU of oxytocin (Syntocinon®), initiated after clamping the umbilical cord and maintained during the first 3-4 hours postpartum. To prevent hypothermia, we maintained the operating room temperature at 23°C and warmed the infused fluids. To minimize postoperative complications, we administered prophylactic antibiotics before the incision, using 2 g of intravenous cefazolin or 15 mg/kg of vancomycin in case of allergy.

The prevention of postoperative nausea and vomiting (PONV) was systematically performed with a corticosteroid (Dexamethasone®) administered intraoperatively after cord clamping and supplemented by a rescue antiemetic, ondansetron (Zofran®).

Postoperative pain prevention was carried out using a multimodal approach, including intrathecal morphine, infusion of Nefopam after cord clamping. We systematically administered oral analgesics such as paracetamol (1 g every 6 hours), ketoprofen (100 mg every 12 hours), and an infusion of nefopam in case of pain score (EVA) higher than 4.

After anaesthesia, the patients were monitored for 2 hours in the post-anaesthesia care unit. They were allowed to drink from the first hour. From the second hour onwards, they could consume a light meal consisting of dates, dairy products, soup, and compotes. Normal diet was reintroduced from 4 hours after the caesarean section, based on the patient's preferences.

To facilitate faster recovery without constraints, removal of the intravenous catheter was performed upon discharge from the postoperative recovery room, and it was typically removed at day 1 postoperative if there are no complications.

The urinary catheter was removed as soon as the motor block was resolved. Resumption of diuresis was closely monitored. In case of urinary retention, nurses were instructed to perform intermittent catheterization if diuresis had not resumed within eight hours after removal of the urinary catheter. If urinary retention recurred, the catheter was kept in place.

The first mobilization was performed as soon as possible and before the 6th hour after the caesarean section.

For thromboprophylaxis, we followed international recommendations. No thromboprophylaxis was administered if the caesarean section was planned with +/- 1 additional minor risk factor. For planned caesarean section with +2 additional minor risk factors, prophylactic low molecular weight heparin (LMWH) at a preventive dose was initiated 8 hours after the end of the caesarean section, with dose adjustment according to weight in obese patients.

From the moment of birth, the midwife places the newborn, skin-to-skin, against the mother, sometimes with only cheek-to-cheek contact, allowing the mother and her newborn to get acquainted. Then, as usual, the child is taken to a separate room where they receive their first care. They will remain in the neonatology unit during the period when their mother is in the post-anaesthesia care unit. Subsequently, the newborn will be

reunited with the mother in the hospitalization room. Depending on the patient's clinical condition, discharge was proposed from day 1 (considering the day of the caesarean section as day 0).

Patients were subsequently scheduled for follow-up consultations with their surgeon on the 8th day and 1 month after the procedure. This allowed for monitoring the quality of healing, particularly of the abdominal wall. In this study, further follow-up was provided by the anesthesiologist through telephone calls for up to six weeks or beyond in case of caesarean-related complications.

In the non-rehabilitated group (the previous caesarean sections), hospitalization took place the day before the surgery, and the fasting period lasted from 8 to 12 hours. Intrathecal morphine was not administered, and postoperative pain management involved the use of intravenous paracetamol. After the return of bowel movements, a liquid diet was introduced, patients were mobilized, and the urinary catheter was removed the day after the caesarean section. Systematic antibiotic prophylaxis and thromboprophylaxis were implemented. Discussions regarding discharge occurred from day 3.

Data collection

After informing eligible patients (patients who have previously undergone a caesarean section in our maternity ward and whose medical records were found in the complete archives, including study-related data and length of stay), we collected the necessary information in different stages. A previously prepared questionnaire was used, and the responses were recorded in an SPSS database. The data collection stages included the pre-anaesthetic consultation, the day of the caesarean section, the hospital stay, and telephone follow-ups up to six months after delivery. For each patient, a form was filled out, including data such as age, ASA score, BMI, hospitalization and intervention dates, possible surgical complications, anaesthesia details, postoperative care, postoperative comfort, hospitalization duration, and readmission rate.

To assess the degree of patient satisfaction, we used a service-specific questionnaire to gather their opinions on the adequacy of the protocol to their needs and expectations. Overall patient satisfaction was evaluated at the time of their discharge from the hospital using a numerical scale

ranging from 0 (not satisfied at all) to 10 (completely satisfied). From the 6th week following delivery, we used the same questionnaire to evaluate different aspects of the enhanced recovery protocol compared to the management during their previous caesarean sections. The evaluated domains included anaesthesia, pain management, early feeding, early removal of urinary catheter, and early discharge. Patients were able to choose from the following responses: "satisfied" (preferring the current protocol), "neutral" (not noticing any difference compared to the traditional management), or "unsatisfied" (preferring the traditional management). Finally, we also asked patients about their preference regarding management with a recovery protocol in a possible future caesarean section.

Data analysis

Nominal variables were expressed as numbers and percentages (%) and the descriptive statistics for continuous variables were expressed as the mean \pm standard deviation or median (minimum-maximum). Significant differences between the groups were evaluated using appropriate tests, including the Student test, the Mann-Whitney U test, McNemar's test, or Wilcoxon test. A P value < 0.05 was considered statistically significant. Statistical analyses were performed using IBM SPSS Statistics for Windows, version 23.

Results

We selected 99 patients who fulfilled the inclusion criteria and had a history of previous caesarean delivery with a medical record available in the archives.

Comparison of the two groups

Postoperative length of stay by group

The average LOS for the rehabilitated group was 1.9 days (\pm 1.7) with extremes ranging from 01 to 15 days, compared with 4.1 days (\pm 3.3) for the non-rehabilitated group with extremes ranging from 01 to 20 days. The Wilcoxon test showed a highly significant difference between the two groups ($P < 0.001$). On the other hand, the number of cumulative hospital days was significantly

different between the two groups as it amounted to 410 days for the non-rehabilitated group versus 195 days for the rehabilitated group.

Readmission rates

Only one patient was readmitted for pelviperitonitis, which required revision surgery, and another patient was readmitted for late neonatal jaundice.

Patient satisfaction

Satisfaction on the day of discharge

On the day of discharge, the patients' overall satisfaction was evaluated, using the numerical satisfaction scale: "not at all satisfied with the management using the ERAS protocol" corresponding to a score equal to 0, to "totally satisfied" corresponding to a score equal to 10.

The mean was 8.9 \pm 1.4 with a median of 9 (4-10)

Patient satisfaction with the different components of the rehabilitation protocol

Six weeks after the caesarean

Desire for similar management at a future caesarean section

In our series 92.6% wished to have a rehabilitation protocol at a future caesarean section. However, 7.4% said no. The reasons for this rejection were related to the existence of pain and/or postoperative complications

Discussion

The concept of a postoperative rehabilitation programme after surgery was developed more than 20 years ago in different surgical specialties. The first specific recommendations for obstetrics were only published in April 2019^{11,12}. Rapid recovery in obstetrics is particularly relevant as this critical period encompasses both the mother's postoperative recovery and challenges related to childbirth, such as breastfeeding and newborn care.

The aim of our study is to propose an accelerated rehabilitation program by improving

Table 1: General characteristics of the populations by group

	Rehabilitated group (n= 99)	Non-Rehabilitated group (n=99)	p
Age (years)	34.7 +/- 5.1	31.2 +/- 4.9	<0.001
BMI (kg/m2)	30.6 +/- 4.5	29.4 +/- 4.6	<0.001
Number of caesarean section	2.1 +/- 0.7	1.6 +/- 0.7	<0.001
Pregnancy term (weeks)	38.3 +/- 0.9	39.1 +/- 1.3	<0.001
ASA 1	65(65.7)	79(79.8)	0.003
ASA 2	34(34.3)	20(20.2)	
RA	99(100)	88(88.9)	0.001
GA	0	11(11.1)	

Values are presented as the number (%) or the mean ± SD (standard deviation). * $p < 0.05$, statistical significance. BMI, body mass index; ASA, American Society of Anaesthesiologists; RA, regional anaesthesia; GA, general anaesthesia. Student test for age, BMI and term of pregnancy, Mann Whitney U test for number of previous caesarean sections, McNemar's test for ASA score and anaesthetic technique.

Table 2: Postoperative length of stay by group

Length of stay	Rehabilitated group N=99	non-rehabilitated group N=99	p
D1	38(38.4)	1(1.0)	<0.001
D2	51(51.5)	20(20.2)	
D3	5(5.1)	42(42.2)	
D4	1(1.0)	14(14.1)	
≥D5	4(4.0)	22(22.5)	
Average +/- SD	1.9+/-1.7	4.1+/-3.3	
Median (extremes)	2(1-15)	3(1-20)	
total number of hospital days/group	195	410	

Results expressed in days (mean and standard deviation, then median with extremes). A Wilcoxon test was performed.

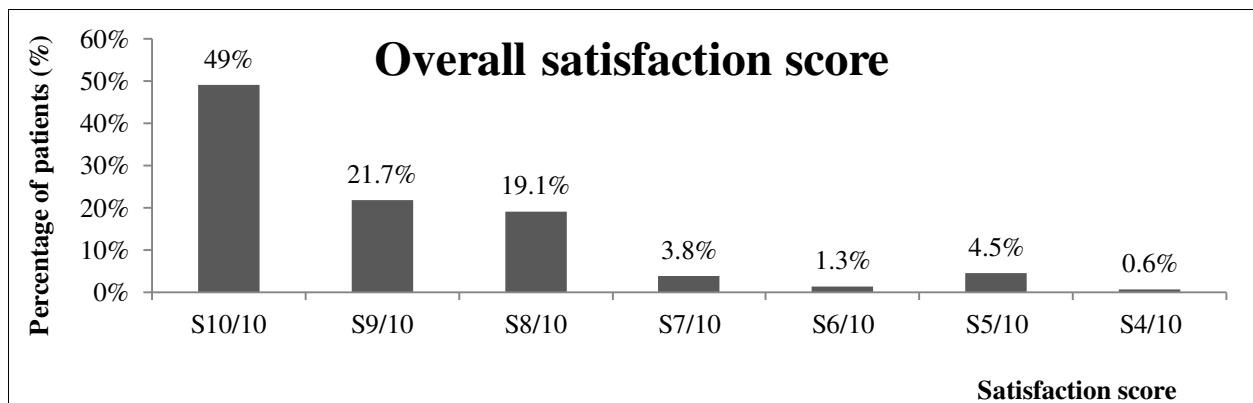


Figure 1: Patient satisfaction assessed on the day of discharge using a numerical satisfaction scale

and optimizing several aspects of postoperative care after a cesarean section. This includes better pain management through a multimodal approach, prevention of complications such as nausea, vomiting, and perioperative hypotension, early nutrition, rapid removal of venous catheters and

urinary catheters, as well as early mobilization. Our results were obtained from a feasibility study in a population of women who had already undergone caesarean section. This allowed us to compare our protocol with "conventional management" regarding length of stay and patient satisfaction.

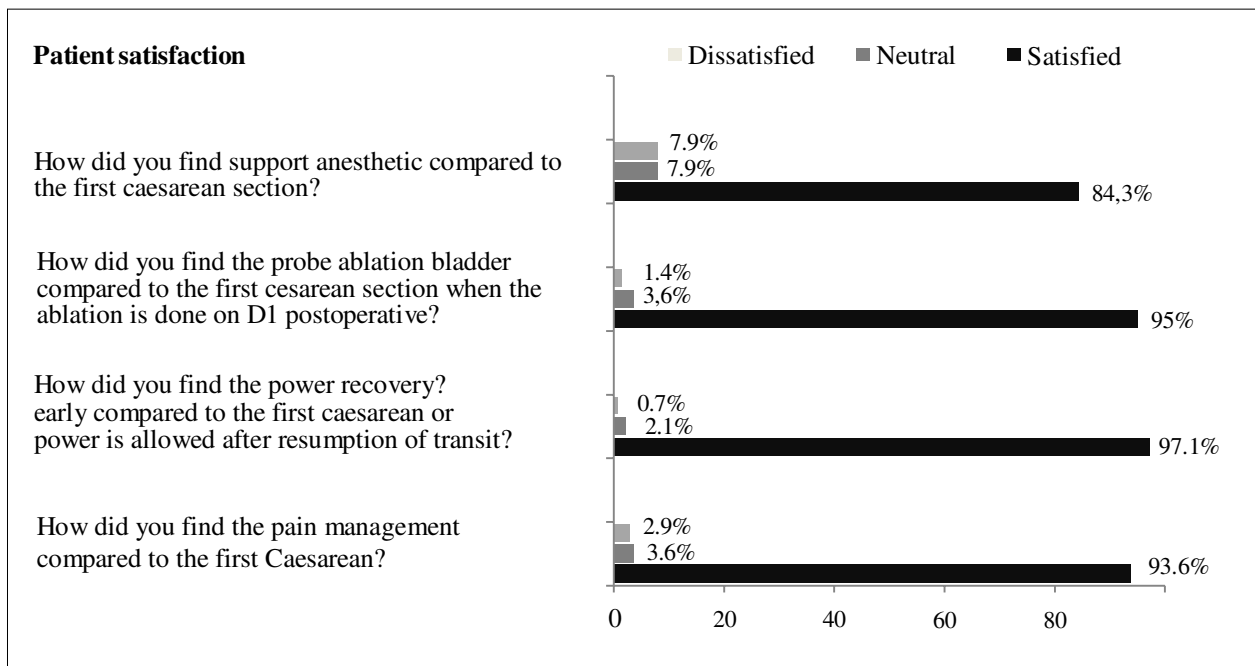


Figure 2: Patient satisfaction with various components of the post-caesarean rehabilitation protocol assessed six weeks after the procedure

Average length of stay (ALOS)

The main results of our study show that the application of an ERAS protocol after caesarean section is associated with a reduction in the length of stay without an increase in the rate of complications or readmission, with better patient satisfaction compared to conventional management. Before the implementation of this protocol (ERAS), the majority of patients were discharged on the third day (42.2%).

The rehabilitation protocol, proposed in our study, allowed a considerable gain in the length of stay, since the discharge on day 1 went from 1% in patients with conventional management to 38.4% with the ERAC. Also, the discharge at day 2 post-op was in favour of the rehabilitated patients, our results were 20.2% versus 51.5%. The ALOS of the rehabilitated group was 1.97 days (+/- 1.746) with extremes ranging from 1 to 15 days, compared to an ALOS of the non-rehabilitated group of 4.14 days (+/- 3.280) with extremes ranging from 1 to 20 days. The Wilcoxon test showed a significant difference between the two groups (P < 0.001).

On the other hand, the cumulative number of days of hospitalisation was significantly different between the two groups as it amounted to 410 days

for the non-rehabilitated group versus 195 days for the rehabilitated group. The readmission rate, corresponding to the percentage of readmission of patients and/or their babies after actual discharge, was very low, involving two patients out of 99, i.e., 2.02%. The reason for readmission for the first patient was pelviperitonitis. The second patient was readmitted for late onset neonatal jaundice. As for outpatient consultations, they mainly concerned wall infections and the majority of patients preferred consultations in local health centres.

Our results fully converge with those of literature, which confirm that the main consequence of improved rehabilitation is the reduction of the length of stay (LOS)¹³⁻¹⁶. Indeed, since the beginning of the implementation of ERAS protocols, especially in colorectal surgery, the decrease in LOS was already very significant^{17,18}.

In a study conducted by Wrench et al. in the United Kingdom in 2015, a significant reduction in length of stay after Caesarean section was reported after the implementation of a rehabilitation program. The percentage of women discharged on day 1 increased from 1.6% to 25.2% after the implementation of the rehabilitation program¹⁹.

Similarly, a study in South Africa in 2011 examined the effect of early discharge (day 2)

compared to extended discharge (day 3) after Caesarean section and found no significant difference in complications between the two groups²⁰. Another study by Chion Tan *et al.* published in Malaysia in 2012 compared women discharged on days 1 or 2 following elective Caesarean section and found no difference in maternal satisfaction with discharge date or exclusive breastfeeding rates at six weeks between the two groups²¹. Furthermore, a study in Nigeria in 2019 compared early versus delayed oral feeding after uncomplicated Caesarean section and found a significantly shorter postoperative hospital stay in the early feeding group²². Additionally, a study in Tunisia in 2016 found that early postpartum discharge significantly reduced hospitalization expenses without compromising the safety of the mother and newborn²³. Moreover, a study in France in 2017 compared an enhanced recovery protocol with standard treatment for post-Caesarean management and found that the patients receiving the enhanced recovery treatment had a significantly shorter average hospitalization time and improved autonomy for toilet and mobility¹⁶.

The main fear of an early discharge is the risk of rehospitalisation, Wrench *et al.* showed that this rate was similar whether the discharge was at day 1 or day 2.

In some countries, early postpartum discharge is a safe practice, due to home care by midwives. In our country, despite the absence of medical support, it is the presence of strong family cohesion (mother, mother-in-law, sisters, etc.), and easy access to local health centres, that has made early postpartum discharge safer

Patient satisfaction

In a hospital setting, patient satisfaction is one of the most important factors in the quality of care. There is a new and growing interest worldwide in patient satisfaction. The measurement of quality of care is correlated with several factors such as adherence to therapy, the continuity of care and the improvement of health status²⁴. Patient satisfaction is usually measured using a questionnaire that explores its multiple dimensions. The international literature agrees that each survey has a different questionnaire²⁴.

The application of the early rehabilitation protocol allowed us to obtain a more rapid

autonomy of the mothers, which allowed us to authorise an earlier discharge from hospital. The evaluation of the patients' feelings regarding the day of discharge showed a high level of satisfaction, as 92.65% of the patients were satisfied with the duration of their hospital stay. The respect of all these parameters of the protocol allowed an overall satisfaction of the stay in the maternity hospital. The majority of patients (92.6%) responded that they would opt for the same protocol for their next caesarean section.

Dan Benhamou in 2002, in a study evaluating early oral feeding after caesarean section, concluded that ERAS programme resulted in improved patient satisfaction without any adverse effects²⁵. Halder *et al.* in 2014 reported a 96.7% satisfaction rate with ERAS protocol after scheduled caesarean section, with a shorter length of stay²⁶. Feasibility and safety of caesarean section with accelerated rehabilitation. Various indicators have shown us that ERAS is feasible in obstetrics for caesarean sections under neuraxial anaesthesia. There were no adverse events related to ERAS that led to termination of the study.

The application of the ERAS protocol allowed a reduction in the duration of hospitalization without impact on the safety of the patients, since we did not record any rehospitalization for complications linked to the application of this protocol.

Strengths and weaknesses

Strengths of the study include its originality, as it presents an Enhanced Recovery After Caesarean (ERAC) program specifically tailored for patients with prior traditional caesarean section experience. This unique approach enhances understanding of the benefits for this particular patient group. The research also demonstrates high data reliability through a prospective study, diligently recording intervention timing, treatments, and follow-up, thus boosting the credibility of the results and ensuring data reliability. Additionally, the study evaluates patient satisfaction and their perception of care, offering a holistic view of outcomes alongside quantitative results.

Weaknesses of the study include the absence of a control group, making it challenging to compare the effectiveness of the ERAC program with other approaches. The inclusion of a control

group would have allowed for a better assessment and comparison of the results. Moreover, the study's small sample size diminishes statistical power and generalizability, and a larger sample would have bolstered the validity of conclusions. Additionally, relying on a single hospital setting may limit the generalizability of the findings to other contexts. Inclusion of multiple institutions would have provided a more diverse perspective on the outcomes.

Policy and clinical implications

Improve caesarean section conditions: Enhancements like allowing the father's presence in the operating room, extended bonding time, and conducting postpartum monitoring in the delivery room can enhance care.

Adoption of ERAS: Promote ERAS in obstetric services through multidisciplinary collaboration and active involvement from hospital administration.

Economic benefits: ERAS can reduce costs and alleviate maternity bed shortages by decreasing hospitalization duration and improving patient turnover.

Ethical consideration

The ethical committee at the Mohamed Lamine Debaghine University Hospital Center in Bab El Oued, Algiers, has approved the implementation of this study. All the participants have provided informed consent after receiving explanations about the various aspects of the study protocol.

Conclusion

The ERAS provides important benefits for mother and child. Therefore, this mode of perioperative management is tending to become more widespread in maternity hospitals, for the greatest benefit of the patients and newborns. An ERAS protocol for scheduled caesarean sections has been introduced in our department and has led to a reduction in the LOS with an increase in the number of women discharged from hospital the day after the surgery. The postoperative maternal readmission rate after discharge was very low. The telephone follow-up of the patients showed that they did not experience any post-discharge problems at home. The ERAS

programme has a major economic benefit, as the recommended measures are affordable, it allows a decrease in the length of hospitalization and thus directly lead to a reduction in the cost of patient care. The administration may also benefit financially through a faster turnaround of inpatients and increased availability of beds.

Authors contribution

Mansouri Rachida: Study design, data collection and analysis, article writing. Other authors: Significant input of ideas during the study design, methodological support, critical review of the article. authors mentioned in the article approved the manuscript.

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