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Effects of the application of combined plan-do-check-action and enhanced recovery by nurses on patients undergoing cesarean section

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Abstract

This study examined the effects of a combination of plan-do-check-action (PDCA) and enhanced recovery after surgery (ERAS) on patients undergoing cesarean section. One hundred and thirty patients undergoing caesarean section at the Second Affiliated Hospital of Nantong University comprised the study group. They were randomly divided into a control group (CG) and an intervention group (IG). The CG accepted routine management during the perioperative period, while the IG accepted a combination nursing of PDCA and ERAS. Relative to the CG, the IG presented lower visual analogue scale (VAS) scores at 4 h and 72 h after cesarean section, lower self-rating anxiety scale (SAS) scores and self-rating depression scale (SDS) scores, shorter time of anal exhaust, first urination along after leaving bed, lower total incidence rate of complications, and higher satisfaction rate of patients. We conclude that a combination nursing of PDCA and ERAS can alleviate postoperative pain, improve the psychological state, expedite postoperative recovery along with lessen the incidence of complications in patients undergoing cesarean section. *(Afr J Reprod Health 2024; 28 [12]: 165-174).*

Keywords: cesarean; plan-do-check-action; enhanced recovery after surgery; pain; psychological state; postoperative recovery

Résumé

Cette étude a examiné les effets d'une combinaison de planification-exécution-vérification-action (PDCA) et de récupération améliorée après chirurgie (ERAS) sur les patientes subissant une césarienne. Cent trente patientes subissant une césarienne au deuxième hôpital affilié de l'université de Nantong ont inclus le groupe d'étude. Ils ont été répartis au hasard en un groupe témoin (CG) et un groupe d'intervention (IG). Le CG a accepté une prise en charge de routine pendant la période périopératoire, tandis que l'IG a accepté une combinaison de PDCA et d'ERAS. Par rapport au CG, l'IG a présenté des scores inférieurs sur l'échelle visuelle analogique (EVA) 4 h et 72 h après la césarienne, des scores inférieurs sur l'échelle d'auto-évaluation de l'anxiété (SAS) et sur l'échelle d'auto-évaluation de la dépression (SDS), un temps d'auto-évaluation plus court. épuisement anal, première miction après avoir quitté le lit, taux d'incidence total inférieur des complications et taux de satisfaction plus élevé des patients. Nous concluons qu'une combinaison de PDCA et d'ERAS peut soulager la douleur postopératoire, améliorer l'état psychologique, accélérer la récupération postopératoire et réduire l'incidence des complications chez les patientes subissant une césarienne.. *(Afr J Reprod Health 2024; 28 [12]: 165-174).*

Mots-clés: césarienne; planifier-faire-vérifier-action ; récupération améliorée après la chirurgie; douleur; état psychologique; récupération postopératoire

Introduction

Caesarean section is a crucial obstetric operation. With the continuous progress of surgery, anaesthesia and other technologies, this operation has become an important method to resolve dystocia and other obstetric complications, and can save the lives of mothers and fetuses[1]. However, cesarean section is a traumatic operation. Pre-operatively, women often experience anxiety, fear and psychological effects before and after the operation. Caesarean section can cause damage to peripheral blood vessels and nerve tissues resulting in different degrees of pain after the operation[2]. Without intervention, the postpartum quality of life and breastfeeding of infants will be compromised, hence the need to strengthen perioperative management undergoing caesarean section.

The concept of enhanced recovery after surgery (ERAS) is designed to apply a series of intervention

measures to standardize the perioperative management, so as to reduce the perioperative trauma and postoperative complications, as well as achieve the purpose of accelerated recovery[3]. ERAS has been widely applied in various areas of surgery, such as urology, orthopedics, and breast surgery[4-6]. However, the application of ERAS in the perioperative period of cesarean section is still limited.

PDCA is a new management pattern whose objective is to develop a hospital quality management to coordinate, plan, implement, and improve the quality of obstetrics nursing care[7]. This theory includes the planning stage P (plan), implementation stage D (do), checking stage C (check) and summarizing stage A (action), which are the processes for achieving intended goals and objectives. In comparison to routine nursing management, there is evidence that the PDCA cycle management model can improve nursing quality and clinical treatment outcomes[8]. However, the role of nursing based on PDCA management model in patients undergoing cesarean is obscure. In this study, we explored the influence of a combination nursing of PDCA and ERAS on patients undergoing caesarean section.

Methods

The study sample consisted of 130 pregnant women who underwent cesarean section at the Second Affiliated Hospital of Nantong University from January 2021 to December 2022. They were randomly allocated into two groups comprising 50 pregnant women in the control group (CG), and 80 pregnant women in the intervention group (IG). No significant difference was exhibited in the general information between 2 groups (P>0.05, Table 1).

Inclusion criteria and exclusion criteria

Inclusion criteria: (1) All were full term pregnant women; (2) all underwent elective cesarean section; (3) women with normal mental status; and (4) women who accepted to participate in the study The exclusion criteria were: (1) presence of coagulopathy; (2) women with cardiopulmonary dysfunction; (3) those with severe pregnancy complications; (4) multiple pregnancies; and (5) women with contraindications to anesthesia.

The CG accepted routine perioperative management, including routine cesarean section related knowledge education before operation, close monitoring of fetal heart rate and blood pressure, routine fasting and water deprivation. The doctors and nurses cooperated well during the operations, and the cesarean sections were completed without difficulties. Postoperative vaginal bleeding and uterine contraction were monitored, and the knowledge of postoperative labor analgesia and neonatal feeding was guided.

The IG accepted a combination of PDCA and ERAS nursing care. The processes of PDCA were as follows:

(1) *Planning stage (P)*: Obstetric nurses summarised and sorted out the delivery quality control indicators and quality control items, and mastered the related quality control programs to implement quality control in each link.

(2) *Implementation stage (D)*: Nursing staff were re-skilled in each nursing operation. They cleaned and sterilised the delivery room, ensured sterile closed environment, and strengthened the standard of hand hygiene. At the same time, the performance assessment was linked to the nursing staff, which mobilized the enthusiasm and initiative of the nursing staff, and made them to abide by the relevant standards and systems of obstetric nursing. Nursing staff guided the family members to give more care to the parturients, and encouraged the parturients to keep optimistic attitudes to the delivery. This was to prevent the occurrence of adverse events during the perinatal period. After delivery, mothers are often weak. At this stage, the nursing staff was required to inform the mothers to rest. They also formulated a scientific diet plan for the mothers, explaining the precautions they need to observe after delivery, including neonatal feeding, touching, and other related health knowledge. Furthermore, the nursing staff encouraged the newly delivered mothers to participate in rehabilitation exercises as soon as possible, such as pelvic floor muscle exercise and ambulation, so as to help postpartum recovery.

(3) *Checking stage (C)*: The completion of nursing work was reported through the regular meeting at the end of each month; the existing problems in nursing care were identified; and the solutions were discussed together. The delivery room and ward adopted the first-level quality control, and were checked to ensure strict compliance with the quality control standards. Attention was paid to the weak nursing links, including the emotional counseling of delivered mothers, labour guidance, and the tracking of clinical progress.

(4) *Action stage:* This stage focused on solving nursing problems and common nursing problems, and developed nursing strategies for improvement.

The processes of ERAS were as follows: *Preoperative management:* (1) On the day of admission, the nursing staff communicated well with the parturients and their families to understand whether there were comorbidities before pregnancy, and to identify daily physical conditions, psychological status, and perceptions about cesarean section. This was to enable the nursing staff to fully grasp the specific conditions of the parturients. If there were comorbidities before pregnancy, it was necessary to manage them before the operation so as to reduce the consequences of such complications during the cesarean section.

(2) The nursing staff would then inform the puerpera about the purpose, significance, anesthesia method, operation steps, and precautions during the cesarean section, and they would explain how they would cooperate during the operation for optimal outcome.

(3) On the day of surgery, the nursing staff communicated with the parturients before surgery, understood the psychological fluctuations of the patient, guided the patient to dispose of inappropriate emotions, and helped the patients to establish a positive and healthy attitudes.

(4) The puerpera were instructed to fast for 6 hours and not drinking water 2 hours before operation, and to manage carbohydrate supplementation. Intraoperative management consisted of: (1) operating room temperature was set to 24-26 ℃, and the humidity was maintained at 50%-60%. Intraoperative fluid infusion or peritoneal fluid flushing were pre-heated, and the insulation blanket was wrapped to avoid hypothermia. During the operation, the fluid volume was controlled within 1500 mL while ensuring normal vital signs. The nurses carefully monitored the vital signs, and informed the doctors in time when abnormal signs were found.

The postoperative management consisted of the following: (1) On the day of operation, patient-controlled analgesia pump combined with drug multimodal analgesia was used. The patients could drink water 2-4 hours after operation, take liquid diet 6 hours after operation, and then gradually turn to semi-liquid, soft diet, etc. After the operation, the parturients were placed in the supine position, and their families were informed to massage their feet and legs appropriately to prevent venous thrombosis. After 6 hours, the parturients could be adjusted to the semi-supine position according to their needs, and active activities such as chest expansion and turning over could be carried out appropriately. Additionally, , the perineum was kept clean twice a day, the urinary catheter could be removed 6 hours after the operation, and the risk of falling was assessed, and the puerpera could be guided to get out of bed when there was no risk. After the mothers returned to the room, the newborn were guided to suck, and made skin contact, etc. (2) One day after operation, routine fluid replacement was performed, and the volume of fluid replacement would be less than 500 mL. Diet was treated according to the abdominal condition of the parturient, and semi-liquid or soft diet could be given as needed. The responsible nurses or family members assisted the puerpera to get out of bed 6 to 8 times, and guided the mothers to breastfeed. (3) Two days after operation, the maternal diet was gradually transferred to normal diet. The number of out-of-bed activities were increased, and breastfeeding was recommended >8 times/day. (4) From 3 days after operation to discharge, the parturients were instructed to take normal diet, keep out of bed activities, keep perineum clean, and breastfeed, etc. Before discharge, the relevant precautions were informed before discharge, and the maternal and neonatal care in daily life was guided.

Observed indicators

(1) Pain score: Utilizing the Visual analogue scale (VAS), the degree of pain at 4 and 72 hours after cesarean section[9], with a score range of 0-10 points, and the lower the score, the lighter the pain.

(2) Psychological status: Utilizing the Self-rating Anxiety Scale (SAS) and self-rating Depression scale (SDS), the puerpera's psychological status was assessed at admission and discharge[10]. The SAS score ≥50 points meant anxiety symptoms, and its degree became more serious with the score raised. The degree of depression became more serious with the score raised (53-62 points meant mild depression, 63-72 points mean moderate depression, >72 points wmean severe depression).

(3) Postoperative recovery: the time of anal exhaust, first urination along with leaving bed were compared between 2 groups.

(4) Incidence of complications including urinary retention, wound infection, deep vein thrombosis along with delayed wound healing was recorded.

(5) Patient satisfaction with treatment: Upon discharge, the parturients were asked to complete a self satisfaction survey[11]. The total score was 100, and the parturients rated themselves along the continuum of satisfaction with the care provided - 0-59 indicated that the parturients were dissatisfied; 60-74 indicated that the parturients were basically satisfied; 75-100 indicated that the parturients were satisfied, and the treatment satisfaction of the parturients was the sum of the latter two.

(6) Quality of life scores for pregnant women. Utilizing the 36-item short-form (SF-36) scale[12], the puerpera's quality of life was assessed.

Statistical analysis

SPSS 20.0 was adopted for data statistics. Counting data were presented as (n/%), and the comparison was tested by χ^2 test. Measurement data were expressed as the mean ± standard deviation (SD). The comparison between groups was tested by the independent-t test. $P<0.05$ was considered statistically significant.

Ethical consideration

This study was approved by the Ethics Committee of the Second Affiliated Hospital of Nantong University in December 2020.

Results

Comparative result of VAS score between 2 groups

As shown in Table 2, relative to the CG, the IG presented lower VAS scores at 4 h and 72 h after cesarean section ($P<0.001$).

Comparative result of psychological status in the two groups

As displayed in Figure 1-2, no significant differences were exhibited in SAS and SDS scores between the two groups prior to cesarean section ($P>0.05$). After cesarean section, the SAS and SDS scores declined in the two groups, but relative to the CG, the IG presented lower SAS scores and SDS scores respectively ($P<0.05$).

Comparative result of postoperative recovery between the two groups

Table 3 revealed that relative to the CG, the IG presented shorter time of anal exhaust, first urination along with leaving bed ($P<0.001$).

Comparative result of complications between the two groups

Table 4 shows that there were one case of urinary retention, one case of wound infection and one case of delayed wound healing in the IG, with a e total incidence rate was 1.25%. In contrast, there were one case of urinary retention, four cases of wound healing, one case of deep vein thrombosis and two cases of delayed wound healing in the CG, with a total incidence rate of 16%.

Table 1: General information of patients in the two groups

Groups	Age (years)	Gestational age (weeks)	Weight (kg)	Number of pregnancies (times)	Delivery times (times)
Intervention group (n=80)	28.7±2.2	39.2±0.6	71.9±5.2	2.4±0.3	0.8±0.2
Control group (n=50)	28.8±2.3	39.3±0.7	72.1±5.3	2.5±0.4	0.8±0.2
t value	0.3	1.0	0.2	1.8	>0.9
P value	0.8	0.3	0.8	0.1	0

Table 2: Comparison of VAS score between the two groups

Groups	4 hours after operation	72 hours after operation
Intervention group (n=80)	2.2±0.3	1.2±0.3
Control Group (n=50)	3.3±0.4	2.1±0.3
t value	16.2	16.7
P value	<0.001	<0.001

Table 3: Comparison of postoperative recovery between the two groups

Groups	Anal exhaust time	First dejection time	Leaving bed time
Intervention group n=80)	14.5±2.2	21.0±2.3	13.0±1.3
Control group (n=50)	20.1±2.2	27.1±2.5	18.8±2.2
t value	16.3	14.2	17.0
P value	<0.001	<0.001	<0.001

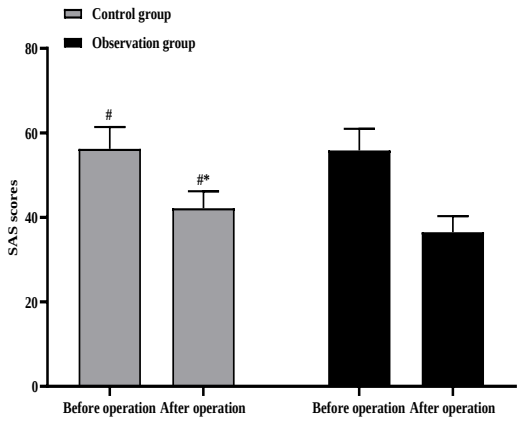

Figure 1: Comparison of SAS scores between the two groups before and after operation. #P<0.05, compared with before operation. *P<0.05, compared with the CG.

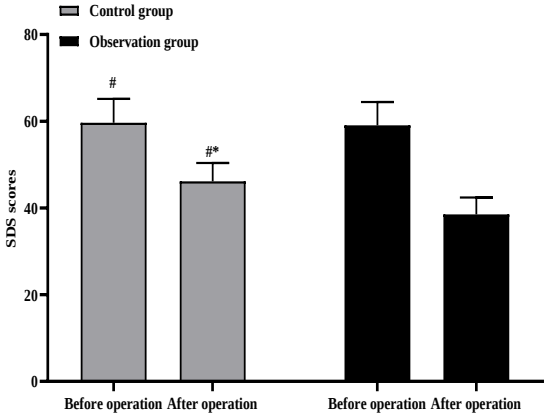

Figure 2: Comparison of SDS scores between the two groups before and after operation. #P<0.05, compared with before operation. *P<0.05, compared with the CG.

Relative to the CG, the IG presented lower total incidence rate of complications (P=0.0).

Comparative result of treatment satisfaction between the two groups

In the IG, 62 parturients were satisfied, 16 parturients were basically satisfied, and 2 parturients were dissatisfied, with a satisfaction rate of 97.5%. In the CG, 23 parturients were satisfied, 15 parturients were basically satisfied, and 12 parturients were dissatisfied, with a satisfaction rate of 76%. Relative to the CG, the IG presented better satisfaction rate (P<0.001, Table 5).

Comparative result of quality of life scores for pregnant women

Before care, no significant differences were shown in SF-36 scores between the two groups (P>0.05).

Table 4: Comparison of complications between the two groups

Groups	Urinary retention	Wound infection	Deep vein thrombosis	Delayed wound healing	Total incidence rate
Intervention group (n=80)	1 (1.3)	1 (1.3)	0	1 (1.3)	3 (3.9)
Control group (n=50)	1 (2.0)	4 (8.0)	1 (2*.0)	2 (4.0)	8 (16.0)
t value	6.0				
P value	0.0				

Table 5: Comparison of treatment satisfaction between the two groups

Groups	Satisfied	Basically satisfied	Dissatisfied	Satisfaction rate
Intervention group (n=80)	62 (77.5)	16 (20.0)	2 (2.5)	78 (97.5)
Control group (n=50)	23 (46.0)	15 (30.0)	12 (24.0)	40 (76.0)
t value	11.3			
P value	<0.001			

Table 6: Comparison of quality of life scores for pregnant women

Groups	SF-36 scores	
	pre-nursing	pos-nursing
Intervention group (n=80)	74.2±7.3	83.7±6.4
Control group (n=50)	75.2±6.6	93.8±8.3
t value	0.7	13.9
P value	>0.05	<0.001

After care, the SF-36 scores in the IG were superior to the control group (P<0.001, Table 6).

Discussion

Cesarean section is a dominant operation in obstetrics, which can effectively improve clinical prognosis for mothers and infants[13]. However, it is a traumatic operation, and most of the mothers are accompanied by negative emotions before the operation, which affects the cooperation of the operation. At the same time, intraoperative operation can cause be stressful and aggravate postoperative pain. In turn, pain can aggravate the stress response, disorder the

internal environment of the body, and even affect early postoperative recovery[14]. Additionally, some parturients may refuse breastfeeding due to pain and discomfort, which may prevent the healthy growth of newborns[15]. Therefore, effective nursing management is needed to help parturients achieve early postoperative recovery.

To date, the PDCA cycle has been widely used in various fields, such as enterprise management, project management, environmental pollution management, education and nursing, and achieved remarkable results[16]. In this study, PDCA cycle method was developed from four aspects, including sorting out the relevant information about childbirth, formulating feasible implementation plans for the problems that may exist during childbirth, adhering to the principle of patient-centeredness in service delivery, and providing high-quality obstetric nursing services. In the process of implementation, the deficiencies and problems existing in nursing work were identified and corresponding solutions put forward in time, to provide patients with comprehensive and high-quality nursing services to meet the reasonable needs of patients[17].

The nursing staff focused on health education of the puerperia, explaining the effects of delivery mode and the delivery outcome. After the operation, the nursing staff observed the physical and mental changes of the mother, and applied relevant nutritional and psychological methods to meet their needs.

In this study, after the PDCA cycle method was introduced into obstetrical surgical nursing work, the SDS and SAS of our patients were lower than before nursing care. This result indicates that the PDCA cycle method can effectively improve parturiens' negative psychological state, as well as promote parturients cooperation with the surgical procedure, which was consistent with previous study[18]. The PDCA cycle concept combined with the nursing work in obstetrics and gynecology operating rooms requires nursing staff to receive regular business learning and participate in the analysis and discussion of various problems during the implementation stage, which can improve the motivation of nursing staff to learn, consolidate their professional knowledge and improve their operational skills. The collective discussions to solve problems and support provided to complete relevant nursing operations can promote the quality of nursing care. The collective discussions to solve problems and assist in completing relevant nursing operations can also enhance team cohesion and improve work efficiency and service quality.

In this study, the application of ERAS in cesarean section women could help to develop a scientific clinical pathway tbat ensures that integrated preoperative, intraoperative and postoperative measures are optimized to improve management efficiency[19]. ERAS paid more attention to preoperative education and psychological counseling than conventional perioperative management, which could reduce the negative emotions of parturients. After the operation, multimodal analgesia under the guidance of ERAS could reduce the impact of pain on postoperative rehabilitation[20]. ERAS made the perioperative management more comprehensive and coherent, and the management measures more targeted, which could well eliminate the related factors affecting rehabilitation before, during and after the operation, and accelerate the rehabilitation process.

The results of this study showed that relative to the CG, the IG presented lower VAS scores at 4 h and 72 h after cesarean swcrion, lower SAS and SDS scores, shorter time of anal exhaust, first defecation along with leaving bed, lower incidence of complications and better

satisfaction, which indicated that PDCA combined with ERAS was effective in the clinical pathway management of cesarean section, which could accelerate postpartum recovery, reduce the breeding of bad emotions and reduce the risk of complications. This positive results may be attributed to the fact that routine clinical perioperative management such as preoperative education, intraoperative medical cooperation and postoperative precautions guidance, lacks pertinence, continuity, and comprehensiveness, which limits the effects that are obtainable. Some parturients recover slowly after operation. Existing literature have suggested that the application of PDCA and ERAS can reduce the pain, improve the psychological status, expedite postoperative recovery, lesen the occurrence of complications along with improve patients satisfaction[17,21-23]. In this study, relative to the CG, the IG presented higher SF-36 scores. This is because the ERAS combined with PDCA nursing method not only improves the quality of nursing services in terms of professional skills, but also encourages and helps patients from psychological care, relieves patients' tension and anxiety, and makes patients more cooperative with surgery.

Strengths and limitations

It is a randomized clinical study with the use of validated outcome measures. The limitations of the study are single-center study and relatively small sample size. Our study suggested that a combination nursing of PDCA and ERAS could be a useful nursing option for patients undergoing cesarean section.

Conclusion

A combination nursing of PDCA and ERAS can accelerate postpartum recovery, improve parturients' psychological state, lessen postoperative pain along with reduce the incidence of complications, which is valuable for clinical application.

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