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Effects of seamless care in the perioperative management of laparoscopic pancreatoduodenectomy on patients' quality of life and postoperative complications

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This study investigates the efficacy of the seamless care model in operative management for patients who have undergone laparoscopic Pancreatoduodenectomy, evaluating its potential effects on postoperative quality of life (QOL) and complications. This study encompassed patients who underwent LPD at our institution between February 2022 and May 2023. Patients were randomly allocated to either the standard care group(control group) or the seamless care group(intervention group) using a random number table method. QOL was assessed both preoperatively and postoperatively. The incidence of adverse events before to discharge was evaluated. No significant changes in preoperative QOL measures were seen between the two groups (P > 0.05). Postoperatively, the intervention group exhibited markedly superior physiological function scores and overall quality of life (P < 0.05), as well as a considerably reduced frequency of adverse events (P < 0.05). The intervention group exhibited significantly shorter times to first postoperative flatus and shortened hospital stays relative to the control group (P < 0.05), times to ambulation demonstrated no significant difference (P > 0.05). Seamless care significantly enhances quality of life and reduces adverse events following LPD, warranting its broader clinical implementation.

Laparoscopic pancreatoduodenectomy (LPD) is regarded as one of the most intricate and demanding procedures in general surgery. It is used predominantly for the treatment of pancreatic cancer, duodenal cancer, bile duct cancer, and other malignancies, especially pancreatic cancer, recognized for its extremely high death rate. Approximately 500,000 new cases of pancreatic cancer are discovered annually around the world, resulting in around 470,000 deaths. In areas with elevated Human Development Index (HDI), the prevalence of pancreatic cancer markedly exceeds the global average. Surgery is the sole curative intervention for pancreatic cancer[1]. Moreover, duodenal cancer and pancreatic cystadenoma are common indications for LPD. However, LPD is burdened with a high complication rate ranging from 26–40%, which can prolong hospitalization and increase costs[2]. Appropriate nursing interventions applied in the setting of LPD have been shown to lead to a relevant reduction in postoperative complications and improvement of patient quality of life (QOL) in terms of LPD[3]. Therefore, a comprehensive care model which encompass encompassing preoperative preparation, intraoperative management, and postoperative recovery, is essential to optimize surgical outcomes.

The seamless care model, initiated at Lakeland Medical Center in Florida in 1989, represents a shift from traditional nursing approaches, focusing on continuous, comprehensive, and targeted care throughout the perioperative period. This paradigm enhances psychological and physiological recovery while also efficiently minimizing medical conflicts and boosting patient satisfaction[4]

This study assessed the outcomes of 76 patients who underwent LPD in a clinical trial conducted from February 2022 to May 2023, comparing 38 patients who received seamless care with 38 patients who received standard treatment. The aim was to examine the impact of the seamless care model on the occurrence of postoperative adverse events and patient quality of life, with the goal of offering a scientifically grounded reference for future nursing practices in clinical treatments.

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Methods

Clinical data collection

This investigation recruited 76 individuals who underwent LPD at our institution from February 2022 to May 2023. Utilizing a computer-generated randomization sequence, participants were allocated into two distinct groups: one group received seamless care, and the other was subjected to conventional care protocols.Before the commencement of the study, all participants and their relatives were thoroughly briefed about the study's scope and provided their written informed consent. The research protocols had been previously reviewed and approved by the Ethics Committee of the First Hospital of Jilin University, ensuring compliance with established ethical standards.

Inclusion criteria comprised: (1) all candidates scheduled for LPD, with tumor resectability collaboratively confirmed by seasoned radiologists and surgeons pre-operatively; (2) candidates in robust health, devoid of severe chronic ailments such as uncontrolled hypertension, cardiovascular diseases, or renal dysfunction; (3) individuals who had not undergone any prior tumor-specific therapeutic interventions; (4) subjects aged 18 years or older.

Exclusion criteria included: (1) individuals afflicted with severe chronic conditions, such as uncontrolled hypertension or cardiovascular diseases; (2) those with a body mass index (BMI) exceeding $40\,\mathrm{kg/m^2}$; (3) patients presenting with locally advanced tumors or metastatic disease; (4) individuals with severe psychiatric disorders or those incapable of understanding or adhering to the postoperative management protocols; (5) those with intolerance to prolonged anesthesia or presenting significant anesthetic risks.

Experimental design

In this study, the control group consisted of 38 patients who were administered conventional care. Specifically, prior to surgery, medical staff introduced the surgical procedure and its necessity to patients and their families, guided them through the required preoperative examinations, and ensured strict adherence to fasting instructions. During the operation, nursing staff coordinated with medical orders and closely monitored the vital signs of the patients. Postoperatively, they reinforced medication guidance, observed wound healing progress, took measures to prevent possible complications, and instructed patients and their families on timely follow-up and regular reviews. Perioperative management was strictly standardized according to the latest guidelines of the International Study Group of Pancreatic Surgery (ISGPS) to ensure consistency in surgical and postoperative care.

On this basis, the intervention group received seamless care. First, a seamless care team was formed, headed by a senior nurse with more than 10 years of experience and supported by three regular staff nurses. Additionally, the team encompasses operating room nurses, anesthesiologists, rehabilitation physicians, and psychotherapists, all of whom play integral roles in the comprehensive care framework. The primary surgeon underwent rigorous training, possess extensive experience, and perform at least 30 PD surgeries annually, ensuring a high level of surgical proficiency and consistency. Each team member underwent specialized knowledge training and periodic assessments to clarify their individual responsibilities and scope of practice. Upon admission, nursing staff guided patients through various examinations, provided dietary, medication, and exercise instructions, utilizing Cognitive Behavioral Therapy (CBT) techniques to manage and maintain patients' mental health, with a focus on reducing anxiety and improving coping mechanisms. Under the guidance of a psychologist, patients learn to avoid excessive worries about surgical outcomes and prognosis through cognitive restructuring, replacing negative emotions with more positive thoughts. Additionally, the psychologist tell the patients how to alleviate emotional stress. Patients are also encouraged to actively communicate with friends and family, as positive social support can effectively help manage complex emotions after surgery. Preoperatively, detailed information about the surgical method, timing, personnel, and preparatory requirements was provided, along with potential complications. During the surgical procedure, seamless care highlight the collaboration between operating room nurses, surgeons, and anesthesiologists. Adopt measures such as warming infusions and adjusting room temperature to prevent hypothermia, while closely monitoring vital signs. Postoperatively, individualized rehabilitation guidance was provided based on each patient's educational background and psychological profile. A nutritionist developed a personalized dietary plan, while a rehabilitation physician collaborated with nursing staff to encourage early in-bed exercises and ambulation, including balloon-blowing, gum-chewing, and deep-breathing exercises to facilitate gastrointestinal recovery. Coupled with psychological support and enhanced postoperative health education, this approach ultimately achieved a multidisciplinary, continuous, and comprehensive "seamless care" model.

Intervention and data collection

Patients undergo QOL assessments before nursing interventions and upon discharge using the WHOQOL-BREF, a standardized questionnaire developed under the guidance of the World Health Organization[5]. It comprises 26 items across four domains: physical, psychological, social, and environmental. The WHOQOL-BREF has been validated for its internal consistency and reliability and has demonstrated construct validity in oncology settings[6,7]. Each item is scored on a five-point Likert scale, where higher scores indicate better quality of life (1-Very Poor, 2-Poor, 3-Neither Good Nor Poor, 4-Good, 5-Very Good). According to the questionnaire manual, raw scores are converted to a 0-100 scale.

In addition, we monitored the incidence of postoperative adverse events, particularly pancreatic-specific complications, including postoperative pancreatic fistula (POPF), delayed gastric emptying (DGE), postpancreatectomy hemorrhage (PPH), and chyle leakage (CL), all defined by the International Study Group for Pancreatic Surgery (ISGPS)[8–11]. Bile leakage (BL) was defined by the International Study Group for Liver Surgery[12]. These definitions are widely recognized as international research standards in pancreatic surgery. Moreover, we assessed common postoperative complications such as abdominal infections[13].

Additionally, metrics such as postoperative time to first flatus, first postoperative ambulation, and length of hospital stay have been collected to understand the influence of the nursing models on physiological function recovery and rehabilitation duration during the recovery process.

Data analysis

In this investigation, the SPSS 21.0 software package has been utilized to analyze baseline data and research data for the 76 patients. For normally distributed data, results have been presented as Mean±SD. For independent data sets with equal variances, the t-test has been applied for comparisons between groups. The categorical variables were displayed as numbers and percentages. The Chi-squared test or Fisher exact probability test was used to compare the differences between the groups. All tests were two-tailed and a P value < 0.05 was considered statistically significant.

Results

Baseline variables of patients

A total of 76 patients were enrolled in the study. The patients were divided into a seamless care group and a control group using the random number table method.The seamless care group included 38 patients, aged 28 to 65 years, with a mean age of 53.21 ± 9.64 years. The gender distribution comprises 21 males and 17 females. The condition comprised 5 instances of duodenal tumors, 29 instances of pancreatic cancer, and 4 instances of pancreatic cysts. The control group comprised 38 patients aged 27 to 68 years, with a mean age of 53.52 ± 8.97 years. The gender distribution comprises 20 males and 18 females. The disease classification comprised 5 instances of duodenal tumors, 30 instances of pancreatic cancer, and 3 instances of pancreatic cysts. Qualitative and quantitative data of the 76 patients were statistically analyzed, as detailed in Table 1. The baseline parameters of both groups were comparable($P > 0.05$).

Comparison of pre-seamless care QOL scores between two groups

Table 2 indicates that an independent t-test revealed no significant differences between the two groups in terms of physiological domain, psychological domain, social domain, and environment domain prior to the nursing

Attribute	Intervention group (n = 38)	Control group (n = 38)	P-value
Sex			0.052
Male	21 (55.3%)	20 (52.6%)	
Female	17 (44.7%)	18 (47.4%)	
Age (years)	49.66 ± 10.35	51.42 ± 10.88	0.47
BMI (kg/m^2)	24.84 ± 2.00	25.22 ± 2.52	0.46
Smoking History			0.76
Yes	19 (50.0%)	18 (47.4%)	
No	19 (50.0%)	20 (52.6%)	
Alcohol History			0.22
Yes	24 (63.2%)	22 (57.9%)	
No	14 (36.8%)	16 (42.1%)	
Education Level			0.97
Elementary School	16 (42.1%)	14 (36.8%)	
Middle School	13 (34.2%)	13 (34.2%)	
High School	5 (13.2%)	8 (21.1%)	
University and above	4 (10.5%)	3 (7.9%)	
Disease Type			0.16
Pancreatic Cancer	29 (76.3%)	30 (78.9%)	
Duodenal Tumor	5 (13.2%)	5 (13.2%)	
Pancreatic Cyst	4 (10.5%)	3 (7.9%)	
Hypertension			0.1
Yes	21 (55.3%)	14 (36.8%)	
No	17 (44.7%)	24 (63.2%)	
Coronary Heart Disease			0.19
Yes	12 (31.6%)	7 (18.4%)	
No	26 (68.4%)	31 (81.6%)	
Diabetes			0.427
Yes	11 (28.9%)	8 (21.1%)	
No	27 (71.1%)	30 (78.9%)	

Table 1. Demographic characteristics of the two patient groups (mean ± SD).

Attribute	Intervention group (n = 38)	Control group (n = 38)	t-value	P-value
Physiological	65.25 ± 7.32	64.17 ± 6.97	0.326	0.719
Psychological	63.87 ± 5.15	62.36 ± 6.21	0.847	0.251
Social	66.18 ± 5.58	65.97 ± 6.37	0.325	0.764
Environment	66.45 ± 4.32	67.23 ± 4.21	- 0.103	0.918

Table 2. Comparison of pre-seamless care QOL scores between two groups (mean ± SD).

Attribute	Intervention group (n = 38)	Control group (n = 38)	t-value	P-value
Physiological	86.39 ± 8.17	71.67 ± 5.68	5.298	< 0.001
Psychological	86.61 ± 8.13	85.08 ± 8.67	0.867	0.219
Social	89.55 ± 7.92	87.86 ± 7.06	0.718	0.324
Environment	66.45 ± 4.32	67.23 ± 4.21	- 0.797	0.428

Table 3. Comparison of pre-discharge QOL scores between two groups (mean ± SD).

Complication	Intervention group (n = 38)	Control group (n = 38)	t-value	P-value
Postpancreatectomy hemorrhage	2 (5.26%)	3 (7.89%)	0.354	0.763
Delayed gastric emptying	1 (2.63%)	3 (7.89%)	0.257	0.819
Abdominal infection	2 (5.26%)	4 (10.53%)	0.497	0.624
Postoperative pancreatic fistula	1 (2.63%)	2 (5.26%)	0.514	0.527
Bile leakage	0 (0.00%)	1 (2.63%)	0.815	0.236
Chyle leakage	0 (0.00%)	0 (0%)	-	N/A
Total incidence rate	6 (15.79%)	13 (34.21%)	3.914	0.012

Table 4. Comparison of postoperative complications between two groups (n(%)).

Metric	Intervention group (n = 38)	Control group (n = 38)	$x^2 - value$	P-value
Time to first flatus (h)	25.67 ± 5.15	36.57 ± 7.28	7.083	< 0.001
Time to ambulation (h)	18.69 ± 3.67	19.37 ± 4.25	0.567	0.591
Postoperative hospitalization duration (h)	222 ± 71.28	304.08 ± 48.48	5.672	< 0.001

Table 5. Comparison of recovery metrics between the two groups.

intervention. This finding suggests that the groups had comparable quality of life scores prior to the intervention, with no notable discrepancies.

Comparison of pre-discharge QOL scores between two groups

Table 3 demonstrates substantial enhancements in physiological function and overall quality of life (QOL) for the intervention group relative to the control group ($P < 0.001$). No statistically significant differences were seen between the groups regarding psychological and social functions ($P > 0.05$). The significant improvements in physiological function and overall quality of life in the intervention group after the nursing intervention underscore the efficacy of the seamless care strategy in facilitating recovery. Despite the lack of statistical significance in the enhancements of psychological and social functions, the intervention nonetheless exerted a beneficial impact on the overall recovery process.

Comparison of postoperative complications between two groups

Table 4 illustrates that the occurrence of postoperative adverse events was markedly diminished in the intervention group compared to the control group, indicating the effectiveness of enhanced management measures during nursing or surgical procedures. Although no statistical significance was observed in specific categories of adverse events, the overall findings emphasize the importance of strengthened nursing interventions to reduce the occurrence of composite adverse events. These results support the efficacy of the seamless care strategy in decreasing the overall incidence of postoperative complications.

Comparison of recovery metrics between two groups

As illustrated in Table 5, the intervention group demonstrated significantly shorter postoperative exhaust time and hospitalization duration compared to the control group ($P<0.05$). However, no significant difference was

observed between the two groups in terms of outdoor activity time (P > 0.05).This demonstrates that seamless care contributes to early postoperative recovery.

Discussion

Laparoscopic pancreatoduodenectomy (PD) is a principal surgical intervention for addressing periampullary, distal common bile duct, and pancreatic neoplasms. Improvements in medical technology have markedly increased the safety of PD, resulting in a considerable decrease in surgical complications[14]. This advancement has redirected the emphasis of medical care from solely guaranteeing safe patient discharge to enhancing postoperative quality of life (QOL), which has emerged as a pivotal domain of surgical study[15]. Cloyd J.M's research demonstrates that seamless care modle play an important role in perioperative period.[16].

In general, the score of QOL ± 0.5 SD is regarded as clinically significant.[17]. In environmental domain, no significant within group differences were observed in our study(<0.5SD), which may due to external factors such the patient's socioeconomic status, educational attainment, and duration of medical treatment. The changes in physiology domain, psychology domain, and social domain have clinical significance (> 0.5SD). We found that the invention group exhibited significantly higher scores in physiological function and a lower incidence of postoperative complications. The disparities may arise from the meticulous preoperative evaluations and preparations conducted by the seamless care group, along with more extensive postoperative care, which enhances communication and collaboration among patients, families, and medical personnel. Furthermore, neither psychological nor social functioning shown statistically significant differences, which may due to the short-term QOL did not meet their preoperative psychological expectations. Additionally, the cost of surgery and the burden of postoperative rehabilitation may have exacerbated financial stress. However, studies have shown that patients are generally satisfied with their surgical decisions years after the procedure, with minimal regret about their choices[18]. A long-term follow-up may help researchers observe the changes. This result may also be influenced by individual differences in psychological resilience and pre-existing social support systems. The increasing trend in the psychological and social domains of patients with pancreatic cystic disease has been noted. If the sample size were larger or the follow-up period extended, these changes might reach statistical significance. In contrast, this trend was absent in patients with malignant tumours, indicating that this subgroup may necessitate more rigorous psychological interventions and a more extensive psychosocial support system. Future study ought to include prolonged follow-up evaluations and more systematic psychological support measures to more effectively examine the enduring effects of seamless care on mental health and social well-being.

In postoperative management, emphasis is placed on adjusting diet according to specific patient conditions, supplementing necessary nutrients, and formulating prevention measures for common complications[19]. Consistent suggestions for modest physical activity facilitate muscle repair and mitigate adverse effects[20]. Moreover, our results indicate that postoperative flatulence and length of hospital stay were considerably improved in the intervention group relative to the control group, highlighting the clinical advantages of seamless care. This strategy not only diminished the occurrence of adverse events but also expedited the recovery of gastrointestinal motility through methods such as balloon insufflation and gum chewing. Assisted by nursing personnel, suitable physical exercise expedited the restoration of bodily functions, hence reducing hospital durations. These results illustrate the efficacy of seamless treatment in accelerating the restoration of gastrointestinal function and physical capacities.

Dagorno's research has confirmed the advantages of LPD in reducing surgical trauma and enhancing long-term QOL[21]. The advantage of seamless care model is comprehensive preoperative preparation, encompassing tailored patient education, nutritional enhancement, and psychological support, improves patients' physiological resilience and mitigates perioperative stress response. Essentially, collaboration between nursing personnel and the surgical team during the procedure minimizes physiological changes during the surgical process, reducing the possibility of anastomotic leakage and abdominal infections[22,23]. Moreover, under the guidance of rehabilitation experts and nursing staff, early mobilization can promote intestinal movement, reduce the incidence of postoperative intestinal obstruction. In addition, multimodal analgesia and patient-controlled analgesia strategies can avoid excessive stress response. Providing psychological support is also beneficial in terms of dealing with postoperative anxiety and enhancing rehabilitation plan adherence. Future research should further quantify the contributions of each seamless component to the understanding of its effectiveness.

This study has several limitations. The relatively small sample size (n = 76) may limit the external validity of our findings. A bigger cohort is going to become the extra strong evidence, the bias was going to be reduced and the conclusions were assumed to become a lot more reliable. In future studies,larger sample size need to be recruited to validate the findings across heterogeneous patients and different healthcare settings. Another limitation is that no long-term follow-up was conducted, which is necessary to demonstrate the impact of seamless care models on postoperative quality of life and long-term complication rates. Long-term follow-up studies to evaluate late sequelae, functional recovery and quality of life will be needed in future studies. Confounding factors may also affect the results. Future research needs to use methods such as propensity score matching to control for confounding factors . Multi-center longitudinal studies are also necessary.

Conclusion

While limited by a relatively small sample size, short duration of follow-up and implications of external confounding, the results suggest that seamless care can be clinically advantageous in patients undergoing laparoscopic pancreatoduodenectomy. Postoperative recovery was faster, complication rates were lower and quality of life was improved overall - all underscoring the potential for this approach to optimize perioperative

management.Future investigations with larger cohorts, extended follow-up, and rigorous control of confounding variables are needed to better define the full impact of this approach.

Data availability

The data underlying this article cannot be shared publicly due to the privacy of individuals that participated in the study. The data will be shared on reasonable request to the corresponding author.

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Author contributions

All authors made substantial contributions to the study conception and design, and to acquisition, analysis and interpretation of data. All authors gave approval of the final version to be submitted.

Declarations

Competing interests

The authors declare no competing interests.

Additional information

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