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Research Article

Evaluation of Perioperative Nursing for Patients with Hepatobiliary Pancreatic Diseases Combined with Diabetes Mellitus Based on Multilayer Perceptron Neural Network

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Objective. To analyze the perioperative nursing methods for patients with hepatobiliary pancreatic diseases combined with diabetes mellitus and to evaluate the differences in nursing methods based on a multilayer perceptron (MLP) neural network. *Methods*. 80 patients with hepatobiliary and pancreatic diseases complicated with diabetes admitted to our hospital from January 2021 to January 2022 were selected as subjects. According to different nursing methods, two groups of hepatobiliary and pancreatic diseases with diabetes were randomly divided into the control group and the experimental group, 40 patients in each group, two groups were given routine nursing care, and the experimental group was given perioperative nursing intervention on the basis of routine nursing. The fasting blood glucose (FBG), postprandial two-hour blood glucose (2hPG), and glycosylated hemoglobin (HbA1c) index of two groups of patients with hepatobiliary pancreatic diseases and diabetes mellitus were observed and compared. The incidence of postoperative complications, the average hospitalization time of patients, and the clinical nursing satisfaction rate of patients were observed and compared. *Results*. The blood glucose level including FBG, 2hPG, and HbA1c in the experimental group were better than those in the control group, and the data comparison difference was statistically significant ($P < 0.01$). The incidence of postoperative complications in the experimental group was lower than that in the control group, and the data comparison difference was statistically significant ($P < 0.05$). The discharge time of patients in the experimental group was significantly shorter than that in the control group, and the satisfaction rate was significantly higher than that in the control group ($P < 0.05$). The comprehensive analysis based on MLP neural network model confirmed that perioperative surgical nursing can improve the treatment effect of patients. *Conclusion*. In the perioperative period of patients with hepatobiliary and pancreatic diseases combined with diabetes, the implementation of comprehensive and comprehensive nursing intervention will help to improve the effect of surgical treatment and postoperative recovery.

1. Introduction

Diabetics usually associate with other diseases (hepatobiliary stones or pancreatic tumors) [1]. In recent years, the incidence rate of diabetes and liver, biliary, and pancreatic diseases is higher. Hepatobiliary pancreatic diseases mainly refer to diseases related to the gallbladder, liver, and pancreas in clinic. They are more common in surgery, and there are many kinds, which makes nursing difficult. The most common hepatobiliary and pancreatic surgical diseases include liver cancer, liver cirrhosis, cholecystitis, gallstones, pancreatitis, and pancreatic tumors. In the clinical treatment of hepatobiliary and pancreatic diseases, drug treatment or surgical treatment can be adopted. Drug therapy is mainly used as a conservative treatment to improve the clinical symptoms of patients and control the progress of the disease. However, the effect of therapeutic drugs is relatively limited and it is difficult to cure the disease fundamentally. The application of surgical methods can directly remove the lesion tissue, thereby achieving the purpose of radical disease cure. However, the surgery is more complex, difficult, and risky, so higher requirements are put forward for the way

of perioperative nursing intervention. Despite advances in patient selection and surgical techniques, the incidence of perioperative complications after pancreatectomy is still high, about 30%-40% [2, 3]. Studies have shown that targeted care during the perioperative period of diabetic patients can improve the patient's psychological state and reduce the occurrence of complications [4, 5]. In this study, 80 patients with hepatobiliary and pancreatic diseases combined with diabetes mellitus who will be admitted to the hospital in January 2021 and January 2022 were the research objects. Combined with the comprehensive evaluation function of the neural network model, the perioperative nursing effect of patients with hepatobiliary and pancreatic diseases combined with diabetes mellitus was analyzed.

The multilayer perception (MLP) model is an important nonlinear multifactor evaluation method and one of the most widely used artificial neural network models [6]. Compared with the single-layer perceptron, which only has the ability to classify linear tasks, the multilayer perceptron artificial neural network has a complex structure and is suitable for solving practical problems. The MLP neural network model is an objective and comprehensive method for evaluating and comparing drug efficacy. Compared with single-layer perceptual neural network, MLP is more suitable for medical data analysis to solve complex linear and indivisible multiclassification problems. For example, MLP combined with artificial neural network (ANN) model can be used to evaluate the efficacy of drugs [7]. The MLP model can also be used for the diagnosis of glomerular filtration rate in patients with polycystic kidney disease and to help judge the progression of the disease [8]. In recent years, MLP has been widely used to predict liver cirrhosis, hypertension, and other diseases [9, 10]. Therefore, we constructed the MLP–ANN model to evaluate the importance of relevant parameters and the effect of perioperative nursing.

2. Materials and Methods

2.1. Research Object and General Information.
A total of 80 patients with hepatobiliary and pancreatic diseases combined with diabetes were selected as the research subjects, including 33 patients with acute severe pancreatitis, 21 patients with hepatic cyst, 15 patients with cholelithiasis, and 11 patients with cholecystitis. This experiment has been approved and agreed by the Ethics Committee of the First People's Hospital of Lianyungang City, Jiangsu Province, and all patients have obtained their informed consent. According to different nursing methods, the two groups of patients with hepatobiliary and pancreatic diseases combined with diabetes were randomly divided into a control group and an experimental group, with 40 patients in each group. Inclusion criteria: all patients were confirmed as hepatobiliary and pancreatic diseases complicated with diabetes by preoperative examination, without other serious heart, liver, or renal insufficiency, and without surgical contraindications. If the patient is delirious, or the treatment does not cooperate, it is excluded.

In the control group, there were 23 male patients and 17 female patients with hepatobiliary and pancreatic diseases combined with diabetes, aged between 51 and 72 years old, with an average age of 62.41 ± 4.63 years old, and the disease course of the patients was 1 to 8 years (6.90 ± 2.06 years). Among them, there were 17 patients with acute severe pancreatitis, 10 patients with liver cyst, 7 patients with cholelithiasis, and 6 patients with cholecystitis. In the experimental group, there were 21 male patients and 19 female patients with hepatobiliary and pancreatic diseases combined with diabetes, aged between 49 and 70 years old, with an average age of 60.50 ± 4.83 years old, and the disease course of the patients was 1 to 9 years (6.16 ± 2.25 years). Among them, there were 16 patients with acute severe pancreatitis, 11 patients with liver cyst, 8 patients with cholelithiasis, and 5 patients with cholecystitis. There was no significant difference in age, gender, course of disease, and other clinical data between the two groups of patients with hepatobiliary and pancreatic diseases combined with diabetes mellitus ($P > 0.05$), which were not comparable (Table 1, $P > 0.05$).

2.2. Nursing Methods.
The control group received routine nursing, measured and recorded the patients' blood pressure, heart rate, and blood oxygen saturation, and guided the patients to participate in various preoperative examination activities. The comprehensive group implemented comprehensive nursing, and the specific methods were as follows.

Preoperative nursing: (1) psychological nursing: introduce the value of surgical treatment and successful treatment cases to patients before operation. Actively communicate with patients, explain the general process of operation and matters needing attention for patients, and alleviate the anxiety of patients. (2) Diet nursing: pay attention to diet matching before operation. You can eat some foods with high fiber, low fat, and high protein.

Intraoperative nursing: during the operation, carefully check the surgical instruments and cooperate with doctors to carry out surgical treatment activities. Accompany patients throughout the process, guide them, and encourage them. The blood glucose level should be recorded every 4 h during the operation to ensure the orderly operation.

Postoperative care: (1) complication care: anti-infective treatment and cleaning care should be done after surgery, regular monitoring of the patient's body temperature, heart rate, etc., and an ECG monitor should be set at the bedside. If the patient has any adverse reactions, the clinician needs to be notified immediately. Pay attention to the condition of the drainage tube to avoid problems such as bending and compression of the drainage tube. Regularly replace the drainage bag for the patient, and guide the patient to turn over once every 2 h to avoid the occurrence of pressure ulcer. (2) Diet nursing: take liquid food three days after operation. With the improvement of the patient's physical state, you can eat semiliquid food, gradually change the diet, and pay attention to the nutritional matching.

2.3. Observation Indicators.
The indexes of FBG, 2hPG, and HbA1c in the two groups, the incidence of postoperative

Table 1: Comparison of general data of patients.

	Experimental group ($n = 40$)	Control group ($n = 40$)	T/χ^2	P
Gender (n, %)			0.2020	0.6531
Man	23 (57.5%)	21 (52.5%)		
Female	17 (42.5%)	19 (47.5%)		
Age ($\bar{x} \pm s$)	62.41 ± 4.63	60.50 ± 4.83	3.2645	0.2829
Disease course ($\bar{x} \pm s$)	6.90 ± 2.06	6.16 ± 2.25	2.3781	0.3784
Complication (n, %)			0.2355	0.9717
Severe acute pancreatitis	17 (42.5%)	16 (40%)		
Liver cyst	10 (25%)	11 (27.5%)		
Cholelithiasis	7 (17.5%)	8 (20%)		
Cholecystitis	6 (15%)	5 (12.5%)		

Table 2: Comparison of blood glucose indexes in patients ($\bar{x} \pm s$).

	Case	FBG (mmol/L)	2hPG (mmol/L)	HbA1c (%)
Experimental group	40	6.96 ± 0.70	8.59 ± 0.87	6.80 ± 0.71
Control group	40	8.37 ± 0.75	11.63 ± 1.06	8.31 ± 0.79
t		0.2649	0.6348	0.2844
P		<0.01	<0.01	<0.01

Table 3: Comparison of average length of stay of patients ($\bar{x} \pm s$).

	Case	Average length of stay (days)
Experimental group	40	5.40 ± 0.89
Control group	40	8.63 ± 0.69
t		0.5724
P		<0.01

complications, the length of hospital stay, and the satisfaction rate of clinical nursing are the indicators.

2.4. Construction of MLP Neural Network. MLP is one of the most widely used artificial neural network models, which has good nonlinear system modeling ability [11]. The MLP neural network is composed of multilayer nonlinear neurons (also known as nodes), which is divided into three parts: the input layer composed of a group of source nodes, the implicit layer of one or more layers of computing nodes, and the output layer of one layer of computing nodes. The input vector enters each node of the first hidden layer, and then, the output of the first hidden layer node is sent to the neurons of the second hidden layer until the output. In order to establish an effective MLP model, 80% of the data was used as the training set to optimize the characteristics of the model, and then, use 20% of the data as the test set to evaluate the generalization ability. Finally, the MLP neural network model was established by blood glucose level, patient age and course of disease, satisfaction rate, complication rate, and other related indicators.

2.5. Statistical Analysis. SPSS 20.0 was used for analysis, $\bar{x} \pm s$ refers to the measurement data, and the comparison between groups is subject to t-test; the count data was represented by %, and the comparison between groups was performed by the χ^2 test. $P < 0.05$ was considered statistically significant. The comprehensive analysis adopts MLP neural network analysis.

3. Results

3.1. Comparison of Blood Glucose Indexes in Patients. All 80 patients underwent successful operations. The patients who received perioperative care (experimental group) had better blood glucose levels (FBG, 2hPG, and HbA1c) than those who received traditional care (control group), and the difference was statistically significant ($P < 0.01$); the results are shown in Table 2. It shows that giving perioperative care to patients with hepatobiliary and pancreatic diseases combined with diabetes can improve the therapeutic effect of patients.

3.2. Comparison of Average Length of Stay of Patients. After nursing, the average hospitalization time of hepatobiliary and pancreatic diseases with diabetes in the experimental group was 5.40 ± 0.89 d, and the average hospitalization time in the control group was 8.63 ± 0.69 d (Table 3, $P < 0.01$).

3.3. Comparison of Postoperative Complications. There were 2 cases of incision infection, 4 cases of pressure sore, and 3 cases of pulmonary infection in the control group, and the complication rate was 22.5%. There were 1 case of incision infection, 2 cases of pressure sore, and 0 cases of pulmonary infection in the experimental group, and the complication rate was 5%, which was significantly lower than that in the control group. The difference between the groups was statistically significant (Table 4, $P < 0.05$).

3.4. Comparison of Clinical Nursing Satisfaction Rate of Patients. The overall nursing satisfaction rate was 80% in the control group and 95% in the experimental group (Table 5, $P < 0.05$). It shows that perioperative surgical nursing can improve the clinical nursing satisfaction rate of patients.

TABLE 4: Comparison of postoperative complications (n, %).

	Incision infection	Pressure sore	Pulmonary infection	Complication rate
Experimental group ($n = 40$)	1 (2.5%)	1 (2.5%)	0 (0)	2 (5%)
Control group ($n = 40$)	2 (5%)	4 (10%)	3 (7.5%)	9 (22.5%)
χ^2				5.1647
P				0.0231

TABLE 5: Comparison of clinical nursing satisfaction rate of patients (n, %).

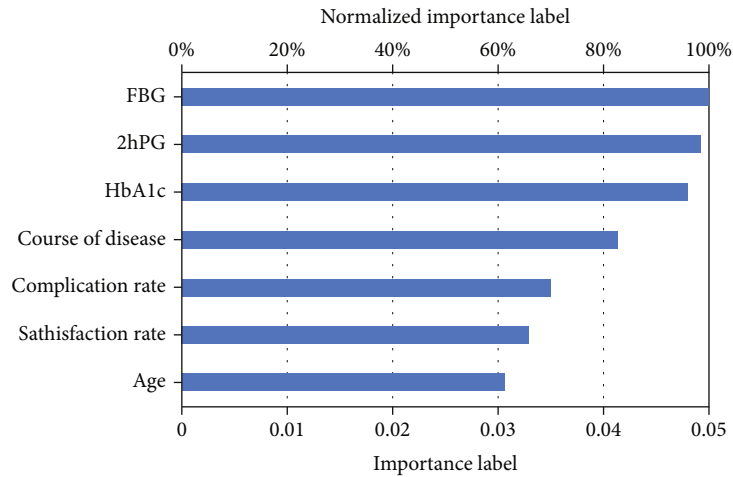|	Satisfied	Basically satisfied	Dissatisfied	Satisfaction rate
Experimental group ($n = 40$)	31 (77.5%)	7 (17.5%)	2 (5%)	38 (95%)
Control group ($n = 40$)	10 (25%)	22 (55%)	8 (20%)	32 (80%)
χ^2				4.1143
P				0.0425

FIGURE 1: Importance analysis of MLP input variables.

3.5. Evaluation of Perioperative Nursing Effect Based on Neural Network Model. We use a three-layer neural MLP neural network model: taking the above factors as input layer, hidden layer, and output layer (average hospital stay). We evaluated and compared the comprehensive effects of perioperative nursing and traditional nursing according to MLP neural network model. The average hospital stay of perioperative nursing patients was 5.12 ± 0.68 days and that of traditional nursing patients was 9.24 ± 0.72 days, indicating that perioperative nursing can achieve better results ($P < 0.01$). According to the influence degree of input indexes on the network, FBG, 2hPG, and HbA1c are more important influencing factors in the neural network model (Figure 1).

4. Conclusion

Diabetes mellitus is a disease with a high clinical incidence, and hyperglycemia is its main clinical feature. In clinical treatment, the operation of hepatobiliary and pancreatic dis-

eases is more complicated, and the symptoms of diabetic patients further increase the difficulty of surgical treatment. Therefore, it is particularly important to do a good job of preoperative, intraoperative, and postoperative nursing measures during the operation.

In this study, traditional nursing care was given to some patients with hepatobiliary and pancreatic diseases combined with diabetes, mainly including maintaining the balance of electrolytes and H_2O in the body, controlling the blood sugar level in the body, ensuring the life safety of the patients during the perioperative period, and avoiding the sudden occurrence of blood sugar in the patients. It is too high and has an impact on the operation, but it ignores the psychological impact of the disease on the patient. Due to the lack of awareness of the disease and the operation, the patient will be suspicious when receiving drug or surgical treatment, resulting in reduced compliance. Not only is it beneficial to surgical treatment, but it is also not conducive to subsequent nursing care. In addition, medical staff did not specifically control the blood glucose in the patient's

body according to the patient's physical condition, resulting in poor nursing effect.

Perioperative nursing can control the blood glucose of patients, ensure the life safety of patients during perioperative period, and avoid the failure of operation caused by the sudden rise of blood glucose during operation. Psychological nursing for patients can make patients clearly know their condition and the importance of surgery, eliminate patients' unrealistic fantasy, improve patients' desire for survival, and make patients more cooperate with doctors and nurses in treatment and nursing. It can not only improve the psychological state of patients before operation but also improve the recovery of patients after operation [12]. However, the lack of knowledge about diabetes and the prevention and treatment of diabetes caused the poor compliance of diabetes treatment. The diabetes-related knowledge defect is relatively large in the elderly with special educational background and middle age without spouse and with a low education level and family history without diabetes [13]. This study shows that education through disease knowledge and medication knowledge can improve patients' understanding of diabetes and help patients adjust their lifestyle to a certain extent, thus improving blood sugar control level. Literature review found that most of the studies in the same period focused on the role of self-management education in patients' life and surgical prognosis [14, 15], but there were few studies on the impact of perioperative nursing on patients. In this study, the perioperative nursing of patients was studied, highlighting the importance of perioperative nursing for patients' intraoperative life safety and postoperative recovery.

Psychological problems related to long-term disease are another important factor affecting the treatment of diabetes. Investigations show that the incidence of psychological distress related to diabetes for 18 months is 38% to 48%, which affects the treatment compliance, self-management behavior, and blood sugar control of diabetic patients to varying degrees [16]. And studies on hospitalized diabetic patients show that different degrees of psychological distress are common in newly hospitalized diabetic patients. Therefore, it is possible to start with health education, improve patients' awareness of the disease, eliminate unnecessary fear and rejection, let patients treat diabetes with a positive attitude, reduce psychological pain, and naturally improve the treatment effect.

In our study, the accuracy between experimental data and MLP prediction is very high (100%). We found that FBG, 2hPG, and HbA1c were more important influencing factors in the neural network model, which were closely related to the length of hospital stay after nursing. In this study, only FBG, 2hPG, and HbA1c were counted, and the data were few. In the follow-up, further statistical analysis of inflammatory indicators and nutritional indicators after diabetes surgery will be conducted to further verify the importance of perioperative nursing. The MLP neural network has great application and development prospects in the future, so we can make more reasonable judgments and decisions on the diagnosis and treatment of diseases by predicting the results. The MLP neural network can also be used to predict the therapeutic effect of perioperative nursing on other diseases.

Data Availability

All data are publicly available and available from the corresponding author.

Conflicts of Interest

The author declares that there is no conflict of interest regarding the publication of this paper.

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