

# Application of Multi-team Blood Glucose Management Model in Perioperative Period of General Surgery Patients

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**Abstract: Objective:** In order to explore the application effect of blood glucose management mode of multi-team cooperation in perioperative period of general surgery patients. **Methods:** The perioperative blood glucose control of 94 patients undergoing surgical treatment in general surgery from January 2016 to March 2019 was reviewed by Non-synchronous. According to the perioperative blood glucose management model of multi-team cooperation, the patients were divided into intervention group and control group. From January 2016 to January 2018, 64 patients who did not implement the multi-team blood glucose management model were the control group and from February 2018 to March 2019, 30 patients who implemented the multi-team blood glucose management model were the intervention group, compared with two groups about the differences in perioperative blood glucose. **Results:** It is not statistically significant about two groups in highest and lowest blood sugar levels under fasting status; during the fluid diet the blood sugar level of the intervention group was lower than control group ( $P < 0.05$ ), and when the patients were in the semi-fluid or food-feeding period, the highest and lowest blood sugar level is that the intervention group was lower than control group ( $P < 0.05$ ). The time of the blood sugar reaching the standard, the coincidence of complications rate and average hospitalization days in the intervention group were particularly lower than control group ( $P < 0.05$ ). **Conclusion:** If we adopt multi-team blood glucose management model can better control the perioperative blood glucose of patients

undergoing general surgery.

**Key words:** Multi-team blood sugar management model; Patients undergoing general surgery; Effect evaluation.

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## 1 Introduction

Diabetes mellitus is a common complication disease in patients with general surgery. Under the stress of anesthesia and operation, diabetes mellitus patients can cause increased secretion of adrenaline, norepinephrine, glucocorticoid and other hormones under stress conditions such as anesthesia and surgery, increase blood sugar, the acute complications of diabetes mellitus and then leads to the decrease of anti-infectious power, poor wound healing and secondary wound infection. Therefore, one of the key factors for success or failure of surgery is that perioperative safety and effective regulation of blood glucose. At present, the main way of regulating blood sugar during perioperative period is the traditional subcutaneous insulin injection, and the utilization rate of insulin pump is not high. Insulin pump uses artificial intelligence to continue low dose subcutaneous insulin infusion, which simulates the physiological secretion mode of insulin and is the best way to control blood glucose. This paper collected the clinical data of 94 patients with diabetes

mellitus who underwent surgery in general surgery by non-synchronous control method from January 2016 to March 2019, the result of explore the multi-team blood glucose management model is better than traditional subcutaneous insulin injection management model, the report is as follows:

## 2 Objects and methods

### 2.1 General information

Collecting the perioperative data of 94 patients from January 2016 to March 2019, who received surgical treatment with diabetes, and from January 2016 to March 2018, 64 patients who did not implement the multi-team collaborative blood glucose management model as the control group, Among them, 1 case of gastric tumor, 19 cases of intestinal surgery(including radical resection of colorectal cancer), 13 cases of liver tumor operation, 27 cases of bile duct operation(including bile duct tumor)and 4 cases of pancreatic tumor operation. From February 2018 to March 2019, 30 patients with

multi-team blood glucose management model were intervention group, including 2 cases of gastric tumor surgery, 19 cases of intestinal surgery(including radical resection of colorectal cancer), 3 cases of liver tumor operation, 5 cases of bile duct operation(including bile duct tumor) and 1 case of pancreatic tumor operation. It was no significant difference in gender, age, type of disease, course of diabetes mellitus and surgical methods between the two groups patients( $P>0.05$ ), and it is comparability between the two groups patients. The baseline data of the two groups were shown in Table 1. All the patients in the study met the 1999 World Health Organization(WHO)criteria for the diagnosis of diabetes, and met the guidelines for the treatment of insulin pump in China(2010)<sup>[4]</sup>. indications for short-and medium-term insulin pump treatment: Perioperative blood glucose control in diabetic patients; Blood glucose control in patients with stress hyperglycemia. Novotel was selected as the drug, and during perioperative insulin therapy all oral hypoglycemic drugs were stopped.

**Table 1.** Comparison of baseline data for both groups

Group	Age	History of diabetes mellitus (year)	BMI (kg/m <sup>2</sup> )	Random blood sugar before treatment(mmol/L, $\bar{x}\pm s$ )	Sex(%)	
					Man	Woman
<b>Cotrol group</b>	64.97±10.37	6.84±5.57	23.70±4.31	15.26±4.98	42(66)	22(34)
<b>Observation group</b>	63.25±9.76	6.02±5.13	22.57±3.60	13.89±3.99	14(47)	16(53)
<i>t/χ<sup>2</sup></i>	0.780	0.699	1.250	1.184	3.084	
<b>P value</b>	0.437	0.486	0.214	0.241	0.081	

### 2.2 Method

#### 2.2.1 Control Group

The general sugary department submitted an application for blood glucose consultation to the endocrine department and gave the perioperative treatment plan. The doctor in the department of the patients adjusts the blood glucose of the patients by himself every day; The doctor in charge of department comprehensively evaluates. If the blood glucose of the patients is still not well control after a few days ago by routine treatment. Consult the endocrine doctor to make some adjusts the dose of insulin.

Nursing Management: The responsible nurse are responsible for the monitoring and management of blood glucose on the same day, according to the doctors

orders to injecting insulin, Monitoring the blood glucose 8 times (before and after three meals, before sleep and at 3:00 *a.m.*) and feedback the abnormal blood glucose in time. Pay attention to the pre-meal insulin injection and eating about patients, avoid the mission and error and insulin injection. Make the insulin injection and drug knowledge education well, and help patients to injection insulin in time. The changes of blood glucose during fluid, half-current and general diet were observed. The wound healing after operation and occurrence of other complications should be observed.

#### 2.2.2 Intervention Group

To adopt the multi-team management model of blood glucose, including the endocrine specialist team, the

surgeon, the diabetes specialist, the diabetes contact nurse of each department, other non-endocrinology staff, the nutritionist and so on. The multi-disciplinary collaborative process between the general surgery and endocrinology glucose management team is as follow: Call the blood sugar management team with a special 24-hour contact phone, and open a consultation of doctors folder and put it into medical record, and the doctors of the blood glucose management team will be consult in time, and notify the nurse of the tube pump. On the first of day pump, endocrinologists and general surgeons communicate and discuss with each other, individualized blood sugar program for patients, endocrine doctor, the diabetes special nurse to conduct general surgeons` pump patrol every daily morning. During insulin pump treatment to understand the fluctuation od blood glucose in time. The doctors and nurse in the general sugary department are responsible for blood sugar observation and communication of special disease conditionate diabetes liaison nurse in the department communicate by WeChat; The nutritionists are responsible for the dietary all location of each other patients during perioperative period.

**Nursing Intervention:** The responsible nurse should obey doctors` instructions to monitor patients` blood glucose, monitor the blood sugar value 8 times(before and after three meals, before sleep and at 3:00 *a.m*) report abnormal blood sugar value to J endocrinologist in time and cooperate with the treatment to prevent the occurrence of hypoglycemia. Pay attention to patients` pre-prandial insulin injection and food intake to avoid the omission and error of insulin injection. Responsible class inspects the operation status of insulin pump, the patency of infusion pipeline and the skin of puncture point of patients, and communicates with the nurse of Endocrinology Department in time to solve the trouble when they encounter abnormal situations (insulin pump alarm, pipeline falling off, *etc.*). Pay attention to the special inspect about patients, for example magnetic resonance imaging (MRA, DWI, *etc.*), PET-CT, CT, hyperbaric oxygen chamber, surgery, bathing and other examinations before treatment, need to separate insulin pump. Insulin pump in placed in the treatment room and handed over strictly. The insulin pump was reconnected after the patient returned. Pay attention to the patient`s dynamic state, before discharge or

sudden death, communicate with endocrinologist in time and stop insulin pump treatment. After patients stop insulin pump treatment and change other treatment schemes, they should do a good job in educating insulin injection and drug knowledge, and timely conduct patient directed injection. Observing the changes of blood sugar during fasting, fluid intake, half-current and general diet. To observe the wound healing after operation and the occurrence of other complications.

## **2.3 Evaluating Indicator**

### **2.3.1 Metabolic Index**

During different dietary structures the highest and lowest blood sugar levels of patients underling surgical treatment in general surgery were collected by the responsible nurses through the bedside fingertip blood. The aim of the perioperative blood glucose control is to adopt the newly published in August 2017“China Standards for Nursing Management of Insulin Pump Therapy”.In china adult patients hyperglycemia management goal is: selective large and medium-sized surgery: fasting blood glucose or pre-meal blood glicose:8-10mmol/L; 2 hours postprandial blood glucose or blood glucose at any time when unable to eat:8-12 mmol/Lit can be relaxed to 13.9 molly under special circumstances.

### **2.3.2 Blood glucose management effect index**

During different dietary structure the highest and lowest values of blood glucose, the time of blood glucose reaching the standard, the dosage of insulin, the frequency of blood glucose monitoring and the number of hypoglycemia occurred.

The incidence of postoperative complications, incision infection rate and average hospiatlization days.

### **2.3.3 Statistical Method**

SPSS16.0 software package was used for statistical analysis. The general data of the two groups were analyzed by  $\chi^2$  testst to determine whether they were comparable. The measurement data adopt ( $x \pm s$ ) expressed, paired T test was used to cpmpare the two groups before and after observation, two independent samples T test was used to compare the two groups, and  $\chi^2$  tests were used to compare the counting data.  $P > 0.05$  was statistically significant.

### 3 Result

#### 3.1 Comparison of perioperative blood glucose management between the two groups

**Table 2.** Comparison of perioperative blood glucose fluctuation in patients with general surgical diabetes(mmol/L,  $x\pm s$ )

Group	Number of cases	Abrosia		Fluid		Semifluid/General Food	
		Lowest blood glucose	Hihest Blood glucose	Lowest blood glucose	Hihest Blood glucose	Lowest blood glucose	Hihest Blood glucose
Control Group	64	9.98±2.79	15.51±4.66	9.96±2.85	16.40±4.50	8.70±2.25	15.29±3.77
Observation Group	30	8.84±3.18	16.47±5.66	6.92±2.61	15.06±3.99	5.60±1.31	12.75±4.59
<i>t</i>		1.549	0.724	4.422	1.254	5.647	2.230
<i>P</i>		0.128	0.472	0.000	0.215	0.000	0.024

**Table 3.** Comparison of perioperative blood glucose management in patients with diabetes mellitus in general surgery

Group	Number of cases	Postoperative blood glucose		Insulin	Blood glucose monitoring	Hypoglycemia
		Time of Achieve the Standard (d)	Dosage( $\mu$ /d)	Frequency Measurement	Number of cases	
Control Group	64	6.75±4.14	19.08±10.61	2.65±1.30	6(9)	
Observation Group	30	3.14±2.13	24.02±9.94	7.95±0.22	11(37)	
<i>t/\chi<sup>2</sup></i>		3.815	1.959	18.44	10.270	
<i>P</i>		0.000	0.054	0.000	0.001	

**Table 4.** Comparison of perioperative complication and average hospital days of diabetes of patients in general surgery

Group	Number of cases	Incisiona infection	Pleural effusion	Pulmonary infection	Abdominal abhesions	Lower extremity venous thrombosis	total	Average days of hospitalization after operation
		Rate(%)	Rate(%)	Rate(%)	Rate(%)	Rate(%)	Case(%)	(Day)
Contral Group	64	3(5)	2(8)	1(2)	1(2)	1(2)	8(12.5)	9.77±7.113
Observation group	30	0	0	1(3)	0	0	1(3)	13.30±10.47
<i>t/\chi<sup>2</sup></i>		0.332	0.045	0.000	0.000	0.000	1.065	1.920
<i>P</i>		0.565	0.832	1.000	1.000	1.000	0.302	0.048

#### 4 The necessity of Collaboration of Glucose Management Team in Endocrinology Department for Patients with Digestive Tract Diseases in General Surgery

In recent years, with the increasing prevalence of diabetes year by year, the disease of the general surgical digestive system has gradually increase, also. Because surgical and anesthetic stimulation can make it in a statue stress, while hepatocytes and other organs use glucose restriction, there is insulin resistance. And a number of patients with gastrointestinal tumors after operation need parenteral or nutritional support. During the intravenous infusion of parenteral nutrition solution, hypertonic glucose can cause hyperglycemia,

hypertonic diuresis, dehydration and even kenotic coma. Therefore, it is key to treatment to strict control of blood sugar during the perioperative period. The blood sugar fluctuation is more obvious, based on the special dietary structure of general surgery, especially after digestive tract surgery. In the traditional general surgery, the general surgery procedure of general surgery is to consult the endocrinology department, and the mediation scheme can be adjusted by itself, and the effect is not good.

The main problem: The factor in the general surgeon are: different doctors have different ways to regulate the use of insulin dosage, and there is no uniform standardization. At the same time, the scheme provided by the endocrinology consultation cannot be adjusted in

time, according to the development of the condition and the fluctuation of the blood glucose. The factors in the surgical are: the relatively lack of the individual blood glucose of the patient is not clear, and in the process of the treatment patients with high or low blood glucose lacks the ability of critical thinking of professional departments, it is more manifested in passive execution of doctors' orders. The factors in the treatment of diabetic patients are: Pay no attention to diabetes. The subjective performance is that there is no need to stress over-attention, missed injection, refused injections and refused to take drugs are common phenomenon, injection sit dose not strictly implement the principle of rotation and so on. Recently years, the studies of Zhou Y *et al*<sup>[1]</sup> has explored the multi-disciplinary blood sugar, management model, and advocated that the multi-disciplinary, cooperation model led by the endocrinology department help to manage the blood glucose of perioperative patients better. Through regular training, the multi-disciplinary, cooperative blood glucose management team can improve the perioperative blood glucose management ability of non-endocrine medical staff, and make good mobile of the enthusiasm of nursing staff in perioperative education, insulin be used and management in hyperglycemic. And then improve the knowledge of diabetes and treatment compliance of non-endocrine patients.

Effectiveness of blood glucose management model with collaboration of blood glucose management team in endocrinology department during the perioperative period.

According to results showing in Table 2, During fasting, it was no significant in blood sugar fluctuation; During fasting, the lowest blood glucose was (6.92±2.61)

mmol/L in the observation group and (9.96±2.85) mmol/L in the control group. The lowest blood glucose value in the observation group was lower than control group it was significant to make statistics( $P>0.05$ ). During semi-fluid and general feeding, the lower blood glucose in observation group was (5.60±1.31) mmol/L and the highest was (12.75±4.59) mmol/L and the lowest blood glucose in control was (8.70±2.25) mmol/L the highest was (15.29±3.77) mmol/L the lowest and the highest blood glucose in observation all under control group, the difference is of statistical significance( $P>0.05$ ).

The result show in Table 3, the time of blood

glucose reaching the standard in the observation group was faster than that in the patients with general surgical diseases after operation, it was significant to statistical( $P>0.05$ ). The reason for the analysis are as follows: The fluctuation of blood glucose after operation is close related to the adjustment of diet structure of patients with general surgical diseases, the recovery of diet from fluid and semi-flow to general diet in patients with fasting after operation is changed gradually intestinal leakage, bile leakage, pancreatic leakage, bleeding and other complications, in the polarization solution group, the dosage of insulin was insufficient, the blood glucose fluctuated greatly and the control was not good. Through the guidance of the assistance mode of the blood glucose management team of the endocrinology department, setting an individual blood glucose to control the blood glucose. According to the change of condition and structure the day to make some communication, the scheme of insulin to adjust, the frequency of monitoring the blood glucose was increased, the amplitude of the blood glucose fluctuation can be reduced, the time for reaching the standard after the operation is more rapid than control group. This is consistent with the result of Xu Jingling the same time, the results of Table 3 also showing that, the number of the case about hypoglycemia in the observation group was higher than control group. The causes of the analysis were as follow: control group hypoglycemia in 6 and observation group hypoglycemic in 11 cases occurred after operation, the change of the diet structure after operation in general surgery<sup>[1-10]</sup>. (fast-flow-feeding-half -filo-predict); postoperative wound pain resulted in the occurrence of hypolipidemia. The non-endocrine health care personnel have the awareness of the blood glucose awareness bad management, and the importance of the low blood glucose is deficient, and the non-endocrine health care personnel are not communicated with the internal secretion department blood glucose management team in time for temporary changes of the patient's condition (such as digestive tract bleeding, the need for fasting, the case of the somatostatin od insulin still maintains the original protocol and leads to hypoglycemia. Therefore, the multi-disciplinary team must pay more attention to postoperative hypoglycemia, communicate with the supervisor in time, analyze the reason why was occurred. improve the continuous quality, and reduce the incidence of hypoglycemia. For example: the scheme was given after operation the day-of-day, the patients

was informed that the patients in the hospital bed and the poor in the stomach were pumping the dose before adjusting the insulin meal. Before the meal, according to the doctor's orders, all the patients were pumped with the insulin, half the dose of insulin was pumped into half the diet, less than 1/3 was not pumped temporarily, and observe blood glucose after meal in 2 hour, and the insulin was added temporarily. At the same time, it is also reminded that the next step of the team should continue to strengthen the professional knowledge of endocrine and blood glucose management of non-endocrine medical staff (prevention of hypoglycemia<sup>[11]</sup>, frequency of monitoring blood glucose, perioperative diet management, dialy management of common problems of insulin pump, *etc.*) and skills training<sup>[12-16]</sup>. The number of complications in the observation group was lower than control group, and the frequency of blood glucose monitoring in the observation group was higher than control group ( $P < 0.05$ ).

The results of Table 4 show that the average postoperative hospitalization days in the observation group were significantly lower than control group ( $P > 0.05$ ). Analysis of the reasons: non-specialists are often unable to manage patients' blood glucose professionally, most of the patients new detect blood glucose when the body appears untimely, or monitor blood glucose only during medical treatment or perioperative period. Doctors hope that blood glucose can reach the standard as soon as possible in the perioperative department and wound healing after complicating a word there are more postoperative complications in patients with diabetes<sup>[17]</sup>. excessive blood glucose can increase the probability of postoperative infection and delay wound healing. Therefore, we will seek the cooperation of endocrine professional blood glucose management team to carry out hospital blood glucose management, provide personalized blood glucose control program for patients, find that patients and their families correct the defects of diabetes militiaman reach the target value of perioperative blood glucose as soon as possible, which of the great help to the control of diabetes militiaman also improve the blood glucose management ability of non-professional blood glucose management medical staff. Therefore, insulin pump can control hyperglycemia in perioperative diabetic patients faster and more smoothly, and can reduce postoperative complications<sup>[18]</sup>.

All in all, the blood glucose of the management

team of endocrinology department and the treatment of insulin management by implementing, pay more attention to management, the time shorter about blood glucose with patients, the frequency of blood glucose monitoring in increased, the general surgery department has increased the management awareness of the blood glucose management of diabetes, and it is more and more standard in management. There are endocrine medical beds to guide diet and control of blood glucose every day, endocrine medical and general surgery doctors and nurse cooperate to management patient's blood glucose, improve doctors and nurse communicate and interaction, reduce the risk of the hyperglycemia, reduce the fluctuation of blood glucose<sup>[19-20]</sup>, shorten the average post operation hospitalization days, reduce the postoperative wound infection rate, thus reducing the hospitalization expenses of patients, at the same time, improve the awareness and self-management of blood glucose was more stable in general surgery patients.

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