Analysis of Reasons For Readmission of Diabetic Patients: 2015-2019

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Abstract

Background: Among patients with diabetes who had been hospitalized, 30% had twice or more hospitalisations rate, accounting for more than 50% of total hospitalizations and hospitalization expense. The purpose of our study was to to find available strategies to reduce the readmission rate of diabetics in rural areas.

Methods: This retrospective single-center study used the data from Yongchuan Hospital of Chongqing Medical University. The t-test and the chi-square test or Fisher's exact test were used to compare continuous and categorical variables, respectively. We used the Spearman correlation coefficient to examine the relationship between variables. Multiple linear regression was performed to analyze the influencing factors of hospitalisation time, and dummy variables were set for categorical independent variables.

Results: There were a total of 1721 readmissions during a five-year period; among them, 829 were females and 892 males. The readmission rate of diabetic patients in the endocrinology department was 32.40%. The age, times of hospitalisation, and duration of all subjects were 64.67 ± 13.82, 2.69 ± 1.41 and 10.60 ± 6.78, respectively. Among all the diabetic patients, type 2 diabetes accounted for 98.55% (n = 1696). Most of the patients were readmitted due to poor glycemic control, infection, edema, dizziness, and weakness, accounting for approximately 56%. During the 5-year period, the majority of readmitted diabetic patients were hospitalized twice. Times of hospitalisation was weakly positively correlated with age (Rho = 0.206, $P \leq 0.001$), diabetic duration (Rho = 0.248, $P \leq 0.001$) and hospitalisation expenses (Rho = 0.008, P = 0.035) by Spearman correlation analysis. Age, duration of diabetes, systolic blood pressure (SBP), diastolic blood pressure (DBP) and alanine aminotransferase (ALT) were the main factors affecting times of hospitalisation in diabetes patients (all $P < 0.05$). Compared with current smokers, non-smokers and cessation smokers had high hospitalisations rate (all P for trend < 0.05). When taking diabetic foot infection as a reference, edema was more accountable than diabetic foot infection for hospitalisation times, which was statistically significant (P for trend = 0.048).

Conclusion: Age, duration of diabetes and hospitalisation costs were positively correlated with times of hospitalisation. Age, duration of diabetes, blood pressure, ALT, smoking status and edema are the influencing factors of hospitalisation times. The most common causes of hospitalisation for diabetics are poor glycemic control, infection, edema, dizziness, and weakness. Controlling these factors may be key to developing rational health strategies for rural diabetics.

Introduction

Diabetes, a chronic non-communicable disease, affects thousands of people all over the world. It is reported that there will be an estimated 693 million (9.9%) adult diabetics globally by 2045 [1]. Due to urbanization, aging, increased prevalence of overweight and obesity and genetic susceptibility of Chinese

people, the prevalence of diabetes in China is rapidly increasing. Presently, China has become the country with the most diabetes patients in the world.

Diabetes mellitus (DM) can be accompanied by acute and chronic complications, leading to organ dysfunction and failure, and even disability or death. DM is not only a serious health problem facing the world with high disability rate, morbidity and mortality, but also a huge economic burden on individuals, family and society. The total global healthcare expenditure due to diabetes was estimated to be USD 850 billion in 2017, and will increase by 7% to USD 958 billion by 2045[1]. Analogously, the total annual medical cost of diabetes treatment in China was about 85-100 billion RMB (USD 12.93-15.21 billion) in 2013[2]. Nevertheless, the health systems in most of the low- or middle-income developing countries are not sufficiently equipped to handle the rapidly rising burden of diabetes [3].

Diabetic patients have a higher risk of hospitalisation than non-diabetic subjects, and a large proportion of these hospitalisations are due to diabetes-related complications [4–6]. Complications from diabetes are a serious threat to the healthcare system and one of the top ten reasons for readmission in public hospitals worldwide [7]. Among patients with diabetes who had been hospitalized, 30% had twice or more hospitalisations rate, accounting for more than 50% of total hospitalisations and hospitalisation expenses [8]. Therefore, this population-based study aims to analyze the causes of the rehospitalisation of diabetic patients, and proposed guidelines for treatment and follow-up to reduce the number of hospitalisations and the cost of health care.

Methods

Definition

We defined two or more hospitalisations as readmission.

Procedures

The data used in this study were obtained from the medical record department of Yongchuan Hospital of Chongqing Medical University, Chongqing China, a tertiary hospital. The principal diagnosis has been coded according to the Tenth International Classification of Diseases (ICD-10) of the World Health Organization at the time of discharge, the information of hospitalized diabetic patients in endocrinology department during the period from January 1, 2015 to December 31, 2019 is retrieved according to the main discharge diagnosis (E10, E11). As we utilized the principal discharge diagnosis to identify diabetic patients; therefore, those patients who were not primarily hospitalized for diabetes or transferred to the endocrinology department because of diabetes-related problems were excluded (Fig. 1). Namely, subjects were admitted and discharged from the endocrinology department. Likewise, patients who were admitted in 2014 and discharged in 2015 were excluded. We used Excel to screen out the information of patients who were hospitalized twice or more. The electronic medical record system was used to search the hospitalisation information according to the patient's hospitalisation number each time. The age, gender, diabetes duration, type of diabetes, smoking, body mass index (BMI), systolic blood pressure (SBP),

diastolic blood pressure (DBP), glucose (Glu), hemoglobin A1c (HbA1c), triglyceride (TG), total cholesterol (TC), high density lipoprotein cholesterol (HDL-C), low density lipoprotein cholesterol (LDL-C), alanine aminotransferase(ALT), aspartate aminotransferase (AST), uric acid (UA), serum creatinine (Scr), times of hospitalisation, reasons for admission, hospitalisation costs, and treatment plans were extracted.

Statistical analysis

Descriptive statistics were used to describe clinical characteristics. Continuous variables were shown as Mean±SD, and t-test was used for comparison between groups. Categorical variables were expressed as frequency and percentage, and were compared using the chi-square test or the Fisher's exact test. Spearman correlation coefficient was applied to examine the relationship between variables. Multiple linear regression was performed to analyze the influencing factors of hospitalisation times, and dummy variables were set for categorical independent variables. A P value < 0.05 (two-tailed) was considered as statistically significant. All statistical analyses were performed with SPSS software version 26.0 (SPSS Inc., Chicago, IL).

Results

Analysis of clinical characteristics

During the study period, we totally screened 1721 readmissions with a principal diagnosis of DM (Fig. 1). Further, we calculated the rate of readmission for patients with DM in the endocrinology department was 32.40%.

As shown in Table 1, a total of 829 females and 892 males were included in our study. The age, times of hospitalisation, and duration of all subjects were 64.67 ± 13.82, 2.69 ± 1.41 and 10.60 ± 6.78, respectively (Table 1). Among all the diabetic patients, type 2 diabetes mellitus accounted for 98.55% (n = 1696, Table 1). Interestingly, we found that both males and females did not smoke in the majority (69.61%, Table 1). Compared with males, females had higher BMI, SBP, TC, HDL-C, and LDL-C (P < 0.05), and low levels of DBP, ALT, AST, UA, and Scr (P < 0.05, Table 1). However, there was no significant difference in glucose, HbA1c, TG, and hospitalisation costs in rehospitalisation diabetes patients among different gender (Table 1).

Our study found that 773 (44.92%) patients were treated with insulin combined with non-insulin medicines in all readmissions (Table 1). Most of the patients were readmitted due to poor glycemic control, infection, edema, dizziness, and weakness, accounting for approximately 56% (Table 1). During the 5-year period, most diabetic readmission patients were hospitalized twice (Fig. 2).

The correlation of factors and times of hospitalisation

The correlation between factors and times of hospitalisation were performed with Spearman correlation analysis. As shown in Table 2, times of hospitalisation were weakly positively

correlated with age (Rho = 0.206, P ≤ 0.001), diabetic duration (Rho = 0.248, P ≤ 0.001) and hospitalisation expenses (Rho = 0.008, P = 0.035).

Association between other variables and times of hospitalisation

Multiple linear regression was used to investigate the independent correlation between other variables and times of hospitalisation. As shown in Table 3, we found that age, duration of diabetes, SBP, DBP and ALT were the main factors affecting times of hospitalisation in diabetes patients (all P < 0.05). The results showed that there was no statistical difference in the number of hospitalisations between type 1 and type 2 diabetic patients (P for trend = 0.859, Table 4), male and female subjects (P for trend =0.880, Table 4). Surprisingly, compared with current smokers, non-smokers and cessation smokers had higher hospitalisations rate (all P for trend < 0.05, Table 4).

With insulin treatment as the reference, non-insulin medicines (NIM) treatment, insulin+ NIM treatment and GS (glucose solution) treatment had no statistically significant effect on the number of hospitalisations (all P for trend > 0.05, Table 4).

When taking diabetic foot infection as a reference, edema was more accountable than diabetic foot infection for hospitalisation times, which was statistically significant (P for trend = 0.048, Table 4). However, there was no significant difference in the number of hospitalisations for poor glycemic control, diabetic ketoacidosis (DKA), hyperosmolar hyperglycemic syndrome (HHS), hypoglycemia, infection, microalbuminuria, blurred vision, dizziness, headache, chest distress, precordial discomfort, palpitation, dyspnea, chest pain, extremities pain, arthralgia, numbness, paresthesia, low back pain, consciousness disorders, abdominal distention, abdominal pain, vomiting, diarrhea, constipation, urinary incontinence, melena, pruritus, weakness, hepatic dysfunction, elevated blood glucose, and the classic symptoms of DM with diabetic foot infection (all P for trend > 0.05, Table 4).

Discussion

The burden of hospitalized diabetics is huge, rapidly growing and expensive, and readmission is another large part of the burden [9]. In view of the significant impact on cost and quality, the hospital readmission rate is increasingly used as an indicator of health care quality and a potential source of regulatory penalties for hospitals [10]. Therefore, some countries use 30-days readmission rates to assess the quality of health care services. However, to the best of our knowledge, the readmission rate has not been taken as a measure of medical quality in China. Moreover, there is a lack of studies to investigate the diabetes readmission in China.

Our results revealed that the readmission rate of diabetic patients in the department of endocrinology at Yongchuan Hospital of Chongqing Medical University was 32.40% in 5 years, which is consistent with Friedman's research that about one-third of diabetic patients had twice or more hospitalisations [11]. Overall, the reason why smokers and non-smokers are readmitted differently is that almost all female

patients do not smoke. Furthermore, our study indicated that the most common causes of readmission for patients with DM were poor glycemic control, infection, edema, dizziness, and weakness.

Due to poor blood glucose control can lead to infection and other complications, need hospital treatment, so it is one of the main reasons for readmission. Such as edema, dizziness, weakness are symptoms of chronic complications of diabetes. These symptoms indicate long duration. Our results also show that duration related to the number of hospital, so there are the main reasons for rehospitalisation.

This study findings are consistent with those of Donnan et al [12] and Strack et al [13], that the readmission rate increases with age. Meanwhile, we also found that the duration of diabetes and hospitalisation costs were positively correlated with times of hospitalisation. Therefore, better glucose control reduction of complications and the times of hospitalisation are the key to reduce the burden of diabetes patients.

By multiple linear regression analysis, not only age and course of disease affected the number of hospitalisation, but it is also affected by blood pressure, ALT and smoking status. Moreover, the edema also affects times of hospitalisation. Although age is immutable, there may be other things they can reduce the readmission of diabetics, such as diabetes education, diabetes self-management, moderate exercise, smoking cessation, blood pressure control and so on.

A series of factors increase hospital readmission among patients with diabetes. Numerous studies that have investigated the risk factors for readmission of patients with diabetes demonstrate gender [14, 15], race[8, 9], insurance type[8, 15], [9, 13]urgent or emergent, comorbidity burden[8]. We did not collect some factors and our study period was different; therefore, we could not compare them with previous studies. However, our study helps to develop strategies for risk factors to reduce readmission.

As previous studies have shown that 27 percent of readmissions within 30 days are preventable [16], efforts are needed to reduce this frequency, especially among the elderly. Our findings show that multiple hospitalisations do not significantly change the health status of patients with diabetes, but may increase the number of readmissions. Similarly, adequate discharge planning, patient education, and follow-up actions are most effective in reducing readmission, which is consistent with previous studies [17–19]. To reduce readmission rates, we could create structured of individualized discharge plan for each patient with diabetes, as the American Diabetes Association does [20], but we have to be aware of the fact that they rarely follow this plan seriously. Hence, primary medical institutions play an important role in diabetes ambulatory management [21], and the family physician model may make a significant contribution to reducing the readmission rate of diabetic patients. For developing countries, these findings may help to plan future health strategies for diabetes management.

The study has several limitations that should be noted. First, this is a retrospective, observational, single-center study of outcomes data. Second, the readmission rate may be underestimated due to the fact that patients may be hospitalized in another medical institution where the hospitalisation records are not available in our hospital database, and patients die during our study period. Third, due to the limitation of

China's medical insurance, people who are hospitalized for more than 30 days need to be readmitted. Therefore, it is possible to overestimate the number of readmissions.

Conclusion

We found that age, duration of diabetes and hospitalisation costs were positively correlated with times of hospitalisation. Age, duration of diabetes, blood pressure, ALT, smoking status and edema were the influencing factors of hospitalisation times. The most common causes of hospitalisation for diabetics, including poor glycemic control, infection, edema, dizziness, and weakness. The analysis of readmission of diabetic patients can help to plan the health strategy of diabetes management in the future, so as to reduce the readmission rate and the cost of health care.

Abbreviations

DM: Diabetes mellitus; ICD-10: the Tenth International Classification of Diseases; BMI: Body mass index; SBP: Systolic blood pressure; DBP: Diastolic blood pressure; Glu: Glucose; HbA1c: Hemoglobin A1c; TG: Triglyceride; TC: Total cholesterol; HDL-C: High density lipoprotein cholesterol; LDL-C: Low density lipoprotein cholesterol; ALT: Alanine aminotransferase; AST: Aspartate aminotransferase; UA: Uric acid; Scr: Serum creatinine; NIM: Non-insulin medicines; GS: Glucose solution; DKA: Diabetic ketoacidosis; HHS: Hyperosmolar hyperglycemic syndrome.

Declarations

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Authors’ contributions

XLZ designed the study, reviewed and edited the article. ZYL supervised the work. JMW, MZ, YMC and DZC collected clinical data. JMW, JYX, CY and XSJ performed the statistical analysis. JMW wrote the manuscript. All authors have read and approved the fnal manuscript.

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Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Ethics approval and consent to participate

The study protocol was approved by the institutional review board of Yongchuan Hospital of Chongqing Medical University. All subjects gave written informed consent, and the study was conducted in accordance with the Declaration of Helsinki.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

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Tables

Table 1 Clinical characteristics of readmitted diabetic patients

	All subjects (*n* = 1721)	Female (*n* = 829)	Male (*n* = 892)	*t*/c2	*p*
Age (years)	64.67 ± 13.82	65.99 ± 12.95	63.46 ± 14.50	2.329	0.020
Times	2.69 ± 1.41	2.70 ± 1.37	2.69 ± 1.44	0.151	0.880
Type (*n*, %)				1.422	0.233
1	25 (1.45)	15 (1.81)	10 (1.12)		
2	1696 (98.55)	814 (98.19)	882 (98.88)		
Duration (years)	10.60 ± 6.78	11.43 ± 7.12	9.83 ± 6.36	2.984	0.003
Smoking (*n*, %)				687.259	<0.001
Yes	311 (18.07)	0	311 (34.87)		
No	1198 (69.61)	827 (99.76)	371 (41.59)		
Cessation	212 (12.32)	2 (0.24)	210 (23.54)		
BMI (Kg/m^2)	24.34 ± 3.69	24.57 ± 3.99	24.12 ± 3.37	2.514	0.012
SBP (mmHg)	137.65 ± 21.90	138.80 ± 22.10	136.59 ± 21.66	2.101	0.036
DBP (mmHg)	79.08 ± 12.95	77.78 ± 12.36	80.30 ± 13.37	-4.042	<0.001
Glu (mmol/L)	14.05 ± 7.82	13.91 ± 7.87	14.18 ± 7.78	-0.722	0.470
HbA1c (%)	8.95 ± 2.31	9.01 ± 2.34	8.89 ± 2.28	1.096	0.273
TG (mmol/L)	2.34 ± 2.38	2.33 ± 2.07	2.36 ± 2.63	-0.259	0.796
TC (mmol/L)	4.75 ± 1.62	5.03 ± 1.59	4.49 ± 1.61	7.000	<0.001
HDL-C (mmol/L)	1.32 ± 0.46	1.41 ± 0.45	1.23 ± 0.46	8.394	<0.001
LDL-C (mmol/L)	2.54 ± 1.13	2.70 ± 1.15	2.39 ± 1.09	5.727	<0.001
ALT (U/L)	28.02 ± 55.08	23.66 ± 28.64	32.06 ± 71.14	-3.254	0.001
AST (U/L)	27.65 ± 52.32	24.84 ± 30.70	30.26 ± 66.28	-2.204	0.028
UA (mmol/L)	340.40 ± 126.03	323.43 ± 121.81	356.17 ± 127.88	-5.428	<0.001
Scr (mmol/L)	90.05 ± 79.91	80.21 ± 60.85	99.20 ± 93.34	-5.032	<0.001

Cost (RMB)	15030.2 ± 9095.21	14614.4 ± 8059.27	15416.74 ± 9950.86	-1.844	0.065
Treatment (*n*, %)					0.531[a]
Insulin	648 (37.65)	318 (38.36)	330 (37.00)		
NIM	288 (16.73)	146 (17.61)	142 (15.92)		
Insulin+ NIM	773 (44.92)	362 (43.67)	411 (46.08)		
GS	8 (0.46)	2 (0.24)	6 (0.67)		
GS+ Insulin	1 (0.06)	0	1 (0.11)		
GS+ NIM	1 (0.06)	0	1 (0.11)		
No treatment	2 (0.12)	1 (0.12)	1 (0.11)		
Reasons (n, %)					<0.001[a]
Poor glycemic control	153 (8.89)	49 (5.91)	104 (11.66)		
DKA	11 (0.64)	8 (0.97)	3 (0.34)		
HHS	3 (0.17)	2 (0.24)	1 (0.11)		
Table 1 Cont.					
	All subjects (*n* = 1721)	Female (*n* = 829)	Male (*n* = 892)	*t*/c2	*p*
Hypoglycemia	34 (1.98)	13 (1.57)	21 (2.35)		
Infection	278 (16.15)	145 (17.49)	133 (14.91)		
Microalbuminuria	5 (0.29)	2 (0.24)	3 (0.34)		
Edema	119 (6.91)	49 (5.91)	70 (7.85)		
Blurred vision	45 (2.61)	29 (3.50)	16 (1.79)		
Eye pain	2 (0.12)	2 (0.24)	0		
Dizziness	268 (15.57)	158 (19.06)	110 (12.33)		
Headache	19 (1.10)	13 (1.57)	6 (0.67)		
Chest distress	12 (0.70)	5 (0.60)	7 (0.78)		
Precordial discomfort	7 (0.41)	7 (0.84)	0		
Palpitation	28 (1.63)	17 (2.05)	11 (1.23)		
Dyspnea	41 (2.38)	21 (2.53)	20 (2.24)		

Chest pain	1 (0.06)	1 (0.12)	0		
Extremities pain	48 (2.79)	32 (3.86)	16 (1.79)		
Arthralgia	10 (0.58)	7 (0.84)	3 (0.34)		
Numbness	75 (4.36)	35 (4.22)	40 (4.48)		
Paresthesia	12 (0.70)	5 (0.60)	7 (0.78)		
Low back pain	20 (1.16)	10 (1.21)	10 (1.12)		
Consciousness disorders	22 (1.28)	12 (1.45)	10 (1.12)		
Mental disorders	1 (0.06)	1 (0.12)	0		
Limb movement disorders	1 (0.06)	0	1 (0.11)		
Abdominal distention	17 (0.99)	10 (1.21)	7 (0.78)		
Abdominal pain	24 (1.39)	14 (1.69)	10 (1.12)		
Vomiting	43 (2.50)	24 (2.90)	19 (2.13)		
Diarrhea	14 (0.81)	5 (0.60)	9 (1.01)		
Constipation	5 (0.29)	2 (0.24)	3 (0.34)		
Dysuria	1 (0.06)	1 (0.12)	0		
Urinary incontinence	1 (0.06)	0	1 (0.11)		
Melena	2 (0.12)	1 (0.12)	1 (0.11)		
Diabetic foot infection	96 (5.58)	47 (5.67)	49 (5.49)		
Pruritus	29 (1.69)	13 (1.57)	16 (1.79)		
Exanthema	1 (0.06)	0	1 (0.11)		
Weakness	141 (8.19)	56 (6.76)	85 (9.53)		
Shock	1 (0.06)	1 (0.12)	0		
Cough	12 (0.70)	3 (0.36)	9 (1.01)		
Hepatic dysfunction	5 (0.27)	1 (0.12)	4 (0.45)		
Table 1 Cont.					
	All subjects (n = 1721)	Female (n = 829)	Male (n = 892)	t/c2	p
Gingival hemorrhage	1 (0.06)	0	1 (0.11)		
Toothache	1 (0.06)	1 (0.12)	0		

Appetite loss	2 (0.12)	1 (0.12)	1 (0.11)
Elevated blood glucose	8 (0.46)	3 (0.36)	5 (0.56)
The classic symptoms of diabetes mellitus	102 (5.93)	23 (2.77)	79 (8.86)

BMI, body mass index; SBP, systolic blood pressure; DBP, diastolic blood pressure; Glu, glucose; HbA1c, hemoglobin A1c; TG, triglyceride; TC, total cholesterol; HDL-C, high density lipoprotein cholesterol; LDL-C, low density lipoprotein cholesterol; ALT, alanine aminotransferase; AST, aspartate aminotransferase; UA, uric acid; Scr serum creatinine; NIM, non-insulin medicines; GS, glucose solution; DKA, diabetic ketoacidosis; HHS, hyperosmolar hyperglycemic syndrome; The classic symptoms of diabetes mellitus, polyuria, polydipsia, polyphagia, and weight loss. 1 RMB » 0.1521 USD. Continuous variables were shown as mean ± standard deviation, and the *t*-test was used for comparison between groups. Categorical variables were expressed as frequency and percentage, and were compared using the chi-square test or the Fisher's exact test. a, the Fisher's exact test.

Table 2 Spearman correlation analysis of factors for times of hospitalization

Times	Age	Type	Duration	Smoking	Gender	BMI	SBP
r	0.206**	-0.049	0.248**	0.059	-0.016	0.019	0.050
p	<0.001	0.215	<0.001	0.139	0.685	0.623	0.207

Table 2 Cont.

Times	DBP	Glu	HbA1c	TG	TC	HDL-C	LDL-C
r	-0.009	0.003	-0.008	0.004	-0.007	-0.049	-0.019
p	0.828	0.935	0.833	0.926	0.857	0.219	0.640

Table 2 Cont.

Times	ALT	AST	UA	Scr	Cost	Treatment	Reasons
r	0.026	-0.050	-0.028	0.003	0.008	-0.032	-0.028
p	0.520	0.210	0.482	0.939	0.035	0.426	0.483

**P< 0.01.

Table 3 Association between other continuous variables and times of hospitalization by multiple linear regression

Variables	B	SE	B¢	*t*	*p*	Lower 95%CI	Upper 95%CI
Age	0.018	0.004	0.176	4.314	<0.001	0.010	0.026
Duration	0.031	0.008	0.149	3.669	<0.001	0.014	0.047
BMI	-0.007	0.016	-0.018	-0.451	0.652	-0.038	0.024
SBP	0.006	0.003	0.096	2.020	0.044	<0.001	0.011
DBP	-0.014	0.005	-0.130	-2.803	0.005	-0.024	-0.004
Glu	-0.005	0.008	-0.027	-0.579	0.562	-0.020	0.011
HbA1c	0.018	0.028	0.028	0.621	0.535	-0.038	0.073
TG	-0.009	0.033	-0.014	-0.284	0.777	-0.074	0.055
TC	0.037	0.077	0.042	0.480	0.631	-0.114	0.188
HDL-C	-0.106	0.138	-0.034	-0.765	0.444	-0.376	0.165
LDL-C	0.026	0.097	0.021	0.273	0.785	-0.164	0.217
ALT	0.007	0.003	0.169	1.995	0.046	<0.001	0.014
AST	-0.004	0.004	-0.085	-1.010	0.313	-0.011	0.003
UA	<0.001	<0.001	-0.020	-0.476	0.634	-0.001	0.001
Scr	0.001	0.001	0.041	0.963	0.336	-0.001	0.002
Cost	<0.001	<0.001	-0.009	-0.230	0.818	<0.001	<0.001

SE, standard error CI, confidence interval.

Table 4 Association between categorical variables and times of hospitalization by multiple linear regression

Variables	B	SE	B¢	*t*	*p* for trend	Lower 95%CI	Upper 95%CI
Type							
1	reference						
2	-0.084	0.472	-0.007	-0.178	0.859	-1.011	0.843
Gender							
Female	reference						
Male	-0.017	0.111	-0.006	-0.151	0.880	-0.235	0.202
Smoking							
Yes	reference						
No	0.282	0.141	0.093	2.001	0.046	0.005	0.560
Cessation	0.455	0.206	0.103	2.213	0.027	0.051	0.859
Treatment							
Insulin	reference						
NIM	-0.152	0.158	-0.042	-0.960	0.338	-0.462	0.159
Insulin+ NIM	-0.148	0.125	-0.053	-0.189	0.235	-0.394	0.097
GS	0.209	1.410	0.006	0.148	0.882	-2.559	2.977
Reasons							
Diabetic foot infection	reference						
Poor glycemic control	-0.081	0.335	-0.015	-0.241	0.810	-0.739	0.578
DKA	-0.074	0.855	-0.004	-0.087	0.931	-1.753	1.604
HHS	-0.741	1.029	-0.029	-0.720	0.472	-2.762	1.280
Hypoglycemia	-0.125	0.474	-0.013	-0.264	0.792	-1.056	0.806
Infection	0.193	0.308	0.048	0.628	0.530	-0.411	0.798
Microalbuminuria	0.259	1.430	0.007	0.181	0.856	-2.549	3.068
Edema	0.728	0.367	0.113	1.984	0.048	0.007	1.449
Blurred vision	-0.349	0.398	-0.046	-0.877	0.381	-1.132	0.433
Dizziness	0.044	0.300	0.012	0.146	0.884	-0.546	0.633
Headache	-0.598	0.596	-0.044	-1.004	0.316	-1.768	0.572

Chest distress	-0.741	0.634	-0.051	-1.169	0.243	-1.986	0.504
Precordial discomfort	0.593	0.634	0.041	0.935	0.350	-0.652	1.837
Palpitation	0.393	0.452	0.042	0.868	0.386	-0.496	1.281
Dyspnea	-0.352	0.427	-0.041	-0.823	0.411	-1.191	0.487
Chest pain	-0.741	1.430	-0.021	-0.518	0.605	-3.549	2.068
Extremities pain	-0.341	0.390	-0.047	-0.874	0.382	-1.106	0.425
Arthralgia	0.593	0.855	0.029	0.693	0.488	-1.086	2.271
Numbness	-0.306	0.398	-0.041	-0.768	0.443	-1.089	0.477
Paresthesia	-0.074	0.855	-0.004	-0.087	0.931	-1.753	1.604
Low back pain	-0.574	0.634	-0.039	-0.906	0.365	-1.819	0.671
Consciousness disorders	-0.530	0.421	-0.064	-1.261	0.208	-1.356	0.296
Abdominal distention	-0.574	0.634	-0.039	-0.906	0.365	-1.819	0.671
Table 4 Cont.							
Variables	B	SE	B¢	*t*	*p* for trend	Lower 95%CI	Upper 95%CI
Abdominal pain	-0.202	0.474	-0.020	-0.427	0.670	-1.133	0.729
Vomiting	-0.191	0.414	-0.024	-0.460	0.645	-1.004	0.623
Diarrhea	-0.491	0.565	-0.039	-0.868	0.386	-1.601	0.619
Constipation	0.259	1.430	0.007	0.181	0.856	-2.549	3.068
Urinary incontinence	2.259	1.430	0.064	1.580	0.115	-0.549	5.068
Melena	-0.741	1.029	-0.029	-0.720	0.472	-2.762	1.280
Pruritus	0.188	0.463	0.020	0.406	0.685	-0.720	1.096
Weakness	-0.225	0.322	-0.048	-0.699	0.485	-0.858	0.408
Hepatic dysfunction	0.259	0.855	0.013	0.303	0.762	-1.419	1.938
Elevated blood glucose	-0.741	1.430	-0.021	-0.518	0.605	-3.549	2.068
The classic symptoms of diabetes mellitus	-0.116	0.443	-0.013	-0.261	0.794	-0.986	0.754

GS+ insulin, GS+ NIM, no treatment and eye pain, mental disorders, limb movement disorders, dysuria, exanthema, shock, cough, gingival hemorrhage, toothache, appetite loss were missing correlations with

insulin and diabetic foot infection, respectively.

Figures

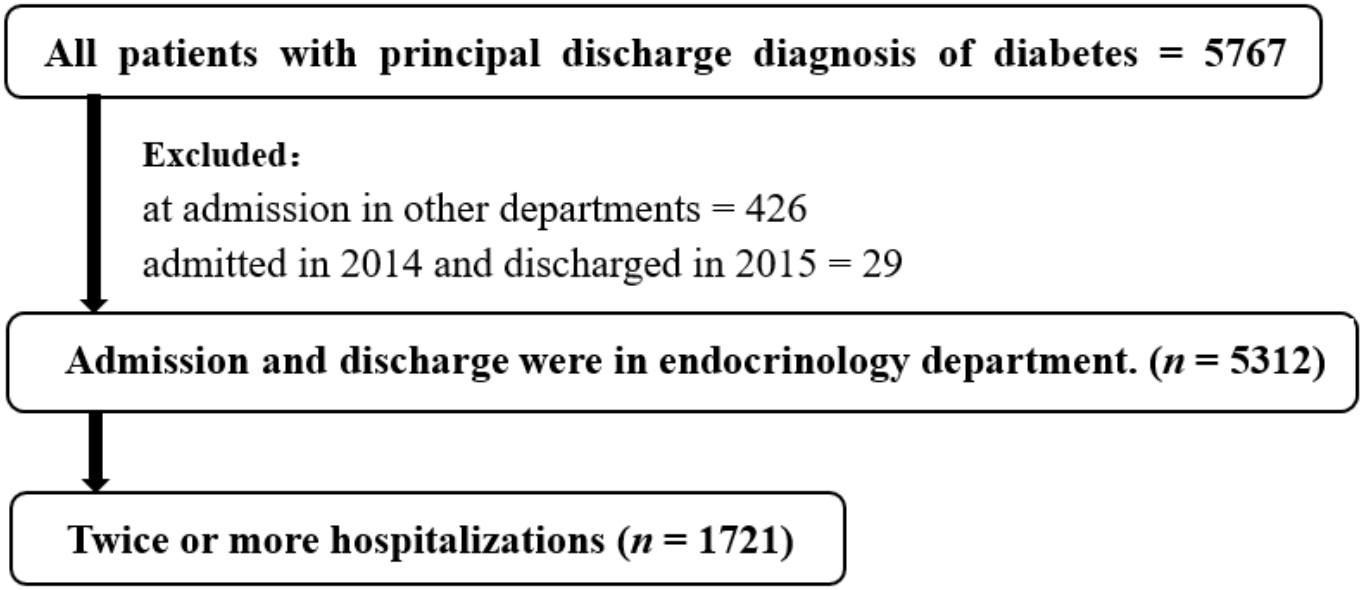

Figure 1

Screening of readmitted diabetic patients

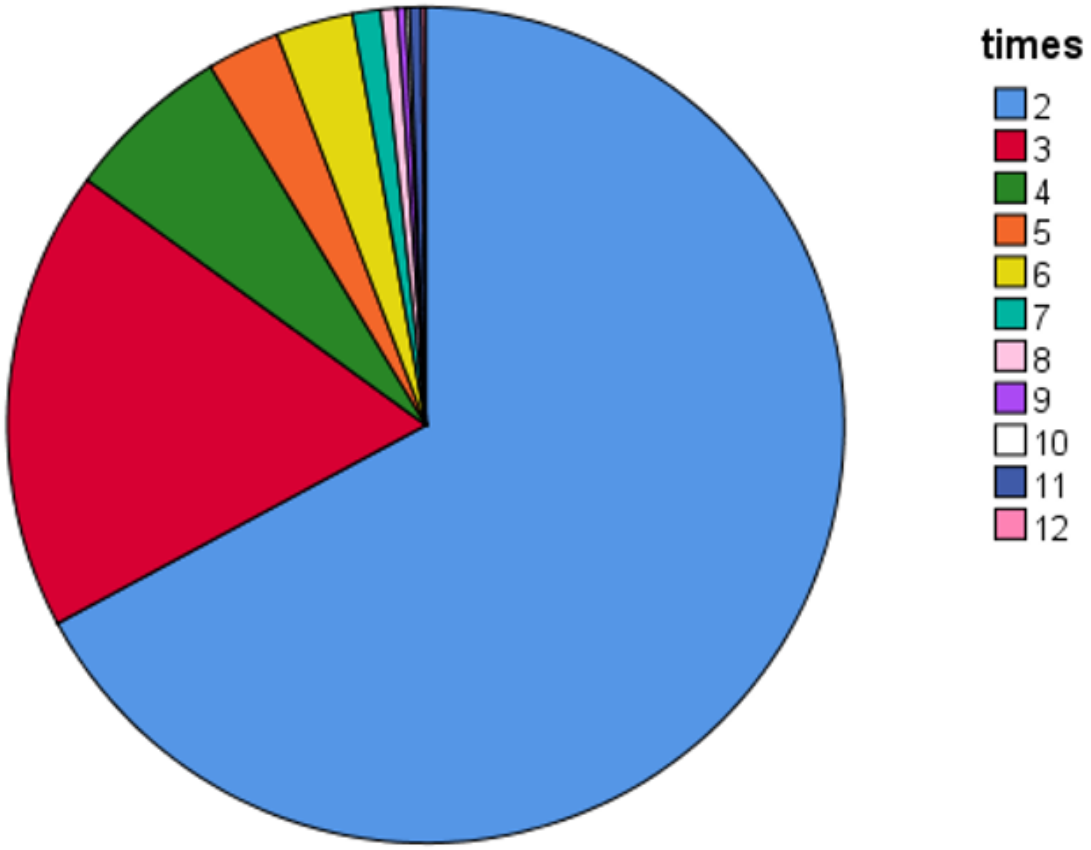

Figure 2

Distribution of readmission times of diabetic patients in five years