The use of insulin in treatment for inpatients with diabetes in Can Tho, Vietnam 2017 to 2020

[El uso de insulina en el tratamiento de pacientes hospitalizados con diabetes en Can Tho, Vietnam, 2017 a 2020]

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Abstract

Context: Diabetes is a dangerous chronic disease with a rapidly increasing rate of hospitalization and death. Patients with uncontrolled diabetes are prone to dangerous acute and chronic complications.

Aims: To determine the characteristics of insulin use and factors related to blood glucose control in inpatients with diabetes at the Department of General Medicine-Can Tho University of Medicine and Pharmacy Hospital.

Methods: A cross-sectional descriptive study on 390 medical records of inpatients with diabetes at the Department of General Medicine-Can Tho University of Medicine and Pharmacy Hospital from 2017 to 2020.

Results: Most hospitalized patients had poor control of HbA1c (52.3%). During the treatment, patients were regularly tested for blood sugar and 3.8% of them had hypoglycemic test patterns. The rate of good control of fasting blood glucose at hospital discharge accounted for the majority with 67.4%. Regarding the insulin use, premixed insulin was used the most with a rate of 77.5% and insulin monotherapy accounted for 73.3%. The mean insulin dose was 23.4 ± 10.6 UI/day. Factors such as HbA1c index, comorbidities, and insulin doses were associated with poor glycemic control of inpatients.

Conclusions: The selection of insulin use in inpatients with diabetes was consistent with global guidelines and actual situations at the hospital. It is necessary to monitor factors such as HbA1c index, comorbidities, and insulin doses because these factors are associated with poor glycemic control of inpatients.

Keywords: associated factors; diabetes; glycemic control; insulin regimen.

Resumen

Contexto: La diabetes es una enfermedad crónica peligrosa con una tasa de hospitalización y muerte que aumenta rápidamente. Los pacientes con diabetes no controlada son propensos a complicaciones crónicas y agudas peligrosas.

Objetivos: Determinar las características del uso de insulina y los factores relacionados con el control de la glucemia en pacientes con diabetes ingresados en el Departamento de Medicina General-Hospital Universitario de Medicina y Farmacia de Can Tho.

Métodos: Estudio descriptivo transversal sobre 390 historias clínicas de pacientes hospitalizados con diabetes en el Departamento de Medicina General-Hospital Universitario de Medicina y Farmacia de Can Tho de 2017 a 2020.

Resultados: La mayoría de los pacientes hospitalizados presentaban un mal control de la HbA1c (52,3%). Durante el tratamiento, los pacientes se sometieron a pruebas periódicas de glucemia y el 3,8% de ellos presentaba patrones de prueba hipoglucémicos. La tasa de buen control de la glucemia en ayunas al alta hospitalaria representó la mayoría con 67,4%. En cuanto al uso de insulina, la insulina premezclada fue la más utilizada con una tasa del 77,5% y la monoterapia con insulina representó el 73,3%. La dosis media de insulina fue de 23,4 ± 10,6 UI/día. Factores como el índice de HbA1c, las comorbilidades y las dosis de insulina se asociaron con un control glucémico deficiente de los pacientes hospitalizados.

Conclusiones: La selección del uso de insulina en pacientes hospitalizados con diabetes fue consistente con las pautas globales y situaciones reales en el hospital. Es necesario monitorear factores como el índice de HbA1c, las comorbilidades y las dosis de insulina porque estos factores están asociados con un control glucémico deficiente de los pacientes hospitalizados.

Palabras Clave: control glicémico; diabetes; factores asociados; régimen de insulina.

INTRODUCTION

Diabetes mellitus, popularly called diabetes, is a common chronic endocrine disorder and one of the three fastest-growing diseases in the world along with cancer and cardiovascular disease (Bonow and Gheorghiade, 2004; ADA, 2019; IDF, 2019). According to the International Diabetes Federation (IDF), worldwide, there were 463 million diabetes people aged 20-79 years in 2019 and this number is projected to rise to 700 million by 2045. In Vietnam, there were about 3.7 million people with diabetes according to the same statistics in 2019 (IDF, 2019). Diabetes-patient hospitalized rate was three times higher than the figure for those without diabetes (McDonnell and Umpierrez, 2012; Elsayed et al., 2021). The number of patients hospitalized because of diabetes and diabetes complications is increasing. Besides, the death rate due to diabetes is also quite high. Around 4.2 million people died in the world and 46.2% of patients died under the age of 60 years in 2019 (IDF, 2019). Thus, diabetes is considered a global health problem in the 21st century.

Patients with uncontrolled diabetes are prone to dangerous acute and chronic complications, which threatens their life or leaves many serious consequences for patients, their families as well as their societies (McHugh et al., 2011; Kodner and Anderson, 2017). Many studies throughout the world have shown that good glycemic control for inpatients improve treatment efficiency and reduce the number of days in hospitals (Rodriguez-Gutierrez et al., 2019; Sharif et al., 2019; Guo et al., 2020). Insulin plays an important role in controlling inpatients' blood glucose (ADA, 2017; Kodner and Anderson, 2017). The world has made recommendations on specific glycemic targets and guidelines for insulin use in inpatients with diabetes (Yale Diabetes Center, 2012; Handelsman et al., 2015; ADA, 2019). In Vietnam, the Ministry of Health has just issued guidelines of treatment for inpatients with diabetes by the end of 2020 (Ministry of Health, 2020). However, studies on glycemic control and insulin use in Vietnam are still limited.

There are a huge number of outpatients and inpatients who come to Can Tho University of Medicine and Pharmacy Hospital for examination and treatment of diabetes. Therefore, this study aims at determining characteristics of insulin use and inpatients with diabetes at the Department of General Medicine-Can Tho University of Medicine and Pharmacy Hospital, which updates information on insulin use in inpatients with

type 1 diabetes and type 2 diabetes, improves treatment effectiveness, decreases mortality, and shortens the length of hospital stays.

MATERIAL AND METHODS

Study design and subjects

This study was carried out according to cross-sectional descriptive research that retrospectively reviews medical records from 2017 to 2020. Medical records of diabetes patients who were treated with insulin at the Department of General Medicine-Can Tho University of Medicine and Pharmacy Hospital between January 2017 and December 2020 were included in this study. The data that have been stored in the Department of General Planning. Medical records of cases of pregnancy, transfer, referral, escape, and death were excluded.

This study was performed in accordance with the ethical principles for medical research outlined in the Declaration of Helsinki 1964 as modified by subsequent revisions (World Medical Association, 2020). Ethical approval for the study was obtained from the Medical Ethics Council of Can Tho University of Medicine and Pharmacy, Can Tho city, Vietnam (approval number 169/HĐĐĐ-PCT, May 28, 2020).

Data collection and sample size

The following formula was used to calculate the sample size to estimate a population proportion:

$$n = z^2_{(1-\alpha/2)} \, p \, (1- p)/ d^2 \qquad\qquad [1]$$

Where, n: The sample size; z: The value of the normal distribution (if α was 0.05, then z was 1.96); α: The probability of type I error (we use α = 0.05); p: We use p = 0.5 to get the maximum sample; d: The margin of error (we use d = 0.05).

Substituting the value of z, α, p, and d into the formula, we had n = $1.96^2 \, 0.5 \, (1-0.5)/0.05^2$ = 384.16. Hence, we collected 390 medical records.

The following variables used for characterizing patients in the sample were sex (male and female), age group (<40 years old, 40-49 years old, 50-59 years old, and ≥60 years old), body mass index BMI (<18.5, 18.5-22.9, 23-24.9, and ≥25), types of diabetes (type 1 and type 2), the number of comorbidities (≤3 diseases and >3 diseases), characteristics of comorbidities (hypertension, coronary heart disease, and dyslipidemia), pre-admission values of HbA1c (≤7%, 7-9%, and >9%), fasting blood glucose control at discharge [good and poor

control; good glycemic control is determined by glycemic goals in hospitalized patients according to the American Diabetes Association (ADA) in 2017 with the fasting blood glucose in the range of 70-180 mg/dL (3.9-10 mmol/L)], and the proportion of patients with hypoglycemia [hypoglycemia was determined according to ADA 2017 when the value of patient's blood glucose was <70 mg/dL (<3.9 mmol/L)].

The variables in terms of the characteristics of insulin use included types of insulin used, regimens of blood-sugar-lowering drugs (insulin monotherapy and combination therapy with insulin and oral antidiabetic agents (ODA), insulin regimens at the hospital, and insulin doses used.

Data processing and data analysis

Data were imported into Microsoft Excel 2016 and were processed by IBM SPSS Statistics 26. Qualitative variables were presented by frequency and percentage. Quantitative variables were presented by the mean and standard deviation (SD). Determining differences in blood glucose control according to characteristics of patients (sex: male and female; age: <60 and ≥60; BMI: <23 and ≥23; comorbidities: ≤3 and >3; HbA1c: ≤7 and >7; antidiabetic regimens: insulin monotherapy and combination therapy with insulin and ODA; groups of insulin doses: ≤40 and >40) by χ^2 test with 95% confidence interval and the figure for the level of statistical significance less than 0.05 (p-value <0.05). Variables with p-value <0.05 obtained from χ^2 analysis will be included in multivariable logistic regression analysis to find out factors related to glycemic control.

RESULTS

In Table 1, the results of the study on 390 medical records showed that the proportion of women was high (72.3%) with 2.6 times higher than that of men. Mean (± SD) age was 65 ± 13 years and up to 71.3% of patients were aged ≥60 years. Mean (± SD) body mass index (BMI) was 22.4 ± 3.6 kg/m², in which the majority of patients belonged to the normal BMI group (18.5-22.9 kg/m²) with a rate of 47.9%. The majority of hospitalized patients had type 2 diabetes (98.5%). Most patients had ≤3 comorbidities (80.8%). Among comorbidities, hypertension was the most common disease (61.5%). Mean (± SD) pre-admission values of HbA1c was 9.9 ± 2.8% and the majority of hospitalized patients had poor HbA1c control (52.3%). During the treatment, patients

were tested for blood sugar regularly and 3.8% of them had hypoglycemic test patterns. The percentage of patients with good control of fasting blood glucose at discharge was 67.4%, which was 2 times higher than the figure for those with poor control of fasting blood sugar.

The results of characteristics of insulin use are showed in Table 2. Five types of insulin were used at the Department of General Medicine, in which the group of premixed insulin was used the most (77.5%), while insulin lispro was used the least (0.2%). The regimens of blood-sugar-lowering drugs were used at the Department include regimens of insulin monotherapy and regimens of combination therapy with insulin and ODA, in which the kind of regimens of insulin monotherapy was commonly used (73.3%). In the group of combination therapy with insulin and ODA, the combination of insulin + metformin + DPP4i occupied the majority (13.1%). The insulin regimen is defined as the number of insulin injections per day. There were four types of insulin regimens used, and the type of regimens with two injections of premixed insulin was high (95.9%). Mean (± SD) insulin dose was 23.4 ± 10.6 UI/day. Most hospitalized patients were received 20-40 UI of insulin per day (50.5%).

In Table 3, chi-square analysis showed that factors such as the number of comorbidities, pre-admission values of HbA1c, and insulin dose groups were statistically significantly associated with poor glycemic control. Meanwhile, there was no difference between sex, age, BMI, and blood-sugar-lowering drug regimens with poor glycemic control. The results of multivariable logistic regression analysis illustrated that the number of comorbidities, pre-admission values of HbA1c, and insulin dose groups were statistically significantly associated with poor glycemic control. To be more precise, patients with three or more comorbidities were nearly twice as likely to have poor blood sugar control as those with less than three comorbidities (OR = 1.83, 95% CI = 1.08-3.11, and p-value = 0.025). Patients with pre-admission values of HbA1c >7 were nearly nine times as likely to have poor glycemic control as patients with pre-admission values of HbA1c ≤7 (OR = 8.94, 95% CI = 2.11-37.98, and p-value = 0.003). Patients with insulin doses of >40 UI/day were nearly three times as likely to have poor glycemic control as people with insulin doses of ≤40 UI/day (OR = 2.66, 95% CI = 1.22- 5.82, and p-value = 0.014).

Table 1. Characteristics of patients.

Characteristics of patients	Classification	n (%)
Sex (n = 390)	Male	108 (27.7)
	Female	282 (72.3)
Age (mean ± SD)		65 ± 13
Age (n = 390)	<40	14 (3.6)
	40-49	23 (5.9)
	50-59	75 (19.2)
	≥60	278 (71.3)
BMI (mean ± SD)		22.4 ± 3.6
BMI (n = 390)	<18.5	44 (11.3)
	18.5-22.9	187 (47.9)
	23-24.9	86 (22.1)
	≥25	73 (18.7)
Types of diabetes (n=390)	Type 1	6 (1.5)
	Type 2	384 (98.5)
Number of comorbidities (n = 390)	≤ 3	315 (80.8)
	>3	75 (19.2)
Comorbidities	Hypertension (n = 390)	240 (61.5)
	Coronary artery disease (n = 390)	66 (16.9)
	Dyslipidemia (n = 390)	58 (14.9)
Pre-admission values of HbA1c (mean ± SD)		9.9 ± 2.8
Pre-admission values of HbA1c (n=390)	Good (HbA1c ≤7%)	37 (9.5)
	Acceptable (HbA1c 7-9%)	149 (38.2)
	Poor (HbA1c >9%)	204 (52.3)
Blood glucose control (n = 390)	Good	263 (67.4)
	Poor	127 (32.6)
Hypoglycemia (n = 390)	Yes	15 (3.8)
	No	375 (96.2)

DISCUSSION

The incidence of type 2 diabetes in this study was 98.5%. Type 2 diabetes is a common disease, so the results of the prevalence in studies around the world were high (IDF, 2017; Bullard et al., 2018; Kamrul-Hasan et al., 2020). Hospitalized patients had many comorbidities making it difficult to control blood glucose. We noted that hypertension accounted for the highest portion among comorbidities (61.5%) because hypertension was the most common comorbidity and led to dangerous cardiovascular risks (Al-Eitan et al., 2016; Iglay et al., 2016; Hao et al., 2017; Schutta, 2017). The rates of good control of HbA1c in studies were low (Al-Eitan et al., 2016; Haghighatpanah et al., 2018; Kamrul-Hasan et al., 2020). Poor glycemic control led to adverse outcomes such as increasing risks of infection, prolonging the duration of treatment, and increasing risks of death in patients (Palta et al., 2017).

Table 2. Characteristics of insulin use.

Characteristics of insulin	Classification	n (%)
Types of insulin (n = 495)	Insulin 70% NPH/30% Regular	315 (63.6)
	Insulin 70% NPH/30% Aspart	69 (13.9)
	Insulin Regular	98 (19.8)
	Insulin Glargine	12 (2.5)
	Insulin Lispro	1 (0.2)
Antidiabetic drug regimens (n = 390)	Insulin monotherapy	286 (73.3)
	Combination therapy of insulin + ODA	104 (26.7)
	- Insulin + metformin	32 (8.2)
	- Insulin + sulfonylurea	4 (1.0)
	- Insulin + metformin + sulfonylurea	9 (2.3)
	- Insulin + metformin + DPP4i	51 (13.1)
	- Insulin + metformin + α-glycosidase inhibitors	1 (0.3)
	- Insulin + metformin + sulfonylurea+ DPP4i	7 (1.8)
Insulin regimens (n = 396)	1 injection of basal insulin	11 (2.8)
	1 injection of premixed insulin	4 (1.0)
	2 injections of premixed insulin	380 (95.9)
	3 injections of prandial + 1 injection of basal insulin	1 (0.3)
Insulin doses (mean ± SD)		23.4 ± 10.6
Insulin dose levels (n = 390)	<20	164 (42.1)
	20-40	197 (50.5)
	>40	29 (7.4)

In this study, the rate of good blood glucose control was 67.4%, higher than that of other studies (Moreira et al., 2013; Allende-Vigo et al., 2014; Lamos et al., 2017; Fiseha et al., 2018). The difference may be due to the sample size, demographic characteristics, study design, and selection of objectives for assessment. Controlling blood sugar in the target range not only is beneficial in preventing cardiovascular, renal, and eye complications but also helps patients recover early and shorten hospital stays. Therefore, the regimens of inpatient treatment always aim at good control of the patients' blood sugar goals. However, trying to achieve glycemic goals can lead to a risk of hypoglycemia, especially in elderly patients with multiple comorbidities. All patients in this study used insulin while the hypoglycemic event was the biggest barrier to insulin treatment. This study recorded 15 patients with at least one hypoglycemic test pattern with a rate of 3.8%. This might be due to the fear of hypoglycemia, which caused doctors to consider using lower doses of insulin than demand. In addition,

with the fear of hypoglycemia, patients tended to eat enough meals. Besides, the drug regimen for diabetes at the hospital was mostly insulin monotherapy; therefore, the restriction of combination of insulin and oral antidiabetic drugs also helped avoid hypoglycemia in patients.

The rates of premixed insulin use in all studies were high (Kalra et al., 2017; Poudel et al., 2017; Kamrul-Hasan et al., 2020) due to the history of drug use, simple treatment, and good blood sugar control. When comparing the effectiveness of two types of premixed insulin, BIAsp 30 and BHI 30, BIAsp 30 had more benefits such as lower frequencies of nocturnal hypoglycemic episodes, less weight gain, and lower treatment costs (Farshchi et al., 2016). The regimens of insulin monotherapy accounted for the majority (73.3%) and there were some differences in studies (Frid et al., 2016; Baruah et al., 2017; Caballero-Corchuelo et al., 2019) due to the history of drug use and characteristics of the

Table 3. Factors associated with poor blood glucose control.

Factors	Classification	Good control n (%)	Poor control n (%)	Univariate results		Multivariate results	
				OR (95%CI)	p	OR (95%CI)	p
Sex	Male	71 (65.7)	37 (34.3)	1.11 (0.69-1.78)	0.658	-	-
	Female	192 (68.1)	90 (31.9)	1			
Age	<60	72 (64.3)	40 (35.7)	1.22 (0.77-1.94)	0.399	-	-
	≥60	191 (68.7)	87 (31.3)	1			
BMI (kg/m²)	<23	164 (71.0)	67 (29.0)	1	0.071	-	-
	≥23	99 (62.3)	60 (37.7)	1.48 (0.97-2.28)			
Number of comorbidities	≤3	221 (70.2)	94 (29.8)	1	**0.019**	1	**0.025**
	>3	42 (56.0)	33 (44.0)	1.85 (1.10-3.09)		1.83 (1.08-3.11)	
HbA1c (%)	≤7	35 (94.6)	2 (5.4)	1	**<0.001**	1	**0.003**
	>7	228 (64.6)	125 (35.4)	9.59 (2.27-40.56)		8.94 (2.11-37.98)	
Regimens of antidiabetic drugs	Insulin monotherapy	197 (68.9)	89 (31.1)	1	0.312	-	-
	Combination therapy of insulin and ODA	66 (63.5)	38 (36.5)	1.27 (0.79-2.04)			
Insulin doses (UI/day)	≤40	250 (69.3)	111 (30.7)	1	**0.007**	1	**0.014**
	>40	13 (44.8)	16 (55.2)	2.77 (1.29-5.96)		2.66 (1.22-5.82)	

study sample. According to the recommendations, insulin should be considered the first-line agent for controlling blood sugar in inpatients and hospitalized patients should discontinue using antidiabetic agents in advance (Horton and Subauste, 2016; Kodner and Anderson, 2017; Umpierrez and Pasquel, 2017). On the other hand, in the group of therapy of insulin combined with oral drugs, the combination of insulin, metformin and DPP4i was used the most with 13.1%. The combination of these three drugs is effective in controlling blood glucose, reducing HbA1c, decreasing insulin doses, and protecting functions of beta cells (Vilsbøll et al., 2010; Shankar et al., 2017). The figures for the type of regimens with two premixed insulin injections in the studies were high (Baruah et al., 2017; Kalra et al., 2017) because this kind was convenient, the number of injections per day was small, and it was easy for patients to follow up. The type of premixed insulin regimens was as effective as the type of basal insulin regimens or basal-bolus insulin regimens (Giugliano et al., 2016; Anyanwagu et al., 2017; Kalra et al., 2017). However, according to the Royal Australian College of General Practitioners (RACGP), the choice of using the regimens with premixed insulin injections should depend on the patients' characteristics, diets, values of blood glucose, and conditions of comorbidities (RACGP, 2016). The

physiological insulin secretion of a normal person is 0.7-0.8 UI/kg/day. A Vietnamese person weighing about 50kg has a demand for insulin at about 35-40 UI/day (Ho-Pham et al., 2015). Therefore, there were three dose levels in our study. The insulin dose rate in the range of 20-40 UI/day was 50.5%. Mean (± SD) insulin dose was 23.4 ± 10.6 UI/day. Studies in China, India, Poland, Brazil, and 42 countries noted that mean of insulin values are different (Frid et al., 2016; Calliari et al., 2018; Kalra et al., 2018; Song et al., 2018; Gorska-Ciebiada et al., 2020) possibly because the mean of Asians' BMI is lower than that of the world's (McHugh et al., 2011).

In our study, hospitalized patients with >3 comorbidities had a higher rate of poor blood glucose control than patients with ≤3 comorbidities. Research by Jelinek et al. (2017) in the UAE showed that most patients had poor glycemic control when there were many comorbidities. It can be seen that hospitalized patients with multiple comorbidities are more difficult to achieve blood glucose control. This can be considered as one of the reasons for the low rate of inpatient glycemic control in our study. Comorbidities affect choices of diabetic drugs and prolong hospital stays and costs. The 2017 ADA (2017) found that comorbidities were factors that need to be considered when planning diabetes treat-

ment for patients. Therefore, research on the relationship between comorbidities and blood sugar control can help health officers make appropriate diagnoses and treatment methods to improve patients' health status and reduce mortality (Iglay et al., 2016). Our study recorded those patients with pre-admission values of HbA1c >7 had a higher rate of poor blood glucose control than patients with pre-admission values of HbA1c ≤7. Foreign studies also found a statistically significant difference between glycemic control and HbA1c (Ong et al., 2015; Sáenz-Abad et al., 2015; Anioke et al., 2019; Zhu et al., 2019). It can be seen that the relationship between these two factors has been proven through many studies in the world. Poor control in pre-admission values of HbA1c in patients will affect the effectiveness of treatments in the hospitals. This may be because the elderly patients with long-standing diabetes are poorly responsive to antidiabetic drugs, not adherent to treatments, or not able to control their diets. The at-admission values of HbA1c assist in the assessment of blood glucose control of patients in the previous 8-12 weeks and play important roles in helping healthcare professionals choose appropriate treatment regimens for patients during hospitalization. Through research on the relationship between daily insulin doses and inpatient glycemic control, we found that patients with insulin doses of >40 IU/day had a higher rate of poor blood glucose control than patients with insulin doses of ≤40 UI/day. A cross-sectional descriptive study on 691 patients at a Spanish hospital by Botella et al. (2011) showed a statistically significant difference in mean insulin dose between the group of good glycemic control and the group of poor glycemic control (p<0.001). Thus, it can be seen that the daily insulin doses are related to inpatient glycemic control. In our research, patients with insulin doses of ≤40 UI/day had better blood sugar control than patients with insulin doses of >40 UI/day. This may be due to the characteristics of the study sample and the remaining responsive ability to treatments of patients with low insulin doses.

The results of multivariable logistic regression analysis of factors related to blood glucose control showed the association between pre-admission values of HbA1c, the number of comorbidities, and insulin doses with poor blood glucose control. These results of multivariate analysis are consistent with the results of the previous univariate analysis. Therefore, factors such as pre-admission values of HbA1c, comorbidities, and insulin doses are related to inpatient glycemic control. This result is the premise for other in-depth studies and may contribute to the development of appropriate treatment regimens to improve the rate of blood glucose control for hospitalized patients with diabetes.

Limitations of this study

This study has some limitations. First, analyzes were performed based on available medical records, without patient intervention. Second, due to the lack of information in the medical records, some variables such as the duration of diabetes, the time the patient used insulin before admission, etc. were not analyzed in this study. Third, samples were collected from only one hospital in Vietnam. Future studies should expand the study population to other hospitals to increase the generalizability of the research results. Furthermore, an intervention study using multiple variables is also necessary to further explore the features of the use of insulin in treatment for inpatients with diabetes.

CONCLUSION

This study recorded the group of good blood glucose control accounted for the majority with 67.4%. Factors such as pre-admission values of HbA1c, comorbidities, and insulin doses were related to inpatient glycemic control. Besides, the choice of insulin use at the Department of General Medicine was also diverse with five different types of insulin. The type of insulin regimens preferred by the Department of General Medicine to treat inpatients was the type of regimens with the combination of two premixed injections (95.9%) because of the benefits of this kind of regimens in glycemic control as well as post-discharge use.

The rates of blood glucose control in this study and other domestic and overseas research were still low. This may be due to differences in the selection of targets for the evaluation of different studies. This study has a limitation in variable selection with the low sample size. We suggest that more in-depth studies with appropriate methods should be conducted to understand the obstacles in inpatient glycemic control. Studies on the patients' insulin compliance to find solutions to improve the rate of glycemic control.

CONFLICT OF INTEREST

The authors declare no conflicts of interest.

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AUTHOR CONTRIBUTION:

Contribution	Huynh DTM	Vo DQL	Tran VD
Concepts or ideas	x		
Design	x	x	
Definition of intellectual content		x	x
Literature search	x	x	
Experimental studies		x	
Data acquisition	x		
Data analysis	x		
Statistical analysis		x	x
Manuscript preparation	x	x	x
Manuscript editing	x	x	x
Manuscript review	x	x	x