CLINICS

CLINICAL SCIENCE

Management of diabetes by a healthcare team in a cardiology unit: a randomized controlled trial

Maria Antonieta P. de Moraes,[I] Juliane Rodrigues,[I] Mariana Cremonesi,[I] Carisi Polanczyk,[II] Beatriz D. Schaan[II,III]

[I] Instituto de Cardiologia, Fundação Universitária de Cardiologia, Clinical Research Center, Porto Alegre/RS, Brazil. [II] Universidade Federal do Rio Grande do Sul, Hospital de Clínicas de Porto Alegre, Cardiology Division, Porto Alegre/RS, Brazil. [III] Universidade Federal do Rio Grande do Sul, Hospital de Clínicas de Porto Alegre, Endocrine Division, Porto Alegre/RS, Brazil.

OBJECTIVE: To assess the effectiveness of healthcare team guidance in the implementation of a glycemic control protocol in the non-intensive care unit of a cardiology hospital.

METHODS: This was a randomized clinical trial comparing 9 months of intensive guidance by a healthcare team on a protocol for diabetes care (Intervention Group, n = 95) with 9 months of standard care (Control Group, n = 87). Clinicaltrials.gov: NCT01154413.

RESULTS: The mean age of the patients was 61.7 ± 10 years, and the mean glycated hemoglobin level was 71 ± 23 mmol/mol (8.7 ± 2.1%). The mean capillary glycemia during hospitalization was similar between the groups (9.8 ± 2.9 and 9.1 ± 2.4 mmol/l for the Intervention Group and Control Group, respectively, $p = 0.078$). The number of hypoglycemic episodes ($p = 0.77$), hyperglycemic episodes (47 *vs.* 50 in the Intervention Group and Control Group, $p = 0.35$, respectively), and the length of stay in the hospital were similar between the groups ($p = 0.64$). The amount of regular insulin administered was 0 (0–10) IU in the Intervention Group and 28 (7–56) IU in the Control Group ($p < 0.001$), and the amount of NPH insulin administered was similar between the groups ($p = 0.16$).

CONCLUSIONS: While guidance on a glycemic control protocol given by a healthcare team resulted in a modification of the therapeutic strategy, no changes in glycemic control, frequency of episodes of hypoglycemia and hyperglycemia, or hospitalization duration were observed.

KEYWORDS: Diabetes Mellitus Type 2; Insulin Treatment; Randomized Controlled Trial; Health Education.

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E-mail: beatrizschaan@gmail.com

Tel.: 55 51 3359-8127

INTRODUCTION

Diabetes mellitus, a highly prevalent disease characterized by sustained hyperglycemia and chronic complications, leads to considerable morbidity and mortality (1). In the course of the disease, patients often need to be hospitalized because of infections, acute coronary syndrome, percutaneous/surgical coronary revascularization, stroke, or complications of peripheral vascular disease, which are frequently accompanied by worsening hyperglycemia, a predictor of poor outcomes (e.g., prolonged hospital stay, disability after hospital discharge, and death) (2,3).

Intensive glycemic control through continuous intravenous insulin infusions has been related to better outcomes in hospitalized patients with diabetes submitted to cardiac surgical procedures (4,5) and after myocardial infarction (6). Glycemic control through subcutaneous insulin regimens can also reduce the frequency of adverse outcomes in adult patients with diabetes that are admitted to general surgical wards (7). However, outside these situations, diabetes management is often not the primary focus during hospitalization and is usually considered less important compared with the condition that led to admission (8). Although sliding-scale regular insulin (SSI) regimens are criticized by specialists because of the associated glucose instability and increased frequency of hypoglycemic events when administered to non-intensive care patients, they are frequently used. Reviews and guidelines strongly suggest that SSI regimens should be avoided (9–11) because the use of these regimens alone cannot control blood sugar levels in many patients (12), and they are less efficient than basal-bolus insulin therapy in reducing hypoglycemia and achieving glycemic control (13,14).

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However, educating healthcare professionals on protocols for ideally controlling blood glucose levels in hospitalized patients has only been tested in a few studies, and most of these studies were not well designed. Baldwin et al. (15) described a case of successful education delivered by a healthcare team regarding the implementation of a diabetes treatment protocol; however, a historical control group was used for comparison. The aim of this study was to evaluate whether providing guidance to a healthcare team responsible for patients with diabetes hospitalized in a non-intensive care unit of a cardiology hospital (with emphasis on the implementation of a glycemic control protocol) could improve glycemic control, reduce the frequency of hypo- and hyperglycemic episodes, and reduce the length of stay in the hospital.

RESEARCH DESIGN AND METHODS

Study design: The intervention program was assessed in a randomized controlled trial developed in a non-intensive care unit of a cardiology hospital.

Eligibility criteria: All in-patients with type 2 diabetes consecutively admitted to a clinical ward at our institution from December 2007 to May 2009 were eligible for enrollment. Inclusion criteria included an age over 18 years and a personal history of type 2 diabetes mellitus (defined as an onset of diabetes after the age of 40 years, initial treatment with diet modification and/or oral anti-diabetic medication, current use of any anti-diabetic medication, fasting plasma glucose $\geq$7.0 mmol/l, or a casual glucose level >11.1 mmol/l) (16). Exclusion criteria included known malignant neoplasia, hemodialysis, use of corticosteroids or immunosuppressants, cognitive neurological sequelae, an expected hospital stay of fewer than 72 hours, transfer from an intensive care unit using intravenous insulin regimens, or cases in which the physician or the patient did not agree with the treatment protocol.

The study was conducted in accordance with the Guidelines and Standards Regulating Research Involving Human Subjects and was approved by the Research and Ethics Committee of Instituto de Cardiologia/Fundação Universitária de Cardiologia. Written informed consent was obtained from each patient prior to randomization.

The sample size calculation was based on a difference in glycemia of 20 mg/dl between the intervention (IG) and control (CG) groups at the end of the hospitalization period. The total number of patients in each group was 93, based on an α of 0.05 and a power of 0.80 ($\beta = 0.20$).

Study protocol

The patients were randomly assigned to the IG or CG. Randomization was performed using a computerized process to generate random numbers. It was performed in three-month blocks for each intervention period, comprising 9 months for the CG and 9 months for the IG. The trial was registered as clinical trial number (NCT) 01154413.

Patients in the IG were treated by medical and nursing professionals who were previously instructed in the use of a protocol for diabetes management during hospitalization that was based on current guidelines and local issues (9). This systematic guidance program consisted of the following steps: 1) Distribution of the protocol, which described the actions to be taken based on intercurrent diseases presented by the patients to all members of the team; 2) Monthly meetings to review and discuss how the professionals should act in consonance with the protocol; 3) Display of reminders on the computer screen every time a physician prescribes blood glucose testing, insulin, or an anti-diabetic medication; 4) Weekly in-service guidance sessions to solve questions that may arise among the healthcare professionals, with individual case discussion if necessary; 5) Distribution of pocket guides, including a summary of the protocol (Figure 1); and 6) Attachment of informative labels to the chart of each patient enrolled in the study.

Patients in the CG group were treated according to the decisions made by healthcare professionals who received no guidance on the protocols for treating hospitalized diabetic patients. The healthcare team decided which monitoring methods and drug treatments for diabetes were to be used and the frequency at which monitoring would be prescribed, as well as the use of SSI regimens based on capillary glycemia readings, as desired.

Three nurses and one endocrinologist (B.D.S.) at the institution were responsible for the guidance of the healthcare professionals, which involved reviewing and discussing issues associated with the patients' cases. This team was responsible for the systematic guidance of members of the clinical staff who worked directly with the patients admitted to the selected unit during the period of intervention and data collection. The clinical care staff was composed of 4 nurses, 20 nursing technicians, 6 staff physicians, and 15 medical residents, and the staff was the same for both the CG and IG groups. The clinical unit where the study was conducted usually had 50 inpatients, approximately 15% of whom had diabetes. All patients were prescribed a low-fat, low-carb diet (16).

All patients were invited to answer a structured questionnaire containing questions about clinical and demographic characteristics, history of the present illness, co-morbidities, previous glycemic control, current anti-diabetic treatment, and duration of diabetes. Anthropometric variables (weight, height, body mass index, and waist circumference), blood pressure, and heart rate were obtained. The results of a biochemical evaluation, which was requested by the attending physician on admission or by the researchers during the first 48 hours of admission, were also recorded and included glycated hemoglobin, fasting plasma glucose, creatinine, and a routine urinalysis.

Glycemia was checked and recorded (capillary samples, reagent strips- Advantage, Roche, Lima, Peru) before each meal in the IG group as described in the protocol (Figure 1) and as prescribed by the attending physician in the CG group. Glycemia was also checked in both groups when the patients complained of symptoms that could be related to hypoglycemia. Throughout hospitalization, the following clinical events were observed and recorded: infections, surgeries, stroke, acute myocardial infarction, angina, death, hypoglycemia, and hyperglycemia. Hypoglycemia was defined as a blood glucose level lower than 3.8 mmol/l, irrespective of the presence or absence of symptoms. Severe hypoglycemia was defined as a blood glucose level lower than 3.8 mmol/l in a patient unable or unwilling, because of neuroglycopenia, to take carbohydrates orally (17). Hyperglycemia was defined as a blood glucose level higher than 13.8 mmol/l, irrespective of the presence or absence of symptoms.

Outcome measures

The primary endpoint was improvement in glycemic control (fasting plasma glucose at the end of hospitalization).

Algorithm for the treatment of patients with type 2 diabetes in non-intensive care units.

Inclusion criteria: 1. Personal history of type 2 diabetes;
2. In use of oral antiabetic agents or insulin;
3. No previous history of diabetes, but two fasting glycemias >7.0 or casual glycemia >11.1mmol/l

Target: Fasting glycemia ~7.0mmol/L; Glycemia before lunch and dinner not over 10mmol/L

A. Management on arrival to the hospital

1. Prescribe diet for diabetes (low fat; low carb);
2. Check capillary glycemia before breakfast, before lunch and before dinner during all the 1st 24h in hospital;
3. Maintain prescription of insulin or oral antidiabetic agent that the patient had been using previously;
   Exceptions: clear indications for intensive insulin therapy, hospitalization due to acute ischemic syndrome, creatinine >1.5mg/dl or oliguria/anuria – stop Metformin.
   NPO -> stop sulfonylueas
4. Never use regular insulin according to insulin scales especially for glycemias that do not need immediate reduction;
5. In patients with severe hyperglycemia (>16,6mmol,l) who do not have any indication for continuous insulin IV regular, insulin can be prescribed, 4-6 (non obese) or (6-8) (obese) U subcutaneously;
6. Avoid regular insulin at 10 p.m.

B. Management of the evolution during hospitalization

1. Maintain prescription of diet for diabetes (low-fat; low carb);
2. Maintain capillary glycemia checking before breakfast only or before breakfast and before dinner;
3. Adjust insulin or oral antidiabetic agents according to glycemia of the previous 48-72h; do not perform daily adjustments excep if hypoglicemia occur;
4. Patients who were being treated with diet of oral antidiabetic agents, and maintain hyperglycemia, should have their medication titrated to maximum doses, should have precipitating factors (corticosteroid use infections, surgical procedures, etc) investigated and treated if no improvement is observed; these patients should begin NPH insulin;
5. Patients who were diagnosed with diabetes during hospitalization should be prescribed a diet for diabetes, oral antidiabetic agents or insulin according to glycemias after 2 to 3 days of clinical observation.

Figure 1 - The diabetes management protocol. NPO: from Latin, *Nil per os*, which means nothing through the mouth.

Secondary outcomes included the number of hypoglycemia and hyperglycemia episodes during hospitalization, period of hospitalization, frequency of events potentially related to diabetes (infections, stroke, acute myocardial infarction, angina, or death), number of glucose sachets needed for hypoglycemic episodes, number of capillary glycemia assessments, doses/number of NPH and regular insulin injections, and use of SSI regimens during the hospitalization. These endpoints were assessed during hospitalization through analyses of medical and hospital infection control records. Patients were followed for the entire hospital stay.

Statistical analysis

Categorical data are presented as frequencies, and their differences were analyzed using the chi-square test. Quantitative data with normal distributions are presented as the means $\pm$ SD, and their differences were analyzed using Student's t test. Nonparametric variables are presented as the median $\pm$ interquartile range (IQR) (P25-P75) and were analyzed using the Mann-Whitney test. Analysis of covariance was used to adjust the data (glycemia) for baseline HbA1c and plasma glucose. All tests followed the principle of intention to treat. Differences were considered significant for a two-tailed p-value <0.05. Data were analyzed using SPSS statistics software (version 19.0; SPSS, Inc., Chicago, IL).

RESULTS

A total of 720 patients with type 2 diabetes were admitted between December 2007 and May 2009; 182 patients met the inclusion criteria and were randomized into the IG (87

patients) or CG (95 patients) (Figure 2). After randomization, 5 patients died (3 from the IG and 2 from the CG) due to clinical complications or infections unrelated to the research protocol. All patients were followed from admission until discharge.

The baseline characteristics of the groups were similar (Table 1). The mean age was 61.7±10.2 years; 61% were women; the fasting plasma glucose level at the time of admission was 8.5±3.5 mmol/l; the glycated hemoglobin level was 71±23 mmol/mol (8.7±2.1%); and the duration of diabetes was 96.0 (24.0–171.0) months. Most patients (83.5%) were taking anti-diabetic agents, the most common of which were metformin (52.7%) and insulin (33.5%).

The primary and secondary outcomes are presented in Table 2. The primary outcome (improvement in glycemic control as evaluated by fasting plasma glucose at the end of hospitalization) was not different between the groups ($p=0.21$, corrected for baseline plasma glucose, and $p=0.52$, corrected for baseline HbA1c). The frequencies of hypoglycemic and hyperglycemic episodes were also similar between the groups ($p=0.77$ and $p=0.35$, respectively). On average, 24.3±16 capillary glycemia assessments were performed per patient (23.6±15 in the IG and 25.2±16.5 in the CG; $p=0.50$). Regular insulin was prescribed for 108 (59.3%) patients, with a greater frequency in the CG compared with the IG ($p<0.01$); NPH insulin was prescribed for 65 (37.7%) patients, with no difference in prescription frequency between the groups ($p=0.23$). A total of 40 (42.1%) and 73 (83.9%) doses of regular insulin were administered to the IG and CG patients, respectively ($p<0.01$), and 38 (40%) and 25 (28.7%) doses of NPH insulin were administered to the IG and CG patients, respectively ($p=0.15$). The amount of insulin, expressed in units administered, was 0 (0–10) IU and 28 (7–56) IU for the IG and CG patients (regular insulin, $p<0.01$), respectively, and 0 (0–114) and 0 (0–52) for the IG and CG patients (NPH insulin, $p=0.17$), respectively. These findings show that 55 (57.9%) and 14 (16.1%) patients in the IG and CG, respectively, did not receive regular insulin, and 57 (60.0%) and 62 (71.3%) patients in the IG and CG groups, respectively, did not receive NPH insulin. Sliding scales of regular insulin based on capillary glycemia were used more frequently in the CG (81.6%) than in the IG (2.1%, $p<0.01$). The occurrence of clinical and cardiovascular events during hospitalization was similar between the two groups, as was the number of deaths. The mean duration of hospitalization was 6 (4–10) days, which was similar between the groups ($p=0.64$).

As shown in Figure 3, panel A, a trend toward a reduction in the mean capillary glycemia was observed during the first week of hospitalization in both patient groups. However, the mean capillary glycemia during hospitalization was not different between the groups ($p=0.08$). After adjustment for baseline HbA1c and plasma glucose, the mean capillary glycemia was also not different between the groups ($p=0.52$ and $p=0.21$, respectively). To attempt to identify any carryover effect, which was not observed, the same analysis was performed and is shown for each 3-month evaluation in Figure 3, panel B.

DISCUSSION

In this randomized controlled trial, we investigated attempts to modify diabetes care through guidance of the healthcare

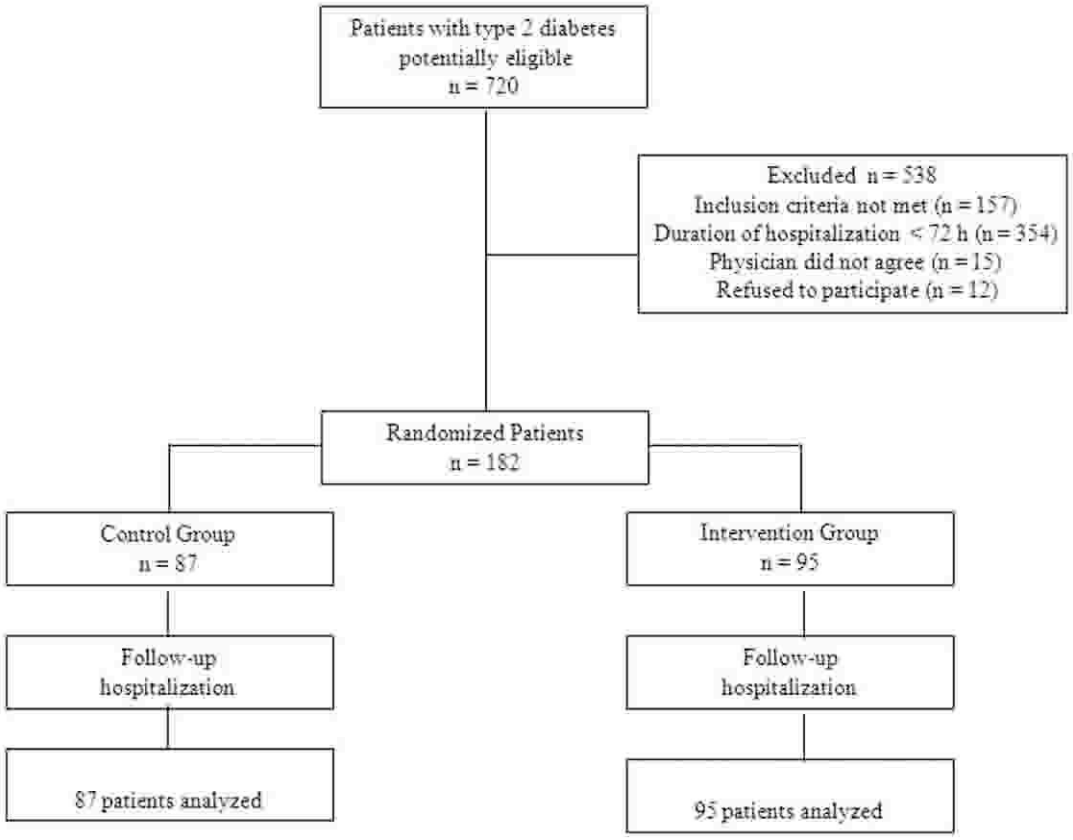

Figure 2 - Flow chart of patient randomization.

Table 1 - Baseline clinical characteristics of the patients.

Clinical Variables	Control Group (n = 87)	Intervention Group (n = 95)	*p*- value
Age (years)	60 ± 10	63 ± 11	0.43
Female gender	58 (66.7)	53 (55.8)	0.17
Caucasian	75 (86.2)	82 (86.3)	1.00
Schooling (years)	4.0 (3.0–8.0)	5.0 (2.0–7.0)	0.68
Weight (kg)	76.6 ± 16.7	74.6 ± 14.6	0.39
Body mass index (kg/m^2)	29.8 ± 5.4	28.4 ± 5.2	0.08
Systolic blood pressure (mmHg)	127.9 ± 23.8	132.6 ± 21.3	0.16
Diastolic blood pressure (mmHg)	78.5 ± 14.5	79.5 ± 11.3	0.74
HbA1c (mmol/mol and %)	75 ± 25 (9.0 ± 2.1)	68 ± 21 (8.4 ± 1.9)	0.04
Creatinine (mmol/mol)	79 ± 35	88 ± 35	0.44
Admission fasting plasma glucose (mmol/l)	8.9 ± 3.7	8.2 ± 3.2	0.47
Clinical comorbidities			
Hypertension	81 (93.1)	80 (84.2)	0.10
Dyslipidemia	51 (58.6)	60 (63.2)	0.63
Smoking	49 (56.3)	53 (55.8)	1.00
Peripheral vascular disease	21 (24.1)	19 (20)	0.62
Family history of ischemic heart disease	57 (65.5)	58 (61.1)	0.63
Family history of diabetes	50 (57.5)	64 (67.4)	0.22
Heart failure	36 (41.4)	35 (36.8)	0.63
Acute myocardial infarction	45 (51.7)	43 (45.3)	0.47
Percutaneous coronary revascularization	36 (41.4)	37 (38.9)	0.85
Coronary artery bypass graft	11 (12.6)	16 (16.8)	0.55
Cardiovascular medications	83 (95.4)	93 (97.9)	0.59
ACEI	78 (89.7)	83 (87.4)	0.63
Diuretic	46 (52.9)	45 (47.4)	0.45
ASA	69 (79.3)	85 (89.5)	0.05
Statins	56 (64.4)	74 (77.9)	0.04
Beta-blocker	69 (79.3)	83 (87.4)	0.14
Diabetes medications	72 (82.8)	80 (84.2)	0.94
Metformin	50 (57.5)	46 (48.4)	0.28
Sulfonylureas	34 (39.1)	29 (30.5)	0.29
Regular insulin (IU/day)	2 (2.3)	0 (0.0)	0.43
NPH insulin (IU/day)	27 (31.0)	34 (35.8)	0.60
Diabetes duration (months)	120 (24–192)	84 (24–132)	0.35

Continuous variables are expressed as the means ± standard deviation and the median (P25-P75). Categorical variables are expressed as absolute frequency (n) and relative frequency (%). The chi-square test, Student's t test, and Mann-Whitney test were used. HbA1c: glycated hemoglobin; ACEI: angiotensin-converting enzyme inhibitor; ASA: acetylsalicylic acid. Reference levels: HbA1c, <7.0%; creatinine, 44.2–106 mmol/l (0.50–1.20 mg/dl); plasma glucose, 3.9–7.2 mmol/l (70–130 mg/dl).

Table 2 - Primary and secondary outcomes.

Outcomes	Control Group (n = 87)	Intervention Group (n = 95)	*p*-value
Primary outcomes			
Fasting plasma glucose at the end of hospitalization (mmol/l)	9.8 ± 2.9	9.1 ± 2.4	0.21*
Secondary outcomes			
Hypoglycemic episodes (no.)	18 (20.7)	17 (17.9)	0.77
Hyperglycemic episodes (no.)	50 (57.5)	47 (49.5)	0.35
Glucose sachets (no.)	9 (10.3)	11 (11.6)	0.97
Number of capillary glycemia assessments	25.2 ± 17	23.6 ± 15	0.50
Use of regular insulin	73 (83.9)	40 (42.1)	<0.01
Use of NPH insulin	25 (28.7)	38 (40.0)	0.15
Use of SSI	71 (81.6)	2 (2.1)	<0.01
Infection	3 (3.4)	2 (2.1)	0.92
Coma	0 (0)	1 (1.1)	1.00
Convulsion	0 (0)	1 (1.1)	1.00
Cardiovascular events			
Angina	4 (4.6)	2 (2.1)	0.59
Acute myocardial infarction	2 (2.3)	1 (1.1)	0.93
Cardiac surgery	11 (12.6)	10 (10.5)	0.83
Cerebrovascular accident	0 (0)	2 (2.1)	0.51
Length of hospital stay (days)	6 (4–10)	7 (5–10)	0.64
Death	2 (2.3)	3 (3.2)	1.00

Continuous variables are expressed as the means ± standard deviation, median, and interquartile range, and categorical variables are expressed as absolute and relative frequencies (%). The chi-square test and Student's t test were used. *ANCOVA corrected by baseline plasma glucose. Hypoglycemia: glycemia <3.8 mmol/l; hyperglycemia: glycemia >13.8 mmol/l. SSI: sliding scale of insulin.

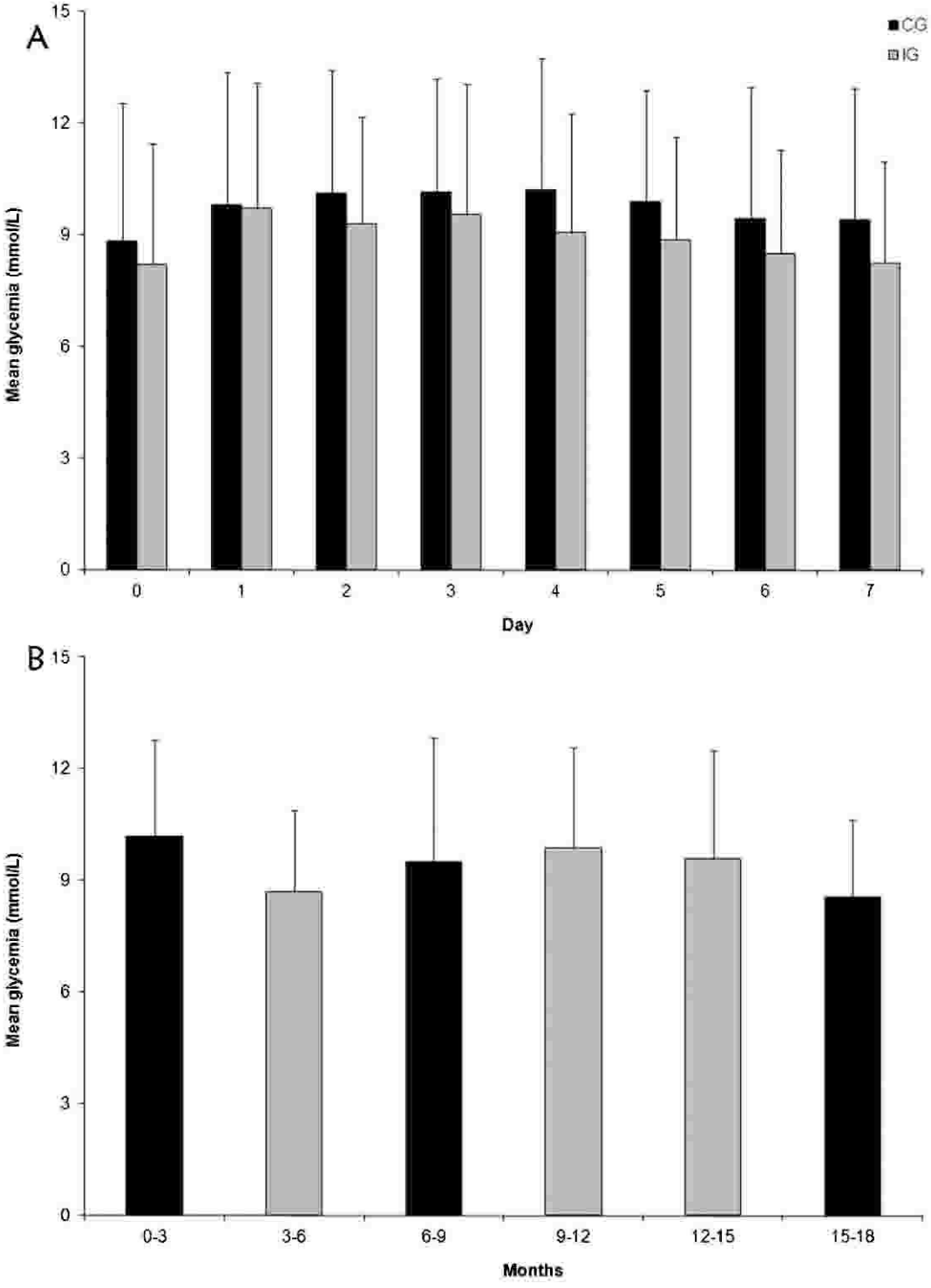

Figure 3 - Panel A) Distribution of capillary glycemia (mean ± SD) during the first week of hospitalization in the groups studied. **Panel B)** Distribution of capillary glycemia (mean ± SD) for each 3-month evaluation in the groups studied. CG: control group (no guidance of the healthcare team); IG: intervention group (intensive guidance of the medical/nursing staff regarding the protocol).

team regarding the implementation of a pre-specified treatment protocol and assessed its possible impact on clinical outcomes. We found that the incidence of prescribing regular insulin "as needed" decreased substantially and that the frequency of capillary glycemia was not different between the groups, while glycemia and the occurrence of hypoglycemic and hyperglycemic episodes remained unaffected. Seeking to identify changes in professional behavior and in clinical outcomes due to this guidance, we showed that the proposed intervention changed prescription practice but that there was

no improvement in glycemic control or reduction of hypoglycemic or hyperglycemic episodes, hospital stay, or other clinical outcomes related to diabetes.

Basal-bolus treatment with dose correction using long-acting, once-daily insulin and short-acting insulin prior to meals in patients with type 2 diabetes was previously shown to improve glycemic control and to reduce hospital complications compared with SSI use in clinical (14) and general surgery (7) patients. One study of diabetic hospitalized patients receiving enteral nutrition reported similar glycemic control in patients treated with a basal-bolus regimen and those treated with SSI regimens; however, at the end of the study, 48% of the patients receiving SSI required the addition of basal insulin (12). However, these favorable results were obtained in randomized clinical trials in which intensified glucose control was the primary objective; it is well known that treatments that are highly effective in trials are not always effective in real-life care systems.

Guidance by healthcare professionals concerning diabetes management during hospitalization was effective in changing prescription practice but did not translate into better outcomes. Very low doses of regular insulin were prescribed to the intervention groups, as SSI was frequently omitted from the prescription. We attribute these results to the intensive guidance program provided to the medical staff in addition to the supervision of the management by an endocrinologist. Another study aiming to manage patients without the use of SSI through systematic education of the healthcare team showed that training a multidisciplinary team was effective and safe (15); however, this was a retrospective study using a historical control group. In a quasi-experimental study (prior to and after intervention) (18) that included seminars and the distribution of pocket guides to a healthcare team in an attempt to increase adherence to current guidelines on glycemic management of hospitalized patients, the use of basal-bolus insulin regimens increased from 17% to ~90%, resulting in better glucose control in most patients; however, most of these changes were not maintained in the long term. Interestingly, a small study focusing on improving medical resident knowledge regarding the management of hyperglycemia in hospitalized patients also revealed better short-term glucose control in patients (19).

The results can partially be explained because the policy of our institution, as many others with similar characteristics, is the speedy resolution of the underlying cardiac problem, focusing on solving the main problem during hospitalization and leaving non-urgent issues for future resolution at secondary and primary levels. Adherence to this policy resulted in short-duration hospitalizations. Additionally, because the treatment was primarily focused on the underlying cardiac disease, less attention was given to diabetes (20). Moreover, the high turnover of medical residents in the unit where the study was conducted could result in decreased efficiency of the guidance program. Achieving good glycemic control is a process that may take longer than the average 6 days for which these patients remained in the hospital (15).

Another possible explanation for the lack of improvement in glycemic control is that the glycemic status of our patients as they arrived at the hospital was not particularly poor (fasting plasma glucose, 8.5 ± 3.5 mmol/l); a higher magnitude of the effect of the intervention would be expected when applied to a population with higher potential benefits (worse glycemic control at admission) compared with a population with less potential benefits (better glycemic control at admission) (21). One study that showed good glucose control over a few days (22) was conducted in patients with a higher mean plasma glucose at the time of admission.

Some limitations of this study should be mentioned. A study conducted at one center in a single non-intensive inpatient unit may provide results that cannot be fully reproduced in other scenarios. The relatively short follow-up time may not allow for the sufficient assessment of the clinical benefit of improved glycemic control; however, this situation reflects the real scenario in cardiology hospitalization units of a middle-income country. Finally, another point to be considered is the randomization process. As two inpatient units with a population of individuals with similar characteristics were not available, we chose to alternate treatment in three-month blocks within the same unit, which may have resulted in interference between the CG and the IG. However, no carryover effect among these blocks was observed in the outcomes evaluated.

The clinical experience of glycemic control based on a pre-established protocol for hospitalized cardiac patients with diabetes described in the present study shows that the protocol can be managed in non-intensive care units. Both strategies were equally effective; however, while guidance by the healthcare team regarding the glycemic control protocol resulted in the modification of the therapeutic strategy, no changes in glycemic control, frequency of episodes of hypoglycemia and hyperglycemia, or hospitalization time were observed. Whether these data indicate a real negative result in which the use of insulin sliding scales is less harmful in the short-term hospitalization of diabetic patients or whether they underscore the need for further assessment and more intensive intervention programs with longer follow-ups remains to be investigated.

AUTHOR CONTRIBUTIONS

Moraes MA was involved in the conception and design of the study; data collection, analysis, and interpretation; and drafting and editing of the final document for publication. Schaan BD was involved in the conception and design of the study; data analysis and interpretation; and writing, drafting, and editing of the final document for publication. Rodrigues J participated in data collection, statistical analysis, and editing of the final text for publication. Cremonesi M was involved in data collection, analysis, and interpretation. Polanczyk C was involved in the conception and design of the study, data analysis and interpretation, and reviewing all parts of the final document for publication. All authors read and approved the final version of the manuscript.

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