

Economic Impact of a Dispensing Analog Insulin Strategy to Diabetic Patients

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Abstract: Objective: Assess the economic impact of the dispensing control strategy implementation on analogue insulin dosage in diabetic patients of the subsidized system of Antioquia. Methodology: A retrospective cohort study compares the units of analogue insulin consumed with the expense per patient during the periods of December/14-May/15 versus December/15-May/16. Statistical treatment is applied to data obtained and the results are analyzed. Results: The expense per patient during the period of December/15-May/16 was statistically less than the one during the same period on the year before (December/14-May/15), having a state dispensing saving per patient of US\$ 1.34 per month. And a saving per patient in the pharmaceutical care is approximately US\$ 2.82 per month. Conclusions: Cost savings in care of insulin-dependent diabetic population enrolled in the subsidized plan was possible due to the development of cost/effective dispensing strategies that allowed access and safety of insulin therapy.

Key words: Dispensing, insulin, dosage, cost.

1. Introduction

DM (diabetes mellitus) is a complex pathological condition, as it is related to multiple micro vascular complications such as retinopathy, nephropathy and neuropathy- and macro vascular- such as acute myocardial infarction, cerebrovascular and peripheral vascular diseases, which lead to decreasing life quality and expectancy to those who suffer it. This is why it is considered a priority public health problem and requires more continuing care [1, 2], based on risk-reduction strategies, rather than just blood glucose control on the patient.

In 2015, 415 million people around the world suffered DM, which means that 1 out of 11 people developed diabetes. 642 people are estimated to have this condition by year 2040 [3, 4].

The use of more technologically developed

medicine has caused improvement in health and increased life quality in patients with diabetes mellitus [5]

Health spending and specifically the one associated with the use of medicines cause a major impact on national economy [6].

Substantial progress has been achieved in the pharmacological treatment of diabetes during the last years by developing new molecules. Analogue insulin represents a very important and current therapeutic group for the treatment and morbidity control due to molecular design and recombinant-DNA techniques that have permitted the development of molecules when inducing replacement of one or two amino acids in the insulin molecule in order to reduce monomer-monomer interactions [7]. As there are problems in the configuration of the products in the systems supporting the prescription or the doctors are not familiar with information for an adequate prescription, this technology of obtaining and

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developing molecules plus non-conventional pharmaceutical means or that require previous knowledge for adequate prescription has increased human error in doctors.

For years now, all types of insulin are already included on the drugs' list covered by the General System of Social Security in Health in Colombia, and its use is increasing as a result a migration from human insulin to the analogue ones.

One of the main actions at the COHAN (cooperativa de hospitales de antioquia) is to guarantee easy and secure access to drugs according to our patients' needs. That is why the initiative of creating a strategy preventing errors in prescriptions and guaranteeing therapeutical requirements of the patients was started.

2. Objective

Assess the economic impact on a dispensing control strategy implementation of analogue insulin dosage in diabetic patients of the subsidized system of Antioquia.

3. Material and Methodology

3.1 Study Design

A retrospective cohort study in which an intervention to the drug dispensing on diabetic patients prescribed with any of the analogue insulin available on our country—*vial, pen, and cartridge*—was introduced. 1,639,349 patients enrolled in the subsidized General System of Social Security in Health in Antioquia receiving outpatient dispensing by COHAN through the pharmacy services network and the associated hospitals during the period of time between December 1, 2014 and May 31, 2015 and from December 1, 2015 to May 31, 2016, were taken into account. The exclusion criteria were patients who were not receiving analogue insulins during the periods of time listed before and patients who were treated with insulin titration therapy and carbohydrate count. 4,373 patients in treatment with

analogue insulin out of a total of 39,923 diabetic patients (10.9% of the diabetic population) enrolled in the subsidized system in Antioquia were identified during the period of the strategy implementation.

3.2 Study Period

The pre-intervention phase caused the identification of the need to ensure measures and strategies that allowed a rational dispensing according to the patients' clinical needs. As a result, the educational intervention was defined between September 1, 2015 and November 30, 2015. Its results were assessed from June 2016 and August 2016.

3.2 Interventions

The intervention consisted of 5 main strategies:

Training the pharmacy care technical directors about the importance of making the correct mathematic calculation that guaranteed the medicine dispensing according to the dosage prescribed by the treating physician.

Strategy disclosure to pharmacy care technical directors via e-mail explaining the consideration which lay behind the implementation in each of the working places.

Personal support to pharmacy care with the largest operations volume (reference) and with pharmaceutical chemical care personnel as a strategy guarantor of execution and backup in case there was any confusing situation during care.

Informative statement notification to the prescriber warning them about the situation.

Enable a phone line to give personal pharmaceutical support in case of any strategy related doubt.

3.3 Information Source

The information of the variables related to analogue insulin prescription in diabetic treatment was obtained from the drug dispensing data base at Cooperativa de Hospitales de Antioquia in which the drug dispensing is registered using the HERINCO information system,

property of COHAN.

3.4 Data Analysis

An Excel 2010 data base that allowed quantifying the economic costs related to analogue insulin dispensing in the state pharmaceutical care during 6 months of the year 2015 and 6 months of 2016 was designed for data analysis.

This analysis was done with the statistical package SPSS 18.0 for Windows.

A sample size of the population universe was taken, with an error range of 5%, + 10% to counteract a possible lack of information on the data bases used. The assumption of normality was validated with the Kolmogorov-Smirnov test. The statistical result was a 0.22, with 420 degrees of freedom and a significance $> 0.05\%$, which indicates the data are

accepted under a normal distribution. Descriptive statistical analysis was applied and *t*-tests were run for independent samples, considering the cost/patient in analogue insulin therapy on each of the two periods of time studied as a dependent variable. A value for $p < 0.05$ was considered as statistically significant.

4. Results and Discussion

An intervention on the dispensing of analogue insulin treatment for 4,373 diabetic patients enrolled in the subsidized system in 116 municipalities of Antioquia, during the first 6 months of 2016 was performed. The insulin found to be of greater rotation in both periods of time studied was the insulin Glargine pen 300 units/mL, covering a 37% of the dispensing of this therapeutic family in 2016 and a 32% in 2015 (see Tables 1 and 2). 63% of the dispensing

Table 1 Quantity and type of analogue insulins dispensed in 2015.

2015		
Medicine description	Total units of dispensed	%
Insulin glargine 100 units/mL vial × 3 mL PEN	12,579	32%
Insulin glargine 100 units/mL vial × 10 mL	8,911	23%
Insulin glulisine 100 units/mL pen × 3 mL	7,374	19%
Insulin glulisine 100 units/mL vial × 10 mL	3,553	9%
Insulin detemir 100 units/mL pen × 3 mL	3,537	9%
Insulin aspart 100 units/mL pen × 3 mL	1,497	4%
Insulin lispro 100 UI/mL pen × 3 mL	545	1%
Insulin glargine 100 units/mL cartridge × 3 mL	506	1%
Insulin glulisine 100 units/mL cartridge × 3 mL	417	1%
Insulin lispro 100 units/mL vial × 10 mL injectable solution	263	1%
Total	39,182	

Table 2 Quantity and type of analogue insulins dispensed in 2016.

2016		
Medicine description	Total units of dispensed	%
Insulin glargine 100 units/mL vial × 3 mL PEN	23,743	37%
Insulin glulisine 100 units/mL pen × 3 mL	14,530	23%
Insulin glargine 100 units/mL injectable Sol. × 10 mL	12,795	20%
Insulin glulisine 100 units/mL vial × 10 mL	5,231	8%
Insulin detemir 100 units/mL pen × 3 mL	4,343	7%
Insulin aspart 100 units/mL pen × 3 mL	2,192	3%
Insulin lispro 100 units/mL pen × 3 mL	593	1%
Insulin glargine 100 units/mL injectable Sol. cart × 3 mL	361	1%
Insulin lispro 100 units/mL vial × 10 mL	216	0.3%
Insulin glulisine 100 units/mL cartridge × 3 mL	185	0.2%
Total	64,189	

operation was focused on the municipalities of the metropolitan area, and the other 37% in other municipalities of the state.

The cost/patient analogue insulin dispensed in Antioquia in 2015 \pm standard deviation was \$ 105868 \pm 1,046,751, while the cost/patient in 2016 \pm standard deviation was \$ 102,341 \pm 1,587,972. The economic impact through the intervention has an estimated cost-reduction of 3.71 % per patient.

On the other hand the cost/patient analogue insulin dispensed by Reference Pharmaceutical Care in 2015 \pm deviation standard was \$ 105,793 \pm 1,315,353, while in 2016 \pm deviation standard was \$ 98,058.5 \pm 2,808,034. The economic impact through the intervention has an estimated cost-reduction of 7.80% per patient.

There was a greater economic impact on pharmaceutical care that included the pharmaceutical chemical personnel in their work force obtaining as a result a higher cost-reduction per patient than the total average in the state.

Finally, the *t*-test for independent samples indicates that the null hypothesis is rejected; thus, there are statistically significant differences in cost/patient between 2015 and 2016 related to the intervention.

5. Conclusions

The intervention introduced caused a reduction of 3.7% on the average cost per patient in analogue insulin treatment in Antioquia and 7.8% specifically in patients treated at the Reference dispensing center where the strategy implementation was focused. The high error rate found in patients' prescriptions who receive this type of medication is still a concern, as it causes a high risk on patients in terms of effectiveness in case they do not receive the quantity needed on the prescription or they receive more than needed, creating insecurities on the patient. These errors are basically done because of mathematic calculation mistakes, lack of knowledge of the pharmaceutical presentations and useful lifetime of the multi dose

bottles once the treatment is started; this last reason being the one causing more impact takes into account the health risk involved when applying an insulin molecule with its denatured physicochemical properties.

It is interesting to see how a simple intervention can make a pharmaceutical treatment more effective and safe when repairing and mending errors that directly affect the use of the medicines, and also improve the prescription habit for the disease by means of alerts—to physicians—that show a deviation with possible impact on the patient's health.

The differences found on dispensing costs during both periods studied with a pharmaceutical strategy are not unexpected as the economic impact on the medicine usage and management derived from pharmaceutical care activities is a constant finding [8-9].

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Conflict of Interests

The authors state that there is no conflict of interests.

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