RESEARCH ON USING THE DECISION TREE METHOD IN ORDER TO SELECT THE BEST ALTERNATIVE FOR THE PHARMACIES SUPPLY

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Summary

Introduction / Aims: Adopting the important decisions represents a specific task of the manager. An efficient manager takes these decisions during a sistematic process with well-defined elements, each with a precise order. In the pharmaceutical practice and business, in the supply process of the pharmacies, there are situations when the medicine distributors offer a certain discount, but require payment in a shorter period of time. In these cases, the analysis of the offer can be made with the help of the decision tree method, which permits identifying the decision offering the best possible result in a given situation.

The aims of the research have been the analysis of the product offers of many different suppliers and the establishing of the most advantageous ways of pharmacy supplying.

Material / Methods: There have been studied the general product offers of the following medical stores: A&G Med, Farmanord, Farmexim, Mediplus, Montero and Relad. In the case of medicine offers including a discount, the decision tree method has been applied in order to select the most advantageous offers. The Decision Tree is a management method used in taking the right decisions and it is generally used when one needs to evaluate the decisions that involve a series of stages. The tree diagram is used in order to look for the most efficient means to attain a specific goal. The decision trees are the most probabilistic methods, useful when adopting risk taking decisions.

Results: The results of the analysis on the tree diagrams have indicated the fact that purchasing medicines with discount (1%, 10%, 15%) and payment in a shorter time interval (120 days) is more profitable than purchasing without a discount and payment in a longer time interval (160 days).

Discussion / Conclusion: Depending on the results of the tree diagram analysis, the pharmacies would purchase from the selected suppliers. The research has shown that the decision tree method represents a valuable work instrument in choosing the best ways for supplying pharmacies and it is very useful to the specialists from the pharmaceutical field, pharmaceutical management, to medicine suppliers, pharmacy practitioners from the community pharmacies and especially to pharmacy managers, chief – pharmacists.

Keywords: pharmacies supply, the Decision Tree Method, pharmaceutical management and business

1. Introduction

The management methods represent the ensemble of means and proceeding which help management in influencing the action of the system's elements, system which is run in order to achieve the set objectives. The management of contemporary organisations, so and pharmacies, can no longer be conceived without

using some scientific methods which permit the knowledge and the efficient application of the objective economic laws, the correct appreciation of the results, the improvement of the decision making process and of all the management's functions [1]. Company management permanently confronts numerous problems which require solving in time and in optimum conditions. The decisions represents the essential elements of management, the quality of management of a company manifesting by the best decisions developed and applied [2]. The research aimed to exploit the opportunities provided by the deposits for the supply of the pharmacies. The aims of the research have been the analysis of the product offers of many different suppliers and the establishing of the most advantageous ways of pharmacy supplying.

2. Material and Methods

There have been studied the general product offers of the following medical stores: A&G Med, Farmanord, Farmexim, Mediplus, Montero and Relad. The decision tree method has been applied in order to select the most advantageous offers. The decision tree is a „map" with all the possibilities of actions and their related results with nodules and branches. There are two types of nodules:

- decisional (represented by a square) – for example: to make or not a certain aquisition, to make or not a promotion;
- chance (represented by a circle) – is a result happened by chance and which cannot be controled by the manager.

The branches represent the secquences of the actions and the results associated with these. One can determine and asign the probabilities by: estimating (data from similar companies) or with the help of experts in marketing and manangement or by using evaluations from the field literature [3-5].

3. Results

Aplication no. 1

The results obtained from the analysis of the general offers of the suppliers taken into account for this research, for the product Ampicillin 500 mg (Ampicillinum) [6], are shown in Tabel I.

Table I. The product offers of the suppliers analyzed for Ampicillin 500 mg medicine

Criteria No.	Suppliers	Unit price (without VAT - Value Added Tax) (lei)	Retail price (lei)	Discount	Payment deadline
1.	A&G Med	2,47	3,23	-	160 days
2.	Farmanord	2,47	3,23	-	160 days
3.	Farmexim	2,47	3,23	-	160 days
4.	Mediplus	2,47	3,23	15 %	120 days
5.	Montero	2,47	3,23	-	160 days
6.	Relad	2,47	3,23	-	160 days

The objective of the analysis: was to establish whether it is more useful to acquire medicine from Mediplus distributor (A) that offers a discount of 15% and a payment deadline within 120 days, or from the other medicine distributors (B) that do not offer any discount but have a payment deadline within 160 days.

There is 80% probability to sell the product (according to marketing studies from previous years). The manager will have to buy product with a proper shelf life (4 or 5 years), so the probability for these products to expire is very little (10%).

The Decision

The existing possibilities are:

- ✓ acquisition from deposit A or
- ✓ acquisition from deposit B

The Chance

The events that can occur independently of the pharmacist's will are the following:

- ✓ the products are not issued
- ✓ the products are issued
- ✓ the products expire

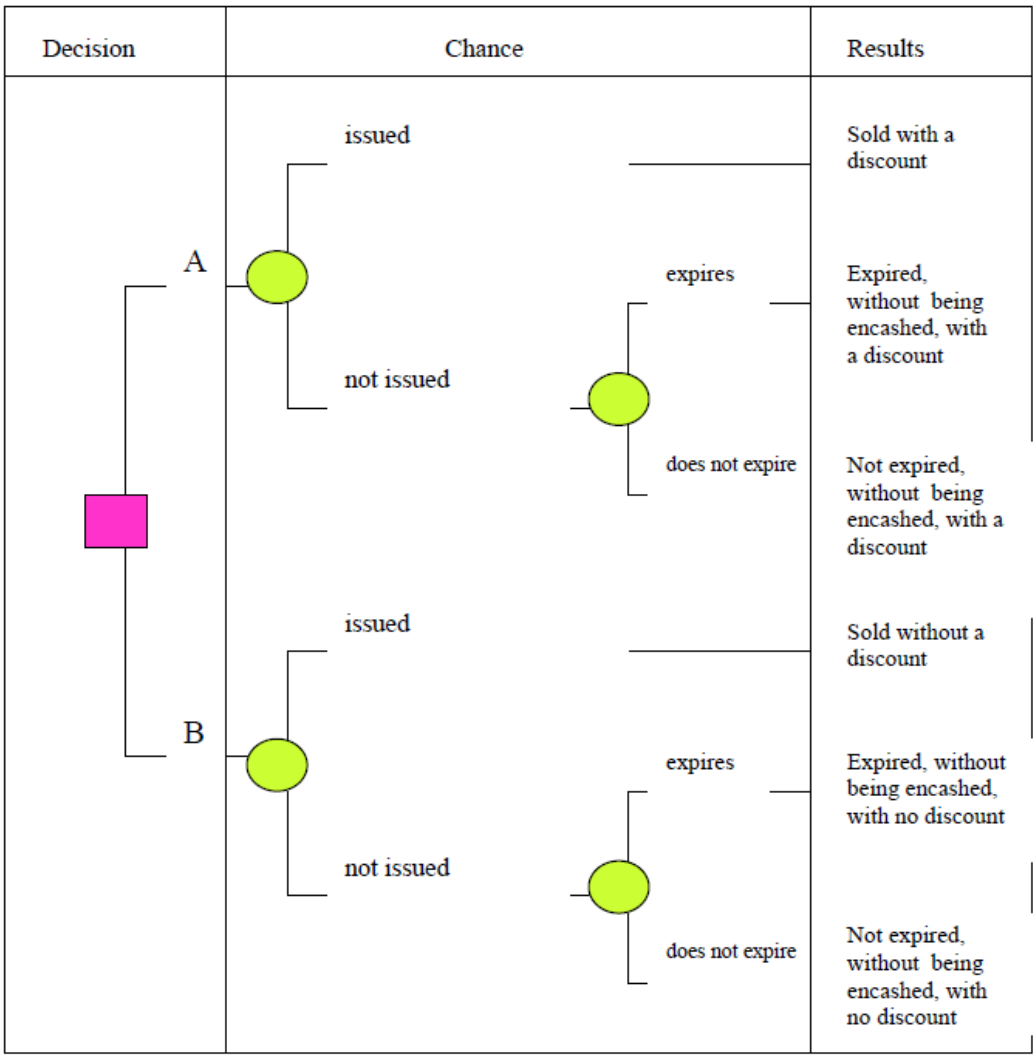

Figure 1. The results obtained according to the chance and the decision of the manager

The utility Each result can be expressed by a numeric value called *utility*. This is established randomly according to the aim of the manager and has values between 0 and 1 (0 = the worst case; 1 = the best case) (Table II).

Table II. The utility given by manager to each of the results obtained

RESULTS	UTILITY
Sold with a discount	1
Expired, without being encashed, with a discount	0.2
Not expired, without being encashed, with a discount	0.4
Sold without a discount	0.7
Expired, without being encashed, with no discount	0.1
Not expired, without being encashed, with no discount	0.3

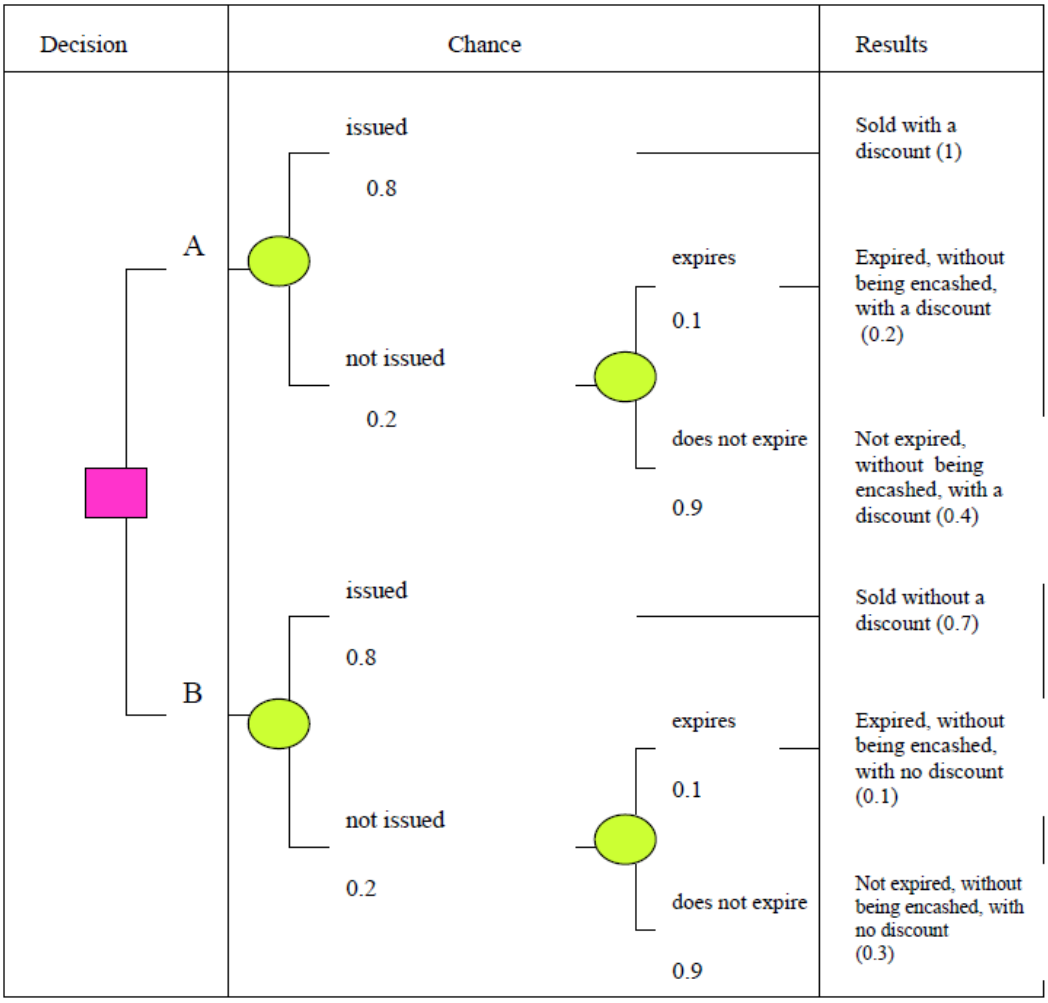

Figure 2. The tree diagram for the acquisition of Ampicillin 500 mg medicine

Figure 2 shows the tree diagram (the decision tree) created for the acquisition of Ampicillin 500 mg product, which reflects the probability of each event and the utilities given by manager for each of the results obtained.

Calculus of global utility **(**for the acquisition of Ampicillin 500 mg)

The global utility can be obtained by multiplying the utility of each branch with the probability the respective events might happen, then added values for each branch.

The utility for the first branch:

0.8 * 1 = 0.8

0.2 * 0.1 * 0.2 = 0.004

0.2 * 0.9 * 0.4 = 0.072

0.8 + 0.004 + 0.072 = 0.876

The utility for the second branch:

0.8 * 0.7 = 0.56

0.2 * 0.1 * 0.1 = 0.002

0.2 * 0.9 * 0.3 = 0.054

0.56 + 0.002 + 0.054 = 0.616

The final decision

A stronger utility indicates the decision that must be taken.

The utility for the first branch (0.876) is stronger than the one for the second branch (0.616), therefore the acquisition of Ampicillin 500 mg product, with a discount and payment deadline up to 120 days (from Mediplus distributor) is more profitable than acquiring the product with payment deadline up to 160 days and without a discount.

Aplication no. 2

The results obtained from the analysis of the general offers of the suppliers taken into account for this research, for Detralex product, are shown in Tabel III.

Detralex (Diosminum + Hesperidinum) is used for the treatment of chronic venous insufficiency, thrombophlebitis and venous leg ulcer and it has vascular protection properties [7].

Table III. The product offers of the suppliers analyzed for Detralex product

Criteria No.	Suppliers	Unit price (without VAT - Value Added Tax) (lei)	Retail price (lei)	Discount	Payment deadline
1.	A&G Med	21,44	26,18	-	160 days
2.	Farmanord	21,44	26,18	-	160 days
3.	Farmexim	21,44	26,18	-	160 days
4.	Mediplus	21,44	26,18	1 %	120 days
5.	Montero	21,44	26,18	-	160 days
6.	Relad	21,44	26,18	-	160 days

The objective of the analysis: was to establish whether it is more useful to acquire medicine from Mediplus distributor (A) that offers a discount of 1% and a payment deadline within 120 days, or from the other medicine distributors (B) that do not offer any discount but have a payment deadline within 160 days.

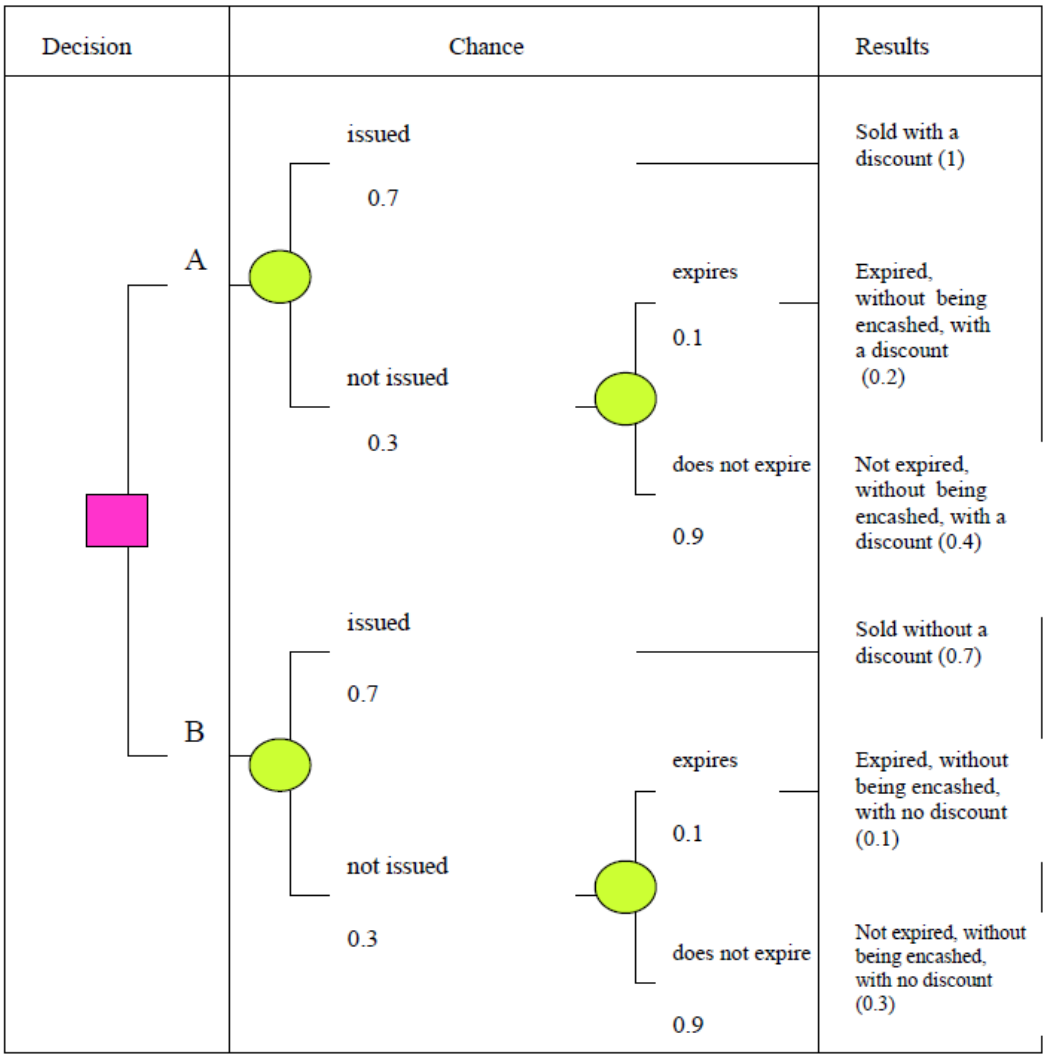

Figure 3. The tree diagram for the acquisition of Detralex product

There is 70% probability to sell the product (according to marketing studies from previous years). The manager will have to buy product with a proper shelf life (4 or 5 years), so the probability for these products to expire is very little (10%).

Calculus of global utility **(**for the acquisition of Detralex)

The utility for the first branch:

0.7 * 1 = 0.7

0.3 * 0.1 * 0.2 = 0.006

0.3 * 0.9 * 0.4 = 0.108

0.7 + 0.006 + 0.108 = 0.814

The utility for the second branch:

0.7 * 0.7 = 0.49

0.3 * 0.1 * 0.1 = 0.003

0.3 * 0.9 * 0.3 = 0.081

0.49 + 0.003 + 0.081 = 0.574

The final decision

The utility for the first branch (0.814) is stronger than the one for the second branch (0.574), therefore the acquisition of Detralex product, with a discount and payment deadline up to 120 days (from Mediplus distributor) is more advantageous than acquiring the product with payment deadline up to 160 days and without a discount.

Aplication no. 3

The results obtained from the analysis of the general offers of the suppliers taken into account, for the Algocalmin 500 mg (Metamizolum natrium) [8], are shown in Tabel IV.

Table IV. The product offers of the suppliers analyzed for Algocalmin 500 mg product

Criteria No.	Suppliers	Unit price (without VAT - Value Added Tax) (lei)	Retail price (lei)	Discount	Payment deadline
1.	A&G Med	2,84	3,83	-	160 days
2.	Farmanord	2,84	3,83	-	160 days
3.	Farmexim	2,84	3,83	-	160 days
4.	Mediplus	2,84	3,83	10 %	120 days
5.	Montero	2,84	3,83	-	160 days
6.	Relad	2,84	3,83	-	160 days

The objective of the analysis: was to establish whether it is more useful to acquire medicine from Mediplus distributor (A) that offers a discount of 10% and a payment deadline within 120 days, or from the other medicine distributors (B) that do not offer any discount but have a payment deadline within 160 days.

There is 90% probability to sell the product (according to marketing studies from previous years). The manager will have to buy product with a proper shelf life (4 or 5 years), so the probability for these products to expire is very little (10%).

Calculus of global utility (for the acquisition of Algocalmin 500 mg)

The utility for the branch with discount:

0.9 * 1 = 0.9

0.1 * 0.1 * 0.2 = 0.002

0.1 * 0.9 * 0.4 = 0.036

0.9 + 0.002 + 0.036 = 0.938

The utility for the second branch:

0.9 * 0.7 = 0.63

0.1 * 0.1 * 0.1 = 0.001

0.1 * 0.9 * 0.3 = 0.027

0.63 + 0.001 + 0.027 = 0.658

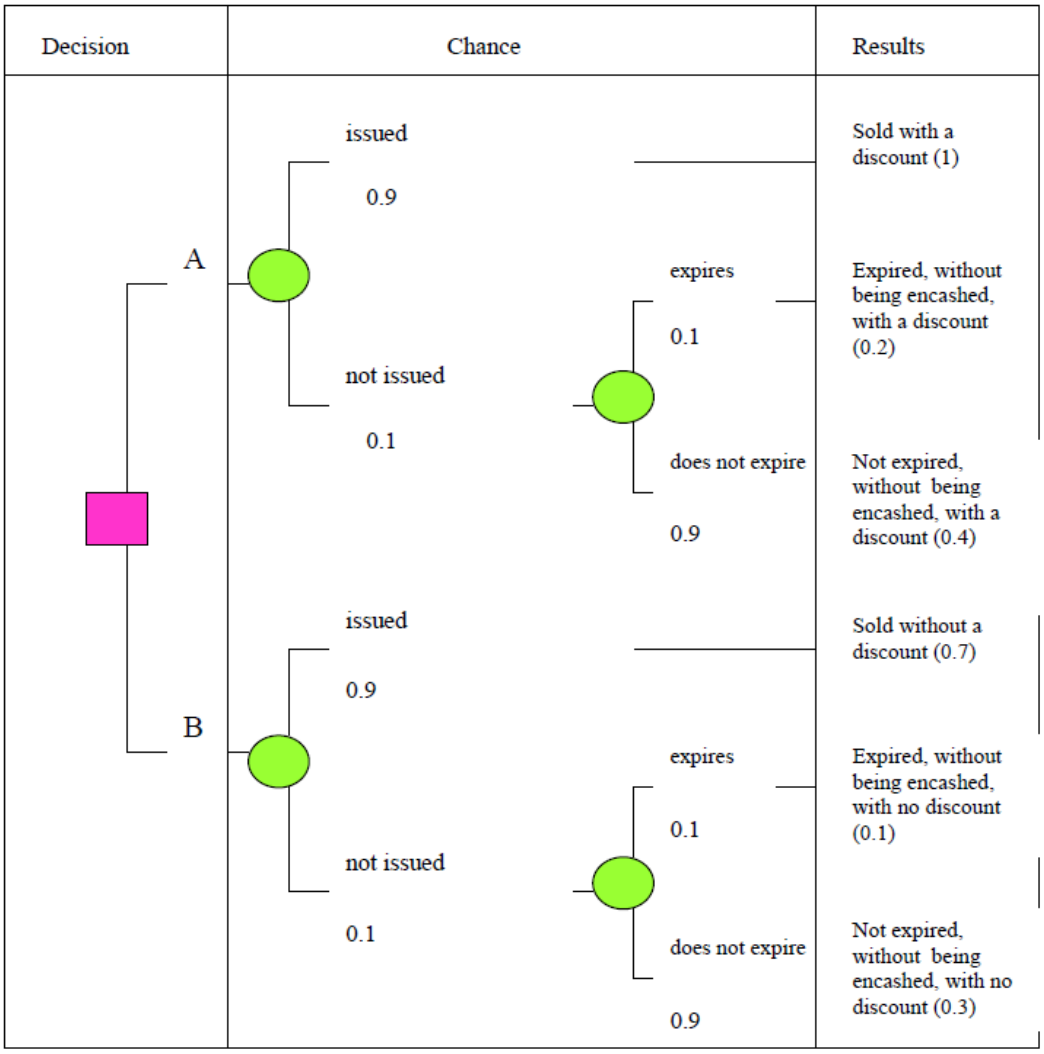

Figure 4. The tree diagram for the acquisition of Algocalmin 500 mg product

The final decision

The utility for the first branch (0.938) is higher than the one for the second branch (0.658), therefore the acquisition of Algocalmin 500 mg product, with a discount of 10% and payment deadline up to 120 days (from Mediplus distributor) is much more profitable than acquiring the product with payment deadline up to 160 days and without a discount.

4. Discussion

The medicine suppliers: A&G Med, Farmanord, Farmexim and Relad have offered a longer payment deadline, this way allowing the pharmacies to have up to 160 days to pay the product they aquired. Mediplus has offered a payment deadline up to 120 days. When the offers of the suppliers do not include any discount and when taking into consideration only the payment terms, the variant with 160 days payment deadline is more advantageous for the pharmacies. In case the offer includes a discount and the payment due date is closer, the decision tree method can be applied in order to take the right decision concerning the most convenient supplier for pharmacies. Depending on the results of the tree diagram analysis, the pharmacies would acquire from the selected supplier. In case of product Ampicillin 500 mg it is more profitable to buy the product from Mediplus distributor, which offers a 15% discount and a payment deadline of 120 days, rather than aquiring the product from the other suppliers (A&G Med, Farmanord, Farmexim, Montero or Relad) that offer a 160 days payment deadline and no discount. The Detralex product is more convenient to be bought from the distributor which offers 1% discount (Mediplus), with a payment deadline within 120 days, rather than to be aquired from the other suppliers that offer pharmacies a payment deadline within 160 days but offer no discount. The aquisition of Algocalmin 500 mg, with a discount of 10% and payment due within 120 days (from Mediplus distributor) is more convenient than buying it with a payment due within 160 days and without a discount.

5. Conclusion

The results of the analysis on the tree diagrams have indicated the fact that purchasing medicines with discount and payment in a shorter time interval is more advantageous than purchasing without a discount and payment in a longer time interval. The research has shown that the decision tree method represents a valuable work instrument in choosing the best ways for supplying pharmacies and it can be very useful to the specialists from the pharmaceutical field.

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