№3 Том4
2016

Фармакоэкономика

теория и практика

Pharmacoeconomics
theory and practice

№3 Volume4
2016

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ФАРМАКОЭКОНОМИЧЕСКИХ ИССЛЕДОВАНИЙ

BUDGET IMPACT ANALYSIS OF IPILIMUMAB USAGE IN PATIENTS WITH METASTATIC MELANOMA

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Summary:

Melanoma is a malignant tumor that develops from transformed melanocytes, located mainly in the skin. According to Russian statistics, the incidence of melanoma in 2014 was 9,390 new cases [4]. In 2004-2014, melanoma prevalence rate per 100,000 population increased on average by 4.2% per year. High prevalence of melanoma and frequent poor prognosis necessitate search of innovative treatment methods and use of high-tech drugs.

Objective:

The objective of this study was to conduct the analysis of financial opportunities within the existing budgets to provide patients with metastatic melanoma with the biological drug ipilimumab, followed by the budget impact analysis of this medical technology.

Conclusion: The results of budget impact analysis show that the inclusion of ipilimumab into the oncology market structure is possible without additional funding, by using the funds accumulated by decreasing drug prices due to the launch of the generic drugs. Introduction of ipilimumab will require only partial use of the savings, leaving the opportunity to further optimization the oncology market through the remaining savings to increase the number of patients receiving new innovative drugs, which will be launched in 2016-2018.

Keywords: budget impact analysis, metastatic melanoma, ipilimumab.

Introduction

Recent epidemiological studies have clearly demonstrated the rapid growth of melanoma incidence rate in different countries, including in the Russian Federation, which allows us to consider this as a global trend.

Melanoma is a malignant tumor of neuroectodermal origin that develops from transformed melanocytes, located mainly in skin [1]. According to Russian statistic data, the incidence of melanoma in 2014 was 9,390 new

cases [4]. In 2004-2014, melanoma prevalence rate per 100,000 population increased on average by 4.2% per year.

Structurally, melanoma takes up not more than 10% of all malignant skin tumors, but it is responsible for 80% of deaths from the diseases of this group [7]. In 2014 in the Russian Federation, the mortality rate of melanoma was 4.3%, and the mortality rate within the first year after diagnosis was 11.9% [2].

Ipilimumab (Yervoy®) is a recombinant human monoclonal antibody that selectively binds to a cytotoxic T-lymphocyte-associated antigen 4 (CTLA-4), which is the key regulator of T-lymphocytes activation. Ipilimumab inhibits CTLA-4 and blocks inhibiting signals of CTLA-4 cascade by increasing the amount of anti-tumor T-helpers, which in turn induce an increase in the amount of direct T-killers. It has been shown that CTLA-4 blockade reduces the regulatory function of T-cells, which can lead to increased anti-tumor immune response. Furthermore, ipilimumab selectively reduces the amount of regulatory T cells in the tumor, resulting in increase in the ratio of antitumor T-helpers to T regulators, which promotes death of cancer cells.

High prevalence of melanoma and frequent poor prognosis necessitate search of innovative treatment methods and use of high-tech drugs. During the recent years, a large number of innovative high cost drugs for cancer treatment were launched. Due to the limited budget, it is important to make balanced decisions regarding the introduction of drugs into clinical practice in the Russian Federation. Health technology assessment approaches to determining the advisability and feasibility of budget spending to providing patients with innovative drugs are crucial in making purchasing decisions.

Purpose of the study

The objective of this study was to conduct the analysis of financial opportunities within existing budgets to provide patients with metastatic

Figure 1. Melanoma prevalence rate per 100,000 population and accumulation index of patients with melanoma in Russian Federation

melanoma with the biological drug ipilimumab, followed by the budget impact analysis of this medical technology.

To achieve this goal, the following problems were solved successively:

1. Literature review.
2. Assessing the oncology market, taking into account the launch of the generic drugs in 2016-2018.
3. Budget impact analysis.

Results

Cost analysis

During the study, the cost of ipilimumab usage was calculated using the following formula:

$$\text{Cost} = P \cdot N, \text{ where:}$$

Cost - the cost of ipilimumab course of treatment, rubles;

P - price per one ipilimumab vial, rubles;

N - the required number of vials;

The recommended dose of ipilimumab is 3 mg/kg administered intravenously over

90 minutes every 3 weeks for a maximum of 4 doses. For a single dose, a 70 kg patient requires 210 mg (5 vials). The cost of package (1 vial is 50 mg/10 mL) is 253,244 rubles..

Thus, cost of ipilimumab use will amount to 5,064,880 rubles.

Budget impact analysis

This type of analysis involves assessment of the costs associated with the introduction into the actual practice of a new medical technology, including the use of a new drug. The final result is expressed as a sum of money, which can either be saved or additionally spent on the use of the evaluated medical technology.

At this stage of the study, a list of drugs that have expiring patent protection before 2020 was determined among the medicines, which are available for procurement in the Russian Federation and indicated for the treatment of cancer (Table 1).

Table 1. The list of drugs with the expiring patent protection before 2020

INN	Trade name	Expiration of patent protection
Abiraterone acetate	Zytiga	2016
Bevacizumab	Avastin	2015
Vorinostat	Zolinza	2012
Gefitinib	Iressa	2013
Degarelix	Firmagon	2017
Cabazitaxel	Jevtana	2016
Megestrol	Megace	2020
Sorafenib	Nexavar	2020
Sunitinib	Sutent	2020
Temsirolimus	Torizel	2014
Trastuzumab	Herceptin	2015
Eribulin	Halaven	2019
Erlotinib	Tarceva	2020

Based on these data, the assumption was made that during one year after the expiration of patent protection one generic drug will appear on the oncology market, two - during the second year, and three - during the third year. At the same time, if the period of patent protection of the drug expired before 2016, but the drug still has no approved generic drugs, than 2016 was considered the year of the first generic drug launch.

The assumption was made that during the first year of the launch of the generic drug the original drug is sold in the volume of 70% of the original volume; the remaining sales volume (30%) accounts for generic drugs. In the second year, sales allocation will be 50% and 50%, respectively; in the third year, the volume of the generic drugs amounts to 70% of the original drug sales, and the sales of the original drug amounts to 30% of sales.

In accordance with the current method of pricing for pharmaceuticals in the Russian Federation, the cost of generic drugs is 80% of the cost of the corresponding original drug.

According to IMS data, in 2011-2015 the annual growth of the oncology market was 10-20%, depending on inflation and incidence rate. Based on this data, the assumption was made that in 2016-2018 the oncology market growth will average 10%.

The analysis of financial opportunities within existing budgets to provide patients with metastatic melanoma with the immuno-oncology drug ipilimumab, followed by the budget impact analysis was conducted for the Russian Federation as a whole, as well as for the following regions: Moscow, St. Petersburg, Voronezh region, Krasnoyarsk region, Chelyabinsk region.

As a result of the analysis for the Russian Federation it was calculated, that due to the launch of the generics of the original drugs, the savings in 2016 will amount to 595,336,210 rubles, 993,917,802 rubles in 2017 and 1'394'036'601 rubles in 2018 (Table 2).

Provided that the number of patients receiving ipilimumab therapy will amount to 52 patients in 2016, 44 patients in 2017 and 43 patients in 2018, and the cost per patient amount to 5'064'880 rubles, the cost of ipilimumab use will amount to 263,373,760 rubles in 2016, 222,854,720 rubles in 2017 and 217,789,840 rubles in 2018.

Thus, in 2016-2018 the budget saved due to the launch of the generics will allow for ipilimumab therapy to all patients in need; additionally financial reserves will become available for the procurement of new drugs: 5,455,134,656 rubles in 2016, 11,529,724,715 rubles in 2017 and 18,133,946,763 rubles in 2018.

Tables 3-7 show the results of this analysis for the regions: Moscow, St. Petersburg, Voronezh region, Krasnoyarsk region, Chelyabinsk region.

Table 2. Budget impact analysis of the generics of the original drugs and ipilimumab use in the Russian Federation

	2015	2016	2017	2018
Planned budget	517,231,722,061	56,354,894,267	61,990,383,693	68,189,422,063
Budget for origins and generics	51,231,722,061	50,636,385,851	50,237,804,259	49,837,685,460
Savings due to the launch of the generic drugs		595,336,210	993,917,802	1,394,036,601
Additional funds for launching new drugs		5,455,134,656	11,529,724,715	18,133,946,763
Cost of ipilimumab use				
Number of patients		52	44	43
Costs per one patient		5,064,880		
Total costs		263,373,760	222,854,720	217,789,840
Budget impact		331,962,450	771,063,082	1,176,246,761
		Savings	Savings	Savings

Table 3. Budget impact analysis of the generics of the original drugs and ipilimumab use in Moscow

	2015	2016	2017	2018
Planned budget	10,009,907,914	11,010,898,706	12,111,988,576	13,323,187,434
Budget for origins and generics	10,009,907,914	9,881,300,631	9,793,224,770	9,705,833,535
Savings due to the launch of the generic drugs		128,607,284	216,683,144	304,074,379
Additional funds for launching new drugs		1 078 949 275	2 278 244 766	3 576 834 858
Cost of ipilimumab use				
Number of patients		10	8	8
Costs per one patient		5,064,880		
Total costs		50,648,800	40,519,040	40,519,040
Budget impact		77,958,484	176,164,104	263,555,339
		Savings	Savings	Savings

Table 4. Budget impact analysis of the generics of the original drugs launch and ipilimumab use in St. Petersburg

	2015	2016	2017	2018
Planned budget	3,344,160,667	3,678,576,734	4,046,434,407	4,451,077,848
Budget for origins and generics	3,344,160,667	3,325,691,772	3,313,079,583	3,299,915,591
Savings due to the launch of the generic drugs		18,468,895	31,081,084	44,245,076
Additional funds for launching new drugs		327,560,562	713,095,304	1,130,902,737
Cost of ipilimumab use				
Number of patients		5	4	4
Costs per one patient		5,064,880		
Total costs		25,324,400	20,259,520	20,259,520
Budget impact		6,855,505	10,821,564	23,985,556
		Savings	Savings	Savings

Table 5. Budget impact analysis of the generics of the original drugs launch and ipilimumab use in Voronezh region

	2015	2016	2017	2018
Planned budget	656,772,160	722,449,376	794,694,314	874,163,745
Budget for origins and generics	656,772,160	650,460,650	646,252,977	642,045,304
Savings due to the launch of the generic drugs		6,311,510	10,519,183	14,726,856
Additional funds for launching new drugs		66,923,846	143,376,457	227,053,562
Cost of ipilimumab use				
Number of patients		1	1	1
Costs per one patient		5,064,880		
Total costs		5,064,880	5,064,880	5,064,880
Budget impact		1,246,630	5,454,303	9,661,976
		Savings	Savings	Savings

Table 6. Budget impact analysis of the generics of the original drugs launch and ipilimumab use in Krasnoyarsk region

	2015	2016	2017	2018
Planned budget	816,631,741	898,294,915	988,124,406	1,086,936,847
Budget for origins and generics	816,631,741	800,950,159	790,495,772	780,041,385
Savings due to the launch of the generic drugs		15,681,581	26,135,969	36,590,356
Additional funds for launching new drugs		87,214,995	187,498,874	301,830,582
Cost of ipilimumab use				
Number of patients		2	2	1
Costs per one patient		5 064 880		
Total costs		10,129,760	10,129,760	5,064,880
Budget impact		5,551,821	16,006,209	31,525,476
		Savings	Savings	Savings

Table 7. Budget impact analysis of the generics of the original drugs launch and ipilimumab use in Chelyabinsk region

	2015	2016	2017	2018
Planned budget	668,599,421	735,459,363	809,005,299	889,905,829
Budget for origins and generics	668,599,421	663,376,974	659,895,343	656,413,712
Savings due to the launch of the generic drugs		5,222,446	8,704,077	12,185,708
Additional funds for launching new drugs		67,017,508	144,045,075	228,427,236
Cost of ipilimumab use				
Number of patients		1	1	1
Costs per one patient		5,064,880		
Total costs		5,064,880	5,064,880	5,064,880
Budget impact		157,566	3,639,197	7,120,828
		Savings	Savings	Savings

Conclusions

1. Due to the launch of the generics of the original oncology drugs, the savings in 2016 will amount to 595,336,210 rubles, 993,917,802 rubles in 2017 and 1,394,036,601 rubles in 2018.

2. Replacement of original drugs by the generics in the regions (Moscow, St. Petersburg, Voronezh region, Krasnoyarsk region, Chelyabinsk region) will save budgetary funds and provide therapy to patients with melanoma using immuno-oncology drug ipilimumab.

3. Inclusion of ipilimumab into the structure of the oncology market of the Russian Federation does not imply allocation of additional funds.

4. The funds saved as a result of the replacement of the original oncology drugs will not only cover the costs of ipilimumab, but leave additional financial reserves for other innovative products that will be available for purchases in 2016-2018.

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