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Costs of plasmocytic myeloma therapy in the drug programme at a Regional Oncology Centre in Poland

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Abstract

Introduction. The rapidly growing market for drugs, including oncology and haemato-oncology drugs, is generating enormous financial expenditure for healthcare systems. In Poland, access to high-cost treatments is possible mainly within drug programmes, funded by public healthcare systems. The path of proceeding adopted in Polish regulations is similar to the solutions adopted in other countries.

Objective. The aim of this study was to demonstrate the actual costs incurred by the treatment entity in the process of treating patients under the drug programme at the Regional Oncology Centre in Olsztyn, north-east Poland.

Materials and method. The oncology drug programme B.54 'Treatment of patients with refractory or malignant plasmocytic myeloma' implemented at the Regional Oncology Centre in Poland between 2018–2021, was selected for the analysis. The choice of the B.54 programme was based on the small population of patients meeting the inclusion criteria for this programme, and the large number of diagnostic procedures stipulated in the drug programme description. On average, 25 patients were treated per year. The financial analysis used the financial categories related to hospital billing information. The costs were presented based on the purchasing power parity of money in 2021, i.e. 1 USD-inter is equivalent to 1.837 PLN.

Results. The flat rate form of financing medical services does not cover the actual costs of treatment. Providing patients with necessary medical services without their full coverage by the public payer, burdens the budget of the centre and may lead to indebtedness of the treatment entity.

Conclusions. Without an increase in the valuation of benefits under drug programmes, corresponding to the actual costs of treatment, the expected increase in access to innovative therapies will be difficult to accomplish.

Key words

cost, drug programmes, financial burden, haemato-oncology, plasmocytic myeloma

INTRODUCTION

Neoplasms are the second leading cause of death in Europe after cardiovascular disease. Every year, there are almost 2.7 million new oncology patients in European countries and 1.3 million deaths. Although the population of the European continent comprises only 10% of the world's population, Europe accounts for 23% of new cancer cases worldwide and 20% of deaths. In addition to the human loss, this results in a gigantic economic cost [1]. The number of cancer deaths is increasing year by year. In 2000, 7,055,380 people died from this disease worldwide, while in 2019 it was already 10,079,637 people, i.e. 44% more. However, taking demographic changes into account, age-standardised cancer-related mortality has decreased by 13.1% since 2000. Thanks to medical advances, the prognosis of cancer patients is improving globally as well as in individual countries [2]. Many advanced cancers can now be successfully treated with targeted therapies [3, 4]. The rapidly growing market for medicines, including oncology and haemato-oncology drugs, is generating huge and increasing financial expenditures for healthcare systems [5]. The total value of the global market for oncology therapies in 2020 was 150 billion US dollars [6]. This is estimated to reach $200 billion in 2022, growing by a further 10–13% over the next five years [7]. A significant proportion of new medicines are biologics, which are produced using complex biotechnology methods [8]. The use of biological drugs increases the effectiveness of treatment for many diseases, but also increases the cost of therapy [9]. The financing of these high-cost treatments is mainly possible through drug programmes [10] which give patients the opportunity to be treated with innovative and costly drugs that would be beyond the financial reach of the average patient [11].

Different national health systems and wealth levels of countries mean that public funding of innovative therapies is subject to internal regulatory procedures [12]. However, before an innovative medicine is approved for use in clinical practice, it undergoes an authorisation process by the relevant registration agency – the US Food and Drug Administration (FDA) and the European Medicines Agency (EMA). Many

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factors influence the decision to fund an innovative drug within the public healthcare system. A significant barrier is the risk of adverse drug reactions, the treatment of which increases the cost of innovative therapy [11, 13]. In Poland, the reimbursement coverage of an innovative drug technology, requires an administrative decision of the Minister of Health [14], published in an announcement [15]. The reimbursement decision is preceded by a multi-directional analysis conducted by the Agency for Health Technology Assessment and Tariff System [16]. The amount of funds earmarked for financing drug therapy in a given indication is determined each time in the financial plan of the National Health Fund (NHF) [17].

The development of medical technologies, especially drug technologies, results in dozens of new medicines being registered each year by the main registration agencies, of which one-third are intended for cancer treatment. Decisions are made on the basis of scientific studies proving the efficacy and safety of the reviewed drugs. The therapeutic effects achieved in individual cancer groups vary widely [18]. A prerequisite for the efficacy of targeted therapies is rapid and accurate molecular diagnostics, allowing the therapy to be selected for the patient and personalised treatment to be implemented [19]. The greatest progress, as measured by five-year patient survival, has been made in haemato-oncology (leukaemias, myelomas) [5, 12, 20]. Haemato-oncology is a highly innovative and fast developing area of medicine worldwide. The treatment of haemato-oncological diseases using modern therapies and an individualised approach to the selection of drug treatment regimens based on age, general health status or stage of progression is turning a fatal disease into a chronic disease [21].

The introduction of new drugs, new technologies and new treatment strategies contributes to improving the health of patients [22]. Poland is also following the standards in the treatment of haemato-oncology patients, the evidence for which is the significant increase in the availability of therapies funded by the NHF and the expansion of drug programmes in this area [16, 18, 23]. In Poland, access to modern therapies needed for the treatment of patients with blood cancers has greatly improved over the past two years. In the actions and decisions of the Ministry of Health, there is a visible trend for drug programmes to deal with the treatment of a particular disease rather than a single drug. There are more and more programmes operating in this way, created to treat one disease by multiple drugs [24]. Expenditures on the latest therapies available in drug programmes are also increasing year by year. The increasing costs of research and introduction to the market innovative drugs, which determine the high prices of new therapies, are more and more often becoming the reason for the selection of new drugs by insurers [25, 26].

Demographic changes and the increasing incidence and mortality of cancer in Poland are indicative of wider availability of treatment with innovative, state-funded drugs [27]. However, new drugs and new indications are not only about improving the effectiveness of cancer treatment, it is also a difficult task for hospitals that treat patients in drug programmes, despite the undervaluation of these therapies by the public payer.

OBJECTIVE

The aim of the study was to identify the basis of access to innovative medicines and to demonstrate the under-valuation of treatment costs for patients under the drug programme at the Regional Oncology Centre in Olsztyn, north-east Poland.

MATERIALS AND METHOD

The drug programme is a guaranteed benefit. Treatment under the programme is carried out with the use of innovative, expensive active substances that are not financed under other guaranteed benefits. The treatment is carried out in selected disease entities and covers a strictly defined group of patients.

One of the drug programmes used in the treatment of hematological malignancies, i.e. B.54 'Treatment of patients with refractory or relapsed plasmocytic myeloma (ICD-10: C90)', was selected to calculate the actual hospital expenditure associated with treatment with innovative drug technologies. The choice of the B.54 programme was based on the small population of patients meeting the inclusion criteria for this programme [7], and the large number of diagnostic procedures stipulated in the drug programme description. Plasmocytic myeloma (another name: multiple myeloma, colloquially: myeloma) is not a common oncological disease but is the second most commonly diagnosed haematological condition [6]. It is estimated to account for no more than 1% of all malignancies and 10% of haematopoietic proliferations [19]. As with most haematological diseases, the origin of multiple myeloma is unknown. What is known, however, is that it is an incurable disease with a relapsing course. The median age at diagnosis of myeloma is 69 years and only 4% of patients are under 40 years of age [5]. Approximately 2,500 people develop myeloma each year in Poland, and approximately 10,000 patients live with it [27].

The financial analysis used the financial categories related to the treatment of patients in the B.54 drug programme in the Independent Public Health Care Facility of the Ministry of the Interior and Administration Hospital (MSWiA) with Warmian-Masurian Cancer Centre in Olsztyn, north-east Poland in 2018–2021.

In the first stage of determining the total cost of treatment of a patient in the drug programme, the direct costs including the cost of drugs, the cost of mandatory diagnostics and the cost of hospitalisation [28, 29] were selected. The cost of the patient's admission and stay in hospital associated with the administration of the drug [30] was also calculated, taking into account the indirect costs belonging to each treatment mode [31]. Analysis of the collected data made it possible to determine the actual costs of treatment for one patient.

In the next stage of the analysis, the revenues received as payment for all services provided to a patient covered by the drug programme were added to the model. The total level of revenues was shaped by the valuation of drugs administered to the patient, used by the NHF to settle accounts with the hospital, the valuation of inpatient services – the same throughout the analysed period, taking into account the quality factor for cancer hospitals introduced from 2021 [32], and the annual diagnostic flat rate settled as 1/12 on

a monthly basis. In order to unify the financial values, the currency used for the presentation of the results was 'USD-inter', according to the 2021 purchasing power parity (PPP), which for '1 USD PPP' was 1,837 PLN [33].

RESULTS

Between 2018–2021, an average of 25 patients per year participated in the B.54 drug programme 'Treatment of patients with refractory or malignant plasmocytic myeloma'.

Table 1. Number of patients treated in the B.54 programme in 2018–2021.

YEAR	No. of patients	No. of inpatient-days	No. of outpatient-days	No. of outpatient stays	Total
2021	32	32	123	122	277
2020	30	115	95	72	282
2019	20	171	58	0	229
2018	17	154	0	0	154

Source: Own elaboration based on data from the hospital patient records

The number of treatment regimens has increased in the analysed drug programme since 2018. In 2018, patients were only treated in the in-patient mode. Since 2019, a day-stay regimen has been included, followed by an out-patient regimen in 2020, so that patients can benefit from all forms of treatment.

In 2018, patients received two treatment regimens, while seven lines of treatment were active in 2019–2020, followed by an increase of three more in 2021. Within this drug programme, prior to November 2018, only Revlimid (lenalidomide) was reimbursed, while since 1 November 2018 the medicinal product Imnovid (pomalidomide) has been reimbursed. Subsequently, since 1 July 2019, Darzalex (daratumumab) and Kyprolis (carfilzomib) have been included in the reimbursement system in the B.54 drug programme. From 2021 onwards, changes have also been introduced to this drug programme, expanding the catalogue of therapies of plasmocytic myeloma patients, including those with newly-diagnosed myeloma [27].

Between 2018–2021, inpatient medical services related to the implementation of the B.54 drug programme were financed by the NHF in accordance with the adopted tarification for different types of services in a flat rate form:

- inpatient hospitalisation: 264.96 USD-inter per person-day (in 2021, after taking into account a quality indicator of 1.025, the payment was 271.58 USD-inter);
- -one-day stay: 264.96 USD-inter per person-day (in 2021, after taking into account the quality indicator: 271.58 USD-inter);

Table 2. Treatment regimens in the B.54 programme between 2018–2021

No.	Regimen name	2018	2019	2020	2021
1	Treatment of patients with refractory or relapsed PCM with omalidomide – var.2	x	x	x	x
2	Treatment of patients with refractory or relapsed PCM with lenalidomide – var.1	x	x	x	x
3	Treatment of patients with refractory or relapsed PCM with daratumumab – var.3		x	x	x
4	Treatment of patients with refractory or relapsed PCM with carfilzomib in combination with lenalidomide and dexamethasone (body surface area up to 2.2 m2) – cycle 2 to 8 – var.5		x	x	x
5	Treatment of patients with refractory or relapsed PCM with carfilzomib in combination with lenalidomide and dexamethasone directly (body surface area greater than 2.2 m2) – cycle 1 – var.6		x	x	x
6	Treatment of patients with refractory or relapsed PCM with carfilzomib in combination with lenalidomide and dexamethasone directly (body surface area greater than 2.2 m^2) – cycle 2 to 8 – var.7		x	x	x
7	Treatment of patients with refractory or relapsed PCM with carfilzomib in combination with lenalidomide and dexamethasone (body surface area up to 2.2 m^2) – cycle 1 – var.4		x	x	x
8	Treatment of patients with refractory or relapsed PCM with carfilzomib in combination with dexamethasone (body surface area up to 2.2 m2) – cycle 1 – var.8				x
9	reatment of patients with refractory or relapsed PCM with carfilzomib in combination with dexamethasone (body surface area up to 2.2 m2) – cycles from 2 – var.9				x
10	treatment of patients with refractory or relapsed PCM with ixazomib – var.10				x

Source: Own elaboration based on data from the descriptions of the drug programme.

- outpatient admissions: 58.88 USD-inter (in 2021 after considering the quality indicator: 60.35 USD-inter).

During the analysed period between 2018–2021, the average cost per person-day in hospitalisation increased from 310.64 USD-inter in 2018 to 467.77 USD-inter in 2021, i.e. by 150.58%. The cost of a person-day of one-day treatment, respectively, increased from 79.99 USD-inter in 2019 to 285.69 USD-inter in 2021, i.e. by 357.16%. On the other hand, the cost of an out-patient admission in 2020 was 65.11 USD-inter and increased to 72.07 USD-inter in 2021, or 110.69% of the baseline.

Throughout the analysed period, the revenue received from the NHF did not cover the full costs incurred by the treatment

Table 3. Revenues and costs per patient treated in B.54 programme from 2018 to 2021 (in USD-inter)

YEAR	Stay in ward			One-day stay			Outpatient stay		
	Revenue	Cost	% overage of costs	Revenue	Cost	% coverage of costs	Revenue	Cost	% coverage of costs
2021	271.58	467.77	58.06%	271.58	285.69	95.06%	60.35	72.07	83.73%
2020	264.95	387.84	68.32%	264.95	270.31	98.02%	58.88	65.11	90.43%
2019	264.95	270.61	97.91%	264.95	79.99	331.24%	58.88	x	x
2018	264.95	310.64	85.29%	264.95	x	x	58.88	x	x

Source: Own elaboration based on the hospital billing information

entity for the treatment of a patient in the drug programme. The greatest dissonance was in in-patient hospitalisation, where the cost of a person-day stay in a hospital ward was the difference between the total cost of the cost centre CC and the cost of drugs, medical devices and medical procedures.

Coverage of hospitalisation costs is on a downward trend: in 2018, the flat rate received from the NHF covered 85% of the costs incurred, while in 2021, despite the application of the quality factor of 1.025, the flat rate received allowed only 58% of the treatment costs to be covered. The percentage of coverage of costs related to the provision of same-day and out-patient services is also decreasing year by year. This means that the flat-rate payment for the provision of medical services related to the implementation of the oncology drug programme, in each authorised treatment regimen, is becoming increasingly under-valued.

Diagnostic examinations performed at the time of patient qualification for the treatment programme and those related to the monitoring of treatment, in line with the description of the drug programme, are financed by a flat rate according to the adopted tariff. The quantitative, annual, value of the flat rate for diagnostics under the B.54 drug programme changed over the period 2018 – 2021. As a result of the double revaluation of the value of the diagnostic flat rate, made by the NHF in the period from August 2018 – July 2019, the average value of the flat rate received by the programme implementer over the entire period adopted for the analysis (2018–2021) was 1462.17 USD-inter.

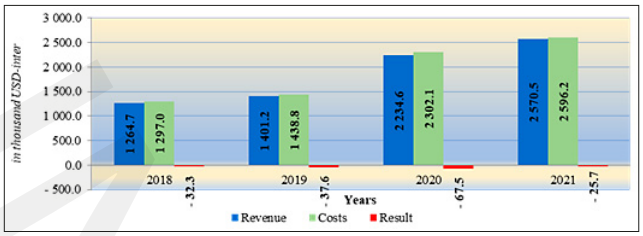

Figure 1. Balance sheet comparison of revenue and costs with result for the B.54 programme 2018 – 2021 in USD-inter thousand

There is a similar growth rate in diagnostics costs and revenues over the analysed period. Revenues in 2021 reached 203.2% of the 2018 revenue level, while costs increased in 2021 – 200.2% of the 2018 cost level. The doubling of revenues is the result of an increase in the number of treatment regimens and an increase in the number of patients treated in a particular drug programme. Throughout the analysed period, drug programme activity showed a negative financial result, despite receiving an additional payment on account of quality factor of 1.025 in 2021.

The value of medicines in the B.54 drug programme provided in this treatment entity is on an upward trend (2018: 1144.2 thousand USD-inter; 2021: 2451.2 thousand

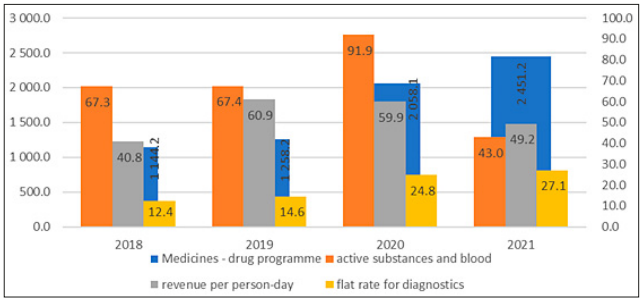

Figure 2. Distribution of revenue components in the B.54 drug programme 2018 – 2021 in thousands USD-inter

USD-inter). In 2020, because of the expansion of treatment regimens and a 50% increase in the number of patients treated, the value of drugs administered doubled compared to 2019 (2019: 1258.2; 2020: 2058.1). The upward trend also continued in 2021. The value of the revenue from flat-rate diagnostics has a growing trend throughout the analysed period (2018: 12.4; 2021: 27.1). The increase in the overall diagnostic flat rate is due to the growing number of patients treated in the B.54 programme each year. From 2020 onwards, a decrease in revenue from per person-day of hospitalisation has been observed. This is a result of the introduction of an out-patient regimen instead of hospitalisation to administer drugs, and due to the introduction of a tablet form of drugs. In 2021, there was a further reduction in revenue from per person-day of stay due to a change in the structure of hospitalisation related to drug administration. In 2020, out-patient stays accounted for 25% of the person-days, whereas in 2021, 44% of the total 277 person-days.

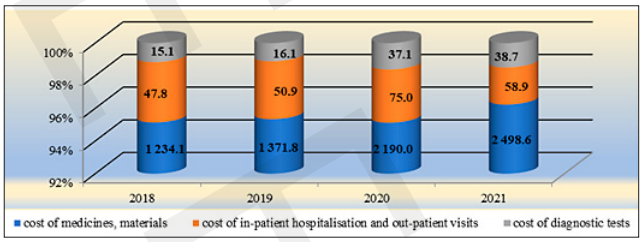

Figure 3. Distribution of component costs of providing services in the B.54 drug programme 2018 – 2021 in thousands USD-inter

In the structure of costs related to the implementation of the B.54 drug programme throughout the analysed period, drugs account for the largest share (2018: 95.1%; 2019: 95.3%; 2020: 95.1%; 2021: 96.2%). The nominal value of medicines increased noticeably from 2020 onwards. The growth rate of 2019/2020 was 159.64%, which is related to a 50% increase in the number of patients treated under this programme. The share of the cost of stays is between 2.3% – 3.7%. The level of the cost of stays related to the drug programme depends on the mode of treatment, which is related to the

Table 4. Flat rate for the patient diagnosis in the B.54 programme between 2018 – 2021 (in USD-inter)

No.	Name of service	YEAR				
		Jan. – July 2018	Aug. – Dec. 2018	Jan.-June 2019	July-Dec. 2019	2020–2021
1	Diagnostics in the lenalidomide programme for the treatment of patients with refractory or malignant multiple myeloma	1 589.72	395.21	395.21	x	x
2	Diagnostics in the programme for the treatment of patients with refractory or malignant plasmocytic myeloma	x	x	x	1 823.63	1 823.63

Source: Own elaboration on data from the orders of the President of the National Health Fund

route of administration of the drug. In 2018, in which the share of stay costs in the cost structure was the lowest at 2.3%, 154 person-days were realised in the in-patient mode. In 2020, the highest hospitalisation costs were recorded. There were 282 person-days realised, including 210 in-patient and 72 out-patient visits. In 2021, the share of stay costs in the cost structure was 3.7%. In 2021, 277 person-days were realised, including 155 in-patient and 122 out-patient visits. The increase in the out-patient mode reduced the cost of stays due to a reduced number of hospitalisations by 55, compared to the previous year.

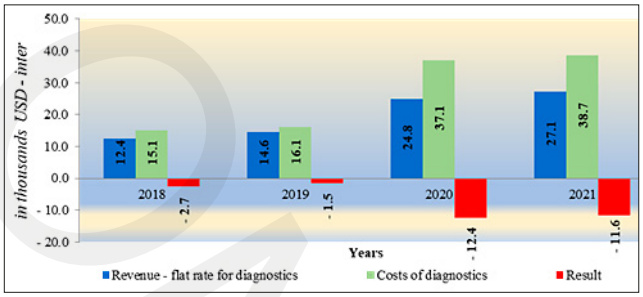

Figure 4. Costs and revenues from the flat rate for diagnostics of patients treated in the B54 programme 2018 – 2021 in USD-inter

In the years included in the analysis (2018–2021), both costs and revenues for diagnostic tests varied, depending on the number of patients covered by the programme and the diagnostic flat rate valuation adopted by the NHF. The flat rate received for diagnostics in none of the years under analysis balanced the costs incurred for that the treatment entity. Coverage of diagnostic costs by the diagnostic flat rate varied and ranged from 90.9% for 2019 to 66.7% for 2020. Despite the payer's increase in the valuation of the flat rate in mid-2019 to 1,823.63 USD-inter (after previously reducing it in August 2018 to $395.21-inter), the financial loss on diagnostics continued. The underestimation of the flat rate valuation for diagnostics, shown in the analysis, is an indicator for the public payer to take measures to increase the valuation corresponding to the actual cost of diagnostics. This will have an impact on balancing losses incurred by drug program implementers, as well as increasing accessibility for patients to treatment under the dedicated drug programme.

Despite the fact that the field of haemato-oncology is the most innovative in terms of diagnosis and treatment, over the past 20 years the number of Poles with haematopoietic and lymphoid malignancies has increased by 156% (in absolute terms, an increase of 3,404 diagnoses), while the number of registered cases of plasmocytic myeloma has doubled (an increase of 850 diagnoses).

In the Warmian-Masurian Province in north-east Poland, the number of registered cases of cancers of the haematopoietic and lymphatic systems increased in 2019 by 360%, compared to 2,000 (in absolute terms there was an increase of 373 diagnoses). However, regarding registered diagnoses for plasmocytic myeloma, there was an increase of 380%, or 40 cases, over the same period.

Table 6 shows the upward trend, year by year, of mortality from malignant neoplasms in Poland (in 2019 there was a 118.6% increase in mortality, compared to 2000, i.e. 15,765 cases). There were 1,539 more deaths from haematopoietic and lymphatic neoplasms in Poland in 2019 than in 2000. Of the total number of recorded deaths in 2019 from hemato-oncological causes (6398 cases), 22% were deaths from plasmocytic myeloma (1,410 cases), which means an increase in mortality by 539 cases, compared to 2000, i.e. by 161.1%.

Table 5. Registered incidences of malignant neoplasms in Poland: total (C00-D09), hematopoietic system (C81-C96) with a focus on plasmocytic myeloma (C90), 2000–2019

Years	Cancer	Poland		Total	Warmian-Masurian Province		Total
		Males	Females		Males	Females	
2019	C00 – D09 cancer of allsites	85,559	85,659	171,218	2,940	3,145	6,085
	C81 – C96	4,898	4,549	9,447	245	271	516
	C90 Multiple myeloma	808	905	1713	29	25	54
2015	C00 – D09	81,649	81,632	163,281	3,275	3,163	6,438
	C81 – C96	4,580	4,375	8,955	167	166	333
	C90	729	812	1,541	26	31	57
2010	C00 – D09	70,024	70,540	14,0564	2,513	2,574	5,087
	C81 – C96	3,970	3,783	7,753	121	120	241
	C90	570	677	1,247	21	20	41
2005	C00 – D09	6,3984	6,1688	12,5672	2,143	2,111	4,254
	C81 – C96	3,805	3,354	7,159	120	112	232
	C90	601	604	1,205	15	20	35
2000	C00 – D09	58,985	55,885	11,4870	1,771	1,636	3,407
	C81 – C96	3,175	2,868	6,043	74	69	143
	C90	408	455	863	5	9	14

Source: Own elaboration based on data from the National Cancer Registry.

Table 6. Registered deaths from malignant neoplasms in Poland, total (C00-D09), hematopoietic system (C81-C96) with a focus on plasmocytic myeloma (C90), 2000–2019

Years	Cancer	Poland		Total	Warmian-Masurian Province		Poland
		Males	Females		Males	Females	
2019	C00 – D09 cancer of all sites	54,370	45,954	100,324	1,972	1,714	3,686
	C81 – C96	3,377	3,021	6,398	119	132	251
	C90 Multiple myeloma	683	727	1,410	22	35	57
2015	C00 – D09	55,663	44,938	100,601	2,171	1,609	3,780
	C81 – C96	3,279	2,932	6,211	137	122	259
	C90	665	662	1,327	27	26	53
2010	C00 – D09	5,1817	4,0794	9,2611	1,917	1,533	3,450
	C81 – C96	2879	2629	5508	118	94	212
	C90	512	611	1123	19	24	43
2005	C00 – D09	51,051	39,345	90,396	1,845	1,330	3,175
	C81 – C96	2933	2622	5555	89	81	170
	C90	520	564	1,084	16	16	32
2000	C00 – D09	48,023	36,538	84,559	1,774	1,157	2,931
	C81 – C96	2,639	2,222	4,861	72	60	132
	C90	429	446	875	3	16	19

Source: Own elaboration based on data from the National Cancer Registry

In the Warmian-Masurian Province, the reported upward trend in mortality was even more noticeable. In 2019, there was a 125.6% increase in mortality from malignant neoplasms compared to 2000. In absolute terms, there were more deaths from malignant neoplasms by 755 cases in 2019 than in 2000, including 119 more cases of cancers of the haematopoietic and lymphatic systems. Of the total of 251 deaths from haemato-oncological causes registered in the Warmian-Masurian Province in 2019, 57 cases were related to deaths from plasmocytic myeloma, which accounts for 22.7%. Compared to 2000, there was an increase of 38 cases, i.e. 300%.

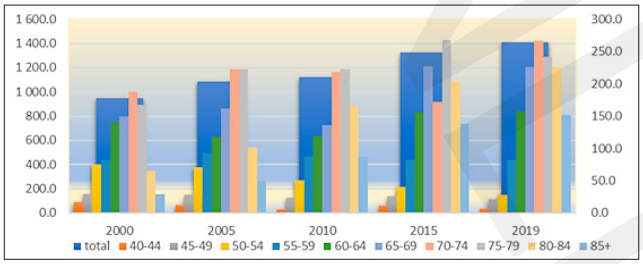

Figure 5. Number of deaths from plasmocytic myeloma by 5-year age groups in Poland, 2000–2019

A marked increase in mortality was largely a product of the median age of patients at myeloma diagnosis – 69 years, with those aged 60–70 the most likely to develop plasmocytic myeloma. Clinicians indicate that this pattern is changing, with 30- and 40-year-olds being increasingly common among patients today. With more and more effective therapies available, the life expectancy of patients with plasmocytic myeloma has increased threefold [5].

The number of deaths from plasmocytic myeloma was on the rise during the period under analysis. According to 5-year age groups, the registered number of deaths was as follows: 2000 – 875; 2005 – 1084; 2010 – 1123; 2015 – 1327; 2019 – 1410. The highest number of deaths was recorded in the 70–74 and 75–79 age groups.

Plasmocytic myeloma is not a common oncological disease, although it is one of the more frequently diagnosed haematological conditions. In Poland, about 2,500 people develop it each year, and about 10,000 patients are living with it. The average survival of patients with multiple myeloma is 3–5 years and ranges from a few months to sometimes several years, depending on the response to anti-cancer treatment

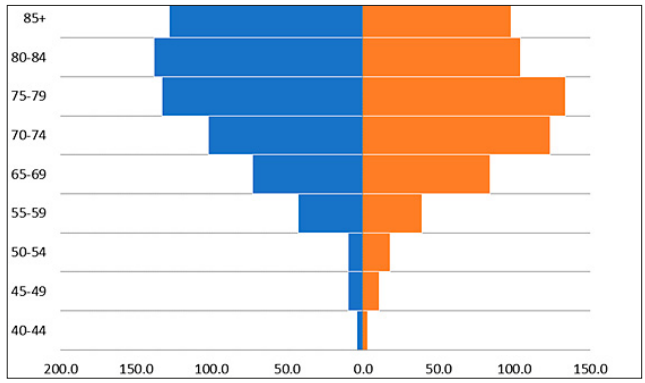

Figure 6. Number of deaths from plasmocytic myeloma in 2019 in Poland by age group

[4]. Plasmocytic myeloma begins to develop insidiously, and its symptoms are non-specific, making diagnosis much more difficult. In the early stages of the disease, the patients most often report fatigue, skeletal pain, and more frequent infections. In some patients, non-characteristic symptoms do not allow the diagnosis of myeloma at an early stage. However, the disease progresses and leads to pathological bone fracture [9], renal failure or anaemia. Patients are then diagnosed in the emergency setting. There are studies showing that half of patients who have had an emergency diagnosis survive a maximum of one year [4, 7]. Myeloma symptoms develop over months to several years. An abnormal protein, known as monoclonal protein, usually appears in the blood and urine, and in every case, detection of its presence requires exclusion of plasmocytic myeloma in the first place, but also many other diseases in which this protein may appear [34].

Monoclonal protein can also be relatively common in healthy elderly people (3–5% of the population over 60 years of age) and then, after excluding the underlying disease, the condition is referred to as benign monoclonal gammopathy, or monoclonal gammopathy of unknown significance (MGUS) [19, 35]. Plasmocytic myeloma is a malignancy with a varied course and prognosis, depending, e.g., on genetic factors. Identification of these factors allows specialists to recognize patients at risk for an unfavourable course of the disease, and helps in the selection of an appropriate therapeutic strategy [31].

Assessment of the risk of progression and unfavourable course of the disease is enabled by cytogenetic diagnostics. Patients at high cytogenetic risk respond less well to

Table 7. Number of deaths from plasmocytic myeloma by 5-year age groups in Poland, 2000–2019

		Total	40–44	45–49	50–54	55–59	60–64	65–69	70–74	75–79	80–84	85+
2019	females	727	4	10	10	43	73	102	133	138	128	86
	males	683	3	11	18	39	84	124	134	104	98	66
2015	females	662	2	9	15	31	72	118	87	139	115	73
	males	665	9	17	25	51	84	109	85	129	88	65
2010	females	611	0	9	22	46	44	73	121	137	103	54
	males	512	5	15	29	42	75	63	97	86	63	33
2005	females	564	5	14	26	43	47	86	127	124	63	28
	males	520	7	14	45	50	71	76	96	99	38	21
2000	females	446	4	10	18	21	62	88	101	94	31	15
	males	429	10	15	30	32	69	74	92	69	27	8

Source: Own elaboration based on data from the National Cancer Registry.

treatment than patients in other risk groups. Response to the applied treatment is usually shorter and the disease relapses more quickly. This necessitates the use of the most effective therapies, a different approach to treatment and its monitoring, as well as more frequent follow-up visits. [36]. Depending on statistics, high-risk patients account for 15–20% of all multiple myeloma patients. In so-called relapsing patients, the percentage is higher at 20–30%, this means that up to 1/3 of all myeloma patients may be at high cytogenetic risk [35, 37].

DISCUSSION

The valuation (rating) used by the public payer to settle the cost of the drug and the services associated with its administration, as well as the flat-rate form of payment for diagnostic services, does not cover the actual cost of treatment incurred by the treatment entity for running the drug programme. Drug programmes are strictly defined therapeutic procedures, funded by public healthcare systems, which allow treatment with very expensive, modern drug technologies. One of the main reasons why innovative medicines are subject to this form of access is the limited financial capacity of the public payer. For this reason, only some medicines are covered by this form of reimbursement. At the stage of agreeing on a drug programme, before a drug is reimbursed or an indication is extended, a limit is set on the willingness to pay for treatment in exchange for gaining additional years of life [29].

Compliance with the cost-effectiveness criterion is measured using incremental analysis, the results of which are taken into account in reimbursement decisions [3, 7, 38]. In view of the limited financial capacity of the public payer, costly drug therapies are targeted at patients who should derive the greatest benefit from such treatment, and patients for whom other treatment methods have not yielded satisfactory results [12, 39]. The patient must meet strict criteria for inclusion in a drug programme in order to receive a specific drug [40]. The inclusion of a patient in the programme is decided by physicians employed in hospitals with a contract with the NHF for administering a given drug therapy [41].

The general guidelines of the public payer for the implementation of drug programmes, define three ways of admitting a patient to a medical centre for the administration of a drug (hospitalisation in a hospital ward, one-day stay and out-patient stay). At the same time, following the optimisation of therapy costs, the out-patient mode is recommended [42].

The use of one of these treatment modes is determined by the safety of the patient, due to the permitted form of drug administration. Thus, administration of the drug is intravenously, which always requires a longer patient observation, and is always in the in-patient mode. On the other hand, subcutaneous medications need a one-day mode. In the case of oral therapies, the issuance of the drug to the patient to be taken at home is on an out-patient basis.

The method and level of financing of drug therapy, and other medical procedures indicated in the description of the drug programme, is regulated by an Order of the President of the NHF [43]. Medical entities – the providers of the drug programme – receive payments according to the valuation included in the benefit catalogue. Unfortunately, as a result of under-estimation of procedures in the majority of drug programmes, expenses not covered by the public payer become costs for hospitals. For many years, providers, clinicians and health care experts have been raising the issue of under-estimation of medical services provided under drug programmes. However, this has not changed the rating and valuations used by the NHF. Since 2021, the introduction of a quality factor by the payer has only slightly improved the financial position related to the implementation of drug programmes in the performance accounts of hospitals. This applies to the cost of the patient admission for drug administration and their stay in a hospital ward, due to high and ever-increasing personnel costs and social and living expenses.

Financing diagnostics. The situation is similar regarding diagnostics. The amount of the diagnostic flat rate which is paid to healthcare providers, is based on the average valuation adopted by the NHF for tests recommended in the drug programme description. It is quite common that the flat rate calculated in this way is only sufficient to cover a part of the costs of obligatory tests. An additional financial burden for the hospital is also the cost of tests performed in connection with the occurrence of adverse drug reactions, which are a serious problem in the treatment of innovative drug technologies. This may be because carefully selected patients participate in the clinical trials of new therapies on the basis of which new drugs are authorised [40]. In clinical practice, simultaneous treatment of complications related to the applied drug therapy and co-morbidities contributes to financial loss for healthcare providers. This is related to the choice between discontinuing the therapy or making a treatment effort to maximise the health benefit for the patient. This treatment pathway should be considered by the public payer as the only valid solution, also due to its idea of optimising treatment costs. For the public payer, discontinuation of drug therapy results in the loss of effects from the financial outlay of the patient's treatment to date in the drug programme.

Drug financing. The method adopted by the public payer to account for the cost of the drug administered to the patient also carries a real risk of generating losses. This is related to the way the drug is packaged by the manufacturer and the dosage of the drug resulting from the description of the drug programme (one milligram of the drug multiplied by the patient's body weight or surface area). According to the accepted settlement method, the NHF pays only for the part of the purchased medicine that has been administered to the patient. The remaining drug in the ampoule is disposed of, which is also a hospital expense. With the expiry of patent protection for successive biological drugs, biosimilar drugs, which are highly similar to the biological drug (reference drug) and at the same time cheaper than the original counterpart, are playing an increasingly important role in the treatment of many diseases [12].

Bonus mechanism. Following the inclusion of biosimilar medicines in reimbursement, from November 2018, the NHF introduced a mechanism to reward the use of substitutes for the active substances listed in the catalogue. The mechanism included a diagnostic lump sum and residency benefits related to the administration of the drug if it was purchased for no

more than the maximum price specified in the catalogue. In practice, there are few opportunities to benefit from these adjustments because the cyclically changed reimbursement limits, which determine the maximum price of a medicine, may differ from the prices in the tender contracts concluded with medicine suppliers [41]. This happens when the amount of the active substance administered to the patient is documented by several purchase invoices, which were executed between updates of the limit tariffs.

To the disadvantage of healthcare providers, the principle, applied by the NHF, of accepting for settlement the price of the drug according to the tariff in force on the day the drug was administered, is in effect. In practice, this means discounting the value of the drug purchased. Similar restrictions apply to the diagnostic lump sum settled as 1/12 of the annual limit. The application of bonus mechanism applies only to the period in which the administered medicine was settled at a price lower than the price resulting from the tariff in force on the day of administration [44].

The element agreed with the manufacturer or importer of the medicine in the negotiation process preceding the issuance of a reimbursement decision by the Minister of Health is the so-called risk-sharing instrument. For the public payer, the establishment of this instrument provides real opportunities to optimise the costs of the drug programme, and thus the expected increase in access to treatment. For programme implementers, this means additional control by medical statistics departments of the number of drug administrations and then, after the prerequisite provided for in this instrument has been met, preparation of accounting notes for previous purchase invoices. This implies the need to double the staff to handle these administrative arrangements.

An economic category that should be considered when analysing the costs incurred by healthcare entities implementing drug programmes in Poland is the loss of value of money over time. Due to the limited budget, the NHF sets a limit for the financing of drug programmes in contracts concluded with hospitals. At the same time, increasing the number of drug programmes by allowing new molecules or extending indications increases the number of patients covered by this form of treatment. This contributes to medical entities exceeding the value of their contracts. The consequence is the necessity to wait for the NHF to pay for services provided above the set limit. The system adopted by the public payer of accounting for services provided above the set limit, often limited to payment only for the drugs used, is very difficult to accept. Provision of services above the set limit is based on health needs. As a rule, a public medical entity cannot refuse a patient benefits that are covered by the public health care system. Therefore, the limiting of services by the NHF at the contracting stage, the delay in reimbursement for services provided, as well as limiting their full coverage, constitutes a kind of shifting of treatment costs to medical entities. This is devastating to the financial liquidity of hospitals, and indirectly contributes to their indebtedness. Due to the high cost of drug therapy and patient safety, the treatment of patients under drug programmes is subject to particular administrative control by the NHF.

Therapeutic Programme Monitoring System (TMPS). An instrument dedicated to reporting all activities related to the implementation of a drug programme is the electronic Therapeutic Programme Monitoring System (TMPS) [45]. This system operates alongside the electronic hospital medical records system. This system is perceived among drug programme implementers as a certain tool in the hands of the NHF, which allows them to withhold payments explained by missing data in the reports, even though the services were provided to the patient. As past experience has shown, the errors are not due to incorrect handling of the drug programme, but to a malfunctioning TPMS. Multiple back-checking prolongs the waiting time for the NHF to pay for the medical services provided to the patient. This contributes to payment bottlenecks, reduced funds for purchasing medicines and, consequently, prolonged initiation of therapy by subsequent patients. The obligation to handle two independent systems raises objections from medical staff, who are already overloaded with work because of the increasing number of cancer patients. It is difficult to deny the validity of these arguments, especially in the context of the small number of oncology doctors. In order to remedy the situation, medical entities employ additional administrative staff to operate the TMPS. The outbreak of the COVID-19 pandemic, which started in Poland in the first quarter of 2020, brought to light shortages of medical staff. Because of doctors' sickness absences, for the duration of the epidemic the legislator reduced the administrative requirements related to the reporting of provided services under drug programmes. This involved the introduction of a simplification in the settlement of the costs of implementing programmes for the duration of the epidemic. Since the entry into force of this provision, the settlement of costs related to the implementation of drug programmes already took place after correct reporting of data by the provider to the NHF [46]. This allows medical staff to take care of patients instead of spending a large part of their time completing the TMPS [47].

A priority for the medical community is to continuously expand access to therapies so that in the case of a lack of response to one therapy, further therapies can be used, especially since there is a growing problem of patient resistance to therapies used in the initial stages of treatment [12]. Oncologists and patients also expect the provisions of drug programmes to be adapted to the registered indications in the Summary of Product Characteristics [48]. A significant reduction in overall treatment costs as a result of the acceptance of cheaper biosimilar drugs for reimbursement allows innovative treatments to be available to more patients within the available resources. Although the availability of innovative medicines is steadily improving, access to pharmacotherapy for myeloma in Poland is still suboptimal [3, 4]. This means that the treatment complies with international standards only to a certain extent. Thus, there is a big gap between the reimbursement of a given drug and its registration [8].

In view of the un-fulfilled needs of haemato-oncology patients, the need to merge drug programmes is emphasized so that the programme is for the disease, not the drug [20]. In plasmocytic myeloma in particular there is a need to organise therapies so that they can be available in earlier lines of treatment. Increasingly, the disease is being diagnosed in younger and younger patients, who are professionally and socially active. It is very important for these patients to remain in their social and professional roles [4, 5]. This is facilitated by the oral form of the drugs, which also contributes to the patient's psychological well-being [49], and is therefore also

a good systemic solution. In view of the inadequate bed base in haematology wards in Poland, all out-patient treatment options are preferred. This is due to the need to eliminate patients' stay in hospital only because of therapy, and not because, for example, of comorbidities [50].

The evolution observed in the therapies available to patients under drug programmes, as well as the experience of the COVID-19 pandemic, which forced healthcare organizers to make some procedures more flexible, have provided the incentive to seek solutions that allow more flexible management for the benefit of the patient and the facility providing the care, without compromising the outcome of treatment. Oral drug formulation is a highly desired form of therapy by patients.

The treatment of plasmocytic myeloma is long-lasting, with most therapeutic regimens administered continuously [5], consequently, the patient also bears social and societal costs associated with it. These are lower with out-patient treatment and oral drug administration. The patient does not have to commute to the health centre, which is additionally associated with a higher risk of infection [37]. A well-organized healthcare system should be aimed at enhancing health value, meant as the relationship between health outcomes and experiences of patients receiving care and the treatment costs [5, 7]. The Polish healthcare system faces great challenges in meeting growing health needs because of limited financial resources and shortages of specialized medical staff.

Although the short observation period due to the several years of the B54 drug programme in the analysed centre was a limitation of this study, it may, nevertheless, form the basis for the Agency for Health Technology Assessment and Tariff System to undertake analyses aimed at increasing the valuation of services corresponding to the actual costs of treatment.

Revaluation of the valuation of benefits covering the costs of running a drug programme will reduce the financial losses of drug programme implementers. Thus, it will increase their interest in running the programme, which will increase the availability of this drug therapy for patients.

CONCLUSIONS

The use of innovative drugs increases the effectiveness of treatment of many cancers, but also generates a huge financial burden for the healthcare system in Poland. Year after year, the public payer's expenditures related to the treatment of patients under drug programmes are increasing. The valuation (rating) used by the public payer to settle the cost of the drug and the services associated with its administration, as well as the flat-rate form of payment for diagnostic services, does not cover the actual cost of treatment incurred by the treatment entity. The costs of treating comorbidities and related complications of intensive anti-cancer treatment are not financed by the NHF. This generates financial losses for the drug programme implementer.

The Polish healthcare system faces a major challenge in meeting growing health needs. Without increasing the valuation of medical services provided to patients treated under drug programmes corresponding to the actual cost of treatment, the expected increase in access to innovative therapies will be difficult to realize.

Ethical Requirements. Consent of the Bioethical Committee was not required as the study was retrospective, and based on financial and accounting data. Medical documentation was not analysed.

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