



Diabetic Macular Edema treatment limits in Poland

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Abstract

Diabetic Macular Edema (DME) is a severe disease, related to Diabetic Retinopathy (DR). All diabetic patients are at risk of DME development. The disease severity may vary from mild to moderate, with a risk of loss of vision. Diabetic Retinopathy, including Diabetic Macular Edema patients in Poland, are treated within Diagnosis Related Groups (JGP) system, that allows settlement of costs of performed medical procedures, including vitreoretinal procedures, fotocoagulation, and administration of VEGF inhibitors.

In this article authors tried to analyse what are the costs of treatment of DME patients within Diagnosis Related Groups (JGP) in Poland, what are the trends in expenditures of DME treatment, and what are the recommended steps to the decision makers in vision loss prevention amongst mellitus patients in Poland?

The study and analyses in this article are based on Diagnosis Related Groups (JGP) statistical reports available for years 2009-2015, published by the Polish National Health Fund (NFZ).

DME treatment spendings within the JGP groups in Poland, are notably low, vary from 1,2 MM PLN in 2009, achieving its maximum of 1,5MM PLN in 2010, and resulting in <1,1 MM PLN in year 2015. The number of treated patients decreased markedly from more than 800 in year 2009, achieving its minimum of 198 patients in year 2014.

DME treatment in Poland within the public system is remarkably below needs, and it does not meet standards of vision loss prevention amongst mellitus patients. The situation is mainly caused by under-diagnosis at the primary healthcare outpatient clinics, long waiting time for an ophthalmologist consultations and treatment budget limits within JGP groups in hospitals.

Diabetic Macular Edema (DME) is a severe disease, related to the Diabetic Retinopathy (DR). All diabetic patients are at risk of DME development. The disease severity may vary from mild to moderate, with risk of loss of vision. 25% to 30% non ophthalmology treated, and up to 15% ophthalmology treated diabetic patients might be affected by moderate loss of vision due to DME. Based on the Rohit Varma, Neil M. Dressler study published in JAMA Ophthalmology weighted DME prevalence in USA is 3,8% (2.7%-4.9%) of diabetes, however the meta-analysis of 35 studies (22,896 patients from United States, Australia, Europe and Asia) calculates DME prevalence on 7.48% (7.39–7.57) of the overall diabetes population.

Progression to DME affects 3% of mild non-proliferative DR eyes, 38% moderate and severe non-proliferative DR eyes and relates up to 71% eyes of the proliferative Diabetic Retinopathy - the most vision-threatening form of the disease,.

According to the Los Angeles Latino Eye Study and in the Proyecto VER study - 18% of participants with diabetes of more than 15 years' duration had the proliferative DR, with no PDR percentage difference between Type 1 vs Type 2 diabetes.

Polish National Health Fund (NFZ) estimates diabetes patients on 2 millions in Poland. Based on NFZ data and referring to cited above Rohit Varma as well as Joanne Yau studies, authors calculate DME prevalence from 76.000 to 149.000 patients in Poland.

In this article authors tried to assess what are the Diabetic Macular Edema treatment limits in a Polish healthcare system perspective.

To answer this question, the Polish National Health Fund (NFZ), Diagnosis Related Group (JGP) data were used. For any other calculations in this article, authors accounted 7,48% DME prevalence amongst mellitus patients as the most relevant to Poland.

NFZ regularly publishes JGP statistics, and since year 2009, there are specific common treatment baskets relevant to eye diseases (JGP B1 to B98).

As for the ICD-10 classification, Diabetic Retinopathy H 36.0 with ICD-9 procedures (E10-E14) are included in NFZ hospital JGP statistics presented in the [table 1](#).

Procedure JGP	Description of the procedure	Maximum possible JGP points	Minimum possible JGP points
B16	Procedures including vitrectomy with the use of silicone oil or decalin, including multi-procedural	163 / 147*	147 / 132*
B17	Procedures including vitrectomy, including multi-procedural	140 / 126*	126 / 113*
B83	Vitreoretinal - medium procedures	29	26
B84	Vitreoretinal - small procedures	16	13
B98	Eye conservative treatment	42	5

Table 1. Diabetic Retinopathy settlement within the JGP system, Poland (years 2009-2016) *from year 2016

Based on the above information, we can observe that during Diabetic Retinopathy treatment in hospitals in Poland, ophthalmologists utilise B16, B17, B83, B84 and B98 JGP groups in order to settle the costs of a treatment, however the value of groups significantly differ in points. Taking into account that 1 hospital JGP point equals to approximately 52 Polish Zloty, DR treatment in years 2009 - 2015 were being settled on value from minimum 260 PLN, up to 8.476 PLN depending on list of medical ICD-9 procedures within a JGP group and type of a hospitalisation performed ('full' hospitalisation, planned hospitalisation, 1 day hospitalisation).

All the presented JGP statistics in the NFZ JGP platform do not cover specifically Diabetic Macular Edema, fortunately there are available Diabetic Retinopathy hospitalisation data, so for the purposes of this article, authors have included all cited above outcomes of the DR and DME medical studies.

To calculate Diabetic Macular Edema treatment costs, based on the available JGP data, we propose to use a mathematical formula, directly related to DME progression to non-proliferative and proliferative Diabetic Retinopathy (H 36.0). The formula is presented as below:

$$\text{DME Hospitalisations} = \text{DR Hospitalisations} * ((82\% * 38\%) + (18\% * 71\%))$$

Where:

- 82% - non-proliferative patients ratio amongst Diabetic Retinopathy
- 18% - proliferative patients ratio amongst Diabetic Retinopathy
- 38% - non-proliferative moderate and severe DR eyes ratio
- 71% - proliferative DR eyes ratio

Using the formula it can be estimated a number of DME hospitalisations and DME patients.

Diabetic Retinopathy, calculated Diabetic Macura Edema JGP hospitalisations and number of treated patients are presented in the [table 2](#).

Analysing the number of the DR and DME hospitalisations, as presented in the [table 2](#), we can remark that, the number of DR and DME treated patients within the JGP groups is significantly low. As described above, in Poland there are approximately 2 millions of diabetes patients, and referring to Joanne W.Y. Yau, DME prevalence as of 7.48% of the overall diabetes population, the number of DME patients equals to around 149.000. Considering that about 50% of them have moderate and severe symptoms of DME, it looks like that in order to achieve high level of vision loss prevention amongst DME patients, ophthalmologist in Poland would have to intensively treat at least 2000 patients per year. Currently there is a huge gap, between a number of treated patients within the public healthcare system versus treatment needs that would prevent worsening or even loss of vision amongst mellitus patients.

	Year	Total Diabetic Macular Edema (calculated)	TOTAL Diabetic Retinopathy (H36.0)	JGP B16	JGP B17	JGP B83	JGP B84	JGP B98
Hospitalisation Days	2009	1494	3830	90	123	99	3518	0
	2010	1286	3295	171	191	56	2877	0
	2011	607	1555	123	188	110	1134	0
	2012	535	1370	125	235	145	865	0
	2013	526	1349	125	288	106	426	404
	2014	487	1247	122	194	2	356	573
	2015	331	849	119	215	0	200	315
Number of Patients	2009	862	2210	80	116	49	1965	0
	2010	812	20181	149	180	30	1723	0
	2011	398	1019	106	177	72	663	0
	2012	374	958	106	220	85	547	0
	2013	279	715	104	267	65	278	0
	2014	198	508	103	181	2	221	0
	2015	273	699	100	201	0	131	267

Table 2. Diabetic Retinopathy and Diabetic Macular Edema hospitalisations and patient

Like in other diseases in Poland, there may be some budget limitations, that reduces level of treatment due to potential high cost of treatment to the healthcare system. To answer this doubt, there are calculated DR and DME patients costs of treatment within the JGP groups, presented in the [figure 1](#).

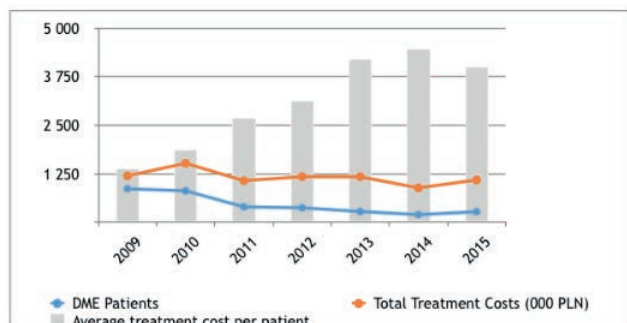


Figure 1. DME patients vs Total Costs of treatment vs Average treatment cost

According to the data presented in the figure 1, authors observe a stable, low annual treatment costs for DME patients treated within the JGP groups. The spendings vary from 1,2 million PLN in 2009, achieving its maximum of 1,5 million PLN in 2010, and resulting in less than 1,1 million PLN in year 2015. Simultaneously the number of treated patients decreased markedly from more than 800 in years 2009 and 2010, to close to 400 in years 2011 and 2012, achieving its minimum of 198 patients in year 2014. Constant costs of treatment with decreasing trend of treated patients resulted boosting average cost treatment per 1 statistical DME patient.

The calculation of the number of treated patients, average cost of treatment and total costs of treatment of DME patients within the JGP system are presented in the [table 3](#).

As per table 3 presented data, authors conclude, that the root cause of significant decrease of DR and DME treated patients with simultaneously kept overall expenditures is mainly caused by giving up treatment within less valued JGP groups as of B83 and B84. Especially in the JGP group B84 there is a drop of treated patients from almost 2000 in year to 2009 to barely 131 patients in year 2015. Within this procedure a laser fotocoagulation is available for the treatment only. On the other hand, within the JGP procedure B98, where there is a possibility to administer VEGF inhibitor, in year 2015 ophthalmologists started to treat 267 DR patients. The most valued JGP groups B16 and B17 have kept the level of treated patients over the discussed period of years 2009 - 2015.

Trend of DR treatment costs within JGP groups is presented in the [figure 2](#).

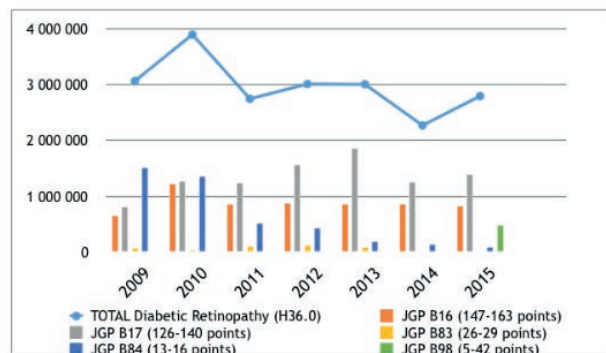


Figure 2. Diabetic Retinopathy treatment costs within JGP groups (PLN)

Discussion

This study aimed to show, what are the DME treatment costs in Poland, based on NFZ JGP statistics. The results show, small and decreasing number of treated DME patients within the JGP groups in Poland which is contrary to the disease prevalence and treatment needs that should focus on vision loss prevention amongst diabetes mellitus patients. However, the current JGP system points within the groups as of B16, B17, B83, B84 and B98 allows DME treatment, but in fact the valuation of a group, consisting form ICD-9 procedures is not directly linked with DME treatment (in opposite to i.a. age-related macular degeneration - AMD). Also, hospitals are not interested in treatment of either DR or DME patients within low valued JGP groups (like B84 - laser fotocoagulation) as it is not economically attractive, so they have retained the treatment within the most highest valued groups like B16 and B17 - vitrectomy - which is mainly used for the highest severe DR and DME patients.

Taking into account current situation in outpatient clinics where there is a very limited patients' access (long queues) to the specialist, that limits DR and DME early stage diagnosis also considering JGP system structure and valuation, all of these circumstances markedly prevents from proper DR and DME treatment and vision loss prevention in the discussed population.

Current direct costs of DME treatment in Poland are low, and there is a space for improvement, as indirect costs of not treating the DME, including social security costs due to the deterioration of vision amongst diabetes patients might significantly exceed the costs of the disease treatment. Also further analyses, especially calculating

	Year	Total Diabetic Macular Edema (calculated)	Average DME cost of treatment	TOTAL Diabetic Retinopathy (H36.0)	JGP B16 (147-163 points)	JGP B17 (126-140 points)	JGP B83 (26-29 points)	JGP B84 (13-16 points)	JGP B98 (5-42 points)
Number of Patients	2009	862		2210	80	116	49	1965	0
	2010	8212		2081	149	180	30	1723	0
	2011	398		1019	106	177	72	663	0
	2012	374		958	106	220	85	547	0
	2013	279		715	104	267	65	278	0
	2014	198		508	103	181	2	221	0
	2015	273		699	100	201	0	131	267
Treatment Costs within JGP groups (PLN)	2009	1 196 815	1 388	3 067 185	657 040	814 218	72 475	1 523 451	0
	2010	1 521 064	1 873	3 898 164	1 224 132	1 273 074	43 599	1 357 358	0
	2011	1 072 014	2 696	2 747 345	868 421	1 244 801	106 540	527 582	0
	2012	1 175 357	3 143	3 012 191	882 880	1 561 364	127 990	439 957	0
	2013	1 173 391	4 208	3 007 152	868 653	1 857 939	89 005	191 555	0
	2014	886 269	4 473	2 271 321	856 856	1 259 901	2 917	151 647	0
	2015	1 090	4 001	2 795 386	827 399	1 396 302	0	90 388	481 296

Table 3. Diabetic Retinopathy and Diabetic Macular Edema patients vs JGP costs of treatment vs average JGP treatment cost

DME costs in a social security system perspective might be helpful in taking any decisions regarding changes in the current treatment possibilities within the JGP groups system.

On top of the pharmacoeconomical divagations, there is a need to start a national program of evaluation of prevalence and incidence of diabetes mellitus related diseases including Diabetic Retinopathy and Diabetic Macular Edema.

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