Pharmacoeconomy of Diabetes Mellitus and its Implications for Organization and Quality of the Care in the Czech Republic

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Abstract

Introduction: Organization of the care is important factor for success, cost effectiveness and quality of the care for large scale chronic diseases such as diabetes mellitus. Valid data are needed for decision support.

Aim: To calculate real prevalence of diabetes in the population from incomplete data sources originally created for billing to the insurance company, to establish how these patients are treated and collect markers of quality of the care.

Methods: In data sources diabetic patients were identified by combining diagnoses from coded procedures with data about medical prescription and procedures directly linked to diabetes.

Results: 6% increase in real incidence rate of diabetes mellitus patients since 2002 was observed as well as 23% (2003-2009) decrease in mortality rate (50% decrease between 1980 to 2009).

Data also show not only higher average expenses for treatment of patients with diabetes mellitus compared to average expenses incurred for treatments of all other diagnoses, but also a crucial relationship of costs with presence or absence of diabetes mellitus complications.

Conclusion: Study overcame disadvantage of data sources which would otherwise lead to underestimation of numbers of diabetic patients. Our analysis bring additional information and showed possible financial impact for the future, if problem with prevention, regional differences in the care and incomplete adherence to guidelines will not be properly addressed.

Keywords

Diabetes mellitus, pharmacoeconomy, quality of the care, organization of the care

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1   Introduction

From 8 to 10 percent population in developed countries suffer from diabetes mellitus. Illness tied together with ample nutrition, sedentary lifestyle, stress of any kind, civilization habits and of course to genome of population. Diabetes presents not only burden for rich developed countries, but it spreads all over the globe, to developing countries with very large groups of very poor people included. There, diabetes is also on the surge because of eating habits imported from the developed world. Much more financially vulnerable health care systems in those countries thus also face serious threat of financial devastation.

But the same is true for health care systems in developed countries. In those countries sophisticated medicines and treatment options are used. As an example we frequently transplant kidneys to diabetics and this diagnosis presents number one indication for this costly procedure. Human insulin's are used for substitution of insulin deficiency and to overcome insulin resistance and thanks to that, our patients live longer. Despite the fact, that diabetes is still shortening the life of the patient, this all means tens of years of expensive care. Increase of incidence and from better treatment resulting increasing prevalence of diabetes pose major challenge to the financial stability and sustainability of health care systems of developed countries with their universal coverage and

equal access to the up to date care for all patients as well. Costs to treat average uncomplicated diabetic patient are two times higher compare to average non healthy patient with non diabetic diagnoses. What is important, for diabetic patients with complications (renal failure is to be mentioned on the first place) costs are ten times higher than average.

It has to be added, that also cooperation with diabetic patients may be far from ideal. To change their eating habits, to correct obesity, to achieve regular self administration of treatments (especially in young patients), this all in illness which does not ache and which usually does not present an imminent threat to the patient life is difficult and we are not always successful in it.

Also health care system has its substantial reserves in organization of the care for chronic patients. Many patients do not know about their condition up to the moment when first complication arrives. Education targeted both to groups at risk and to the wide population, comprehensive prevention and screening programs, this all can bring patients in time to the appropriate care. Early enough either to prevent occurrence of illness or at least to delay its onset or prevent major complications. Efficient co-ordinated care can prevent occurrence of costly episodes which not only endanger and shorten patient life, but also challenge availability of adequate resources to treat all diabetic and non diabetic patients in the society. Good data analysis is very important and helpful tool for those who organize care at the national level.

2   Experience in the Czech Republic

National Health Service of former regime in the Czech Republic twenty years ago required mandatory registration and follow up of diabetic patients. Care for them and also for other patients with diseases perceived to be threat to the national health was hierarchically organized with gate keeping primary care physicians which referred patients to the specialists. Because of growing number of patients, new medical specialty was created, and as a result of this, until present, diabetologists are in the Czech Republic taken care of diabetics and not endocrinologists like in most, maybe all other countries.

Nowadays liberally organized health care system exists in our country. There is no gate keeping role of primary care physicians, those are often used to refer all, or most diabetic patients to the diabetologists, because they are afraid of expenses and higher intensity of care. Patients have free access to all physicians. They can choose almost any care giver they want. But in the outpatient sector most care givers are self employed fee for service reimbursed private physicians. From obvious reasons this leads to duplicate and unnecessary care which wastes resources. But there are also patients who seek care unsuccessfully or decide to be a "no show". This presents high risk of complications of diabetes in years to come and also more

frequent hospitalizations because of emergences resulting from poor compensation of the illness. From the organizer of care point of view, it is very difficult to get good data about incidence and prevalence of diabetes and data about treatments, utilization of resources and quality and outcomes of the care for diabetics. This is a chance for medical informatics and up to date means of getting and analyzing data in order to improve the quality of the care.

3   Data collection and analysis

3.1   Aim of the Study

- To detect as many diabetics as is possible in population of largest medical insurance company (VZP - with more than 6 millions insured from total of 10 million population of the Czech Republic) and make good extrapolation of total numbers of diabetics in the country.

- To establish how and by whom these patients are treated and collect as many as possible markers of quality of the care.

- To present results obtained to the medical societies and to the Ministry of the Health with hope that appropriate measures to increase quality and organization of the care will be discussed and adopted.

3.2   Data collection

Data of the largest insurer in the Czech Republic VZP (General Health Insurance Company) were used. We were aware of some important challenges we had to meet:

- Primary care physicians in the Czech republic are paid by capitation and are not required to report individual services rendered (and also diagnoses) of the patient to the insurance company. To detect diabetics among their patients we had to use information about medical prescriptions in their offices (insulin, medical devices, pumps, strips, oral antidiabetic agents) and specialized services ordered - laboratory tests – glycosylated hemoglobin, referrals to the diabetologists which contain diagnosis, etc.)

- Specialist, if they diagnose or treat the patient, have to report service and diagnosis, but often are used to report diagnosis related to their specialty and not other diagnoses. For example nephrologists treating diabetic patients with chronic renal failure would for billing to the insurance company rather use this diagnosis and not diagnosis of diabetes. The same will be true for specialized services ordered (e.g. some functional test or CT, NMR studies). Similarly, cardiologist treating chest pain would probably for billing of stress test use diagnosis of angina pectoris and not diabetes.

- Hospitals because being paid by DRG (Diagnoses Related Groups), where diabetes is a condition usually having beneficial impact on reimbursements, have tendency to over report this diagnosis (for example if higher blood glucose is found at admission of acute patient, which can be caused by many other reasons then diabetes). Diabetes is also a frequent diagnosis, its code know all physicians by heart, so it is simpler and easy to use this diagnosis for reporting instead for looking for the more appropriate in the manual.

- Data from one year are clearly insufficient. There are patients who do not visit physician during the one calendar year period (or they visit only GP for small checkup which is not reported to the insurance company). To identify patients with diabetes we search databases from all years and we pick individuals with clear marker of this diagnosis – diagnosis reported by diabetologist, repeated reporting of this diagnosis by others, specific treatments, tests, medical devices, procedures with clear association with diabetes and after that, complete dataset of these patients (the whole account from insurer) from all years searched, was used for further analysis (Figure 1).
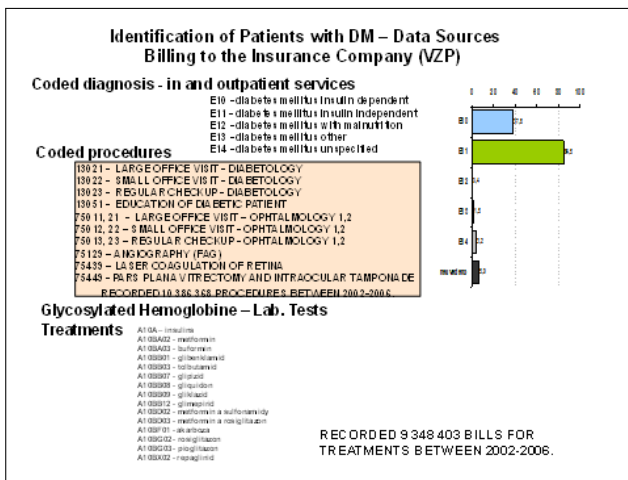

Figure 1: Diagnoses, procedures, treatments used to detect patients with diabetes.

On Figure 2 input of different medical specialties used to identify patients with diabetes. No other data from other specialties were used.

On Figure 3 overview of all possible combination of markers of diabetes (in individual patients) used in the study is given.

Picture shows, that all used flags for diabetes displayed 44.5% of patients (of course there are also patients who do not receive therapy yet, so it was impossible to achieve this in all patients) and for example, that 2.5% diabetics were identified only by therapy (probably those only treated by primary care physicians).
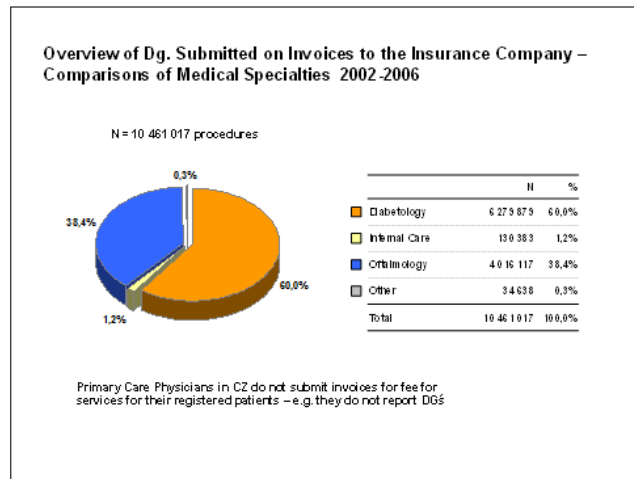

Figure 2: Presence of dg. diabetes mellitus on invoices to the insurance company – comparison of different specialties.
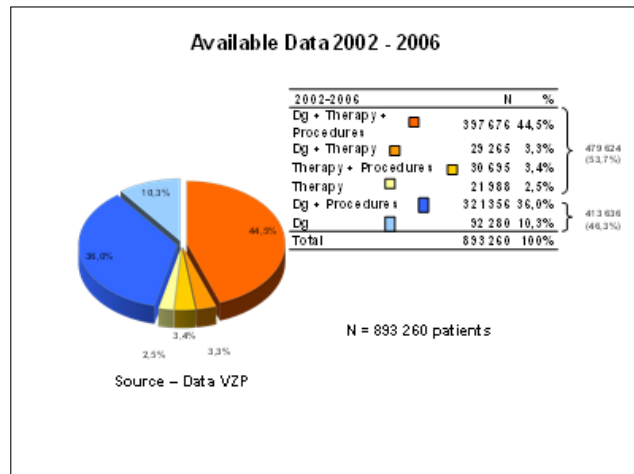

Figure 3: Overview about how patients with diabetes were detected.

4   Results

Table 1 shows number of patients detected to be diabetic and calculated percentages of diabetic patients in the population.

For patients collected during the study, their medical accounts at the insurance company were analyzed. Costs for medicines (insulin, peroral antidiabetic drugs separately), for medical devices (prescribed in outpatient setting and used during hospitalization, if they are separately billed to the insurance company) and fees for medical services were recorded. Only costs directly linked to the diabetes and its complications were included. Drugs, services, medical devices used for other purposes or in the primary care were not included. Results are displayed in Figure 4.

Results clearly show rise in direct costs between 2000 to 2007, from 1.5 billion Czech Crowns (CZK) which corresponds approximately to 75 mil. US dollars (USD), to 2.5 billion CZK (125 mil. USD). This is 66% increase (9.4% annually, which is approximately double the rate

Table 1: Number of diabetics in the Czech Republic 2002-2007.

Year	2002	2003	2004	2005	2006	2007
Total of insured in mil	6.96	6.85	6.73	6.65	6.56	6.53
Dg. of DM coded (a)	494 249	485 761	484 566	483 888	485 100	492 960
Dg, Th, procedures (all flags for DM) coded (b)	618 011	606 090	599 006	591 025	582 120	-
Percentage of DM (a)	7.1	7.08	7.2	7.27	7.39	7.54
Percentage of DM (b)	8.88	8.84	8.90	8.88	8.87	-

of the increase in overall health care costs in the Czech Republic)
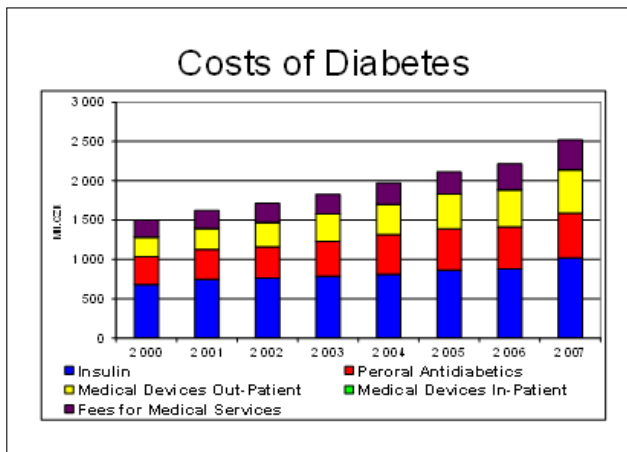
Figure 4: Direct costs of diabetes in the Czech Republic between 2000-2007.

On the Figure 5 all cost to treat diabetic patients were recorded. To this comparison, all expenses, which are attributable to the individual patient with diabetes were used.
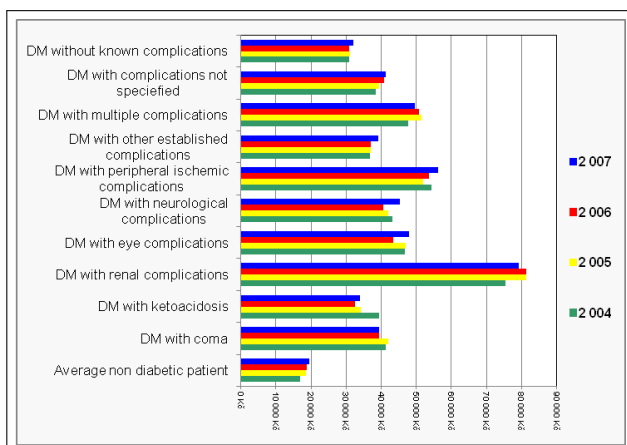

Figure 5: All costs to treat patients with diabetes 2004 - 2007.

Data show, that even without detected complications, patients with diabetes are 2times more costly to treat, than average non diabetic patient (healthy patients without any treatments and costs – except for prevention, immunizations etc. were excluded from the calculations). Patients with renal complications of diabetes are

4 times more expensive and those from them treated with hemodialysis more than 10 times. For comparison to other countries average cost for hemodialysis in the Czech republic is 370 580 CZK/year (approx. 18 500 USD/year) and average total cost for the patient in the hemodialysis program is 673 300 CZK/year (33 600 USD/year).

To know more about how the system works, it was interesting for us to know how many patients are treated resp. how many visits are done by specialists –diabetologists (Figure 6). We found, that this percentage is relatively stable, ranging from 68 to 71%.
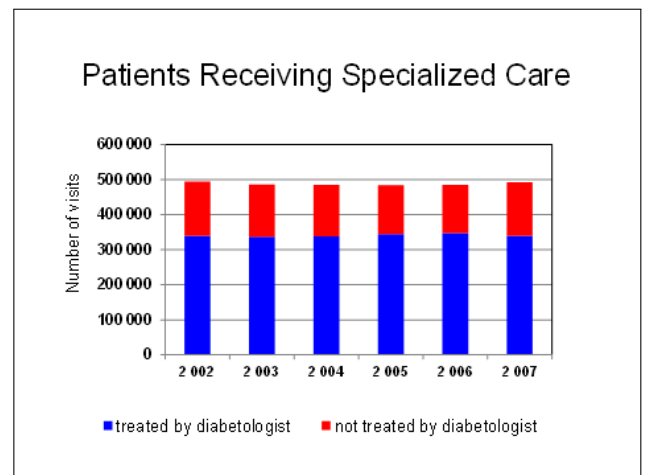

Figure 6: Visits to diabetologists and to other physicians – patients with diabetes.

One of markers of quality of the care we used was a number of patients who get glycosylated hemoglobin test according to the guidelines [1]. It should be once a year, but of course not calendar year is in question but test should be performed in approximately each 12 months period. When interpreting results depicted in Figure 7 this has to be taken into account. Another aspect analyzed were regional differences in this value, this is shown in Figure 8. Results are important inputs to medical societies and to responsible bodies of organizers and payers of the care.

If we look for trends, number of tests is slightly increasing over the years. But still it is a substantial number of patients who do not get it and on the other hand there are many patients where this test was administered repeatedly. Not surprisingly the highest utilization of services is in the capital city of Prague and in the more industrial

parts of the country (and the same can be seen almost for all other services) with more rural regions on the other side of the frequency. Interestingly, the difference in percentage of patients receiving the test differs not so much (from 46 to 64%) compare with the difference in number of test per patient, which ranges from 1,4 to 4,3 showing clearly overutilization of services in big cities.
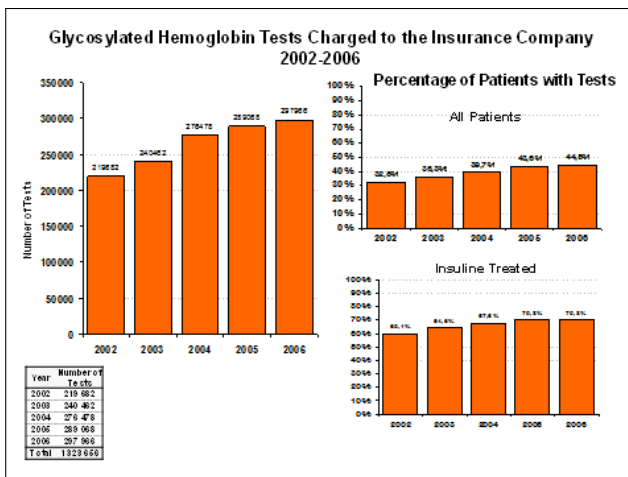

Figure 7: Glycosylated hemoglobin tests performed in diabetics in 2002-2006.
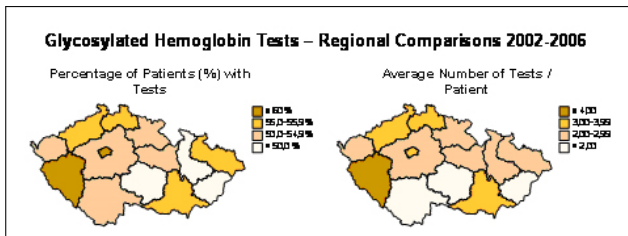

Figure 8: Regional comparisons in indication of glycosylated hemoglobin tests.

There were still more than 40% of patients with no medication, on so called "diet" (from our experience with not very high compliance rate) and this has to be goal for physicians to adopt new standards proposing metformin to be the drug of choice for those patients (Figure 9). Diabetes is very often associated with abnormal levels of serum cholesterol, triglycerides and other blood lipids. This condition is supposed to be treated, because present together with diabetes itself a potent risk factor for cardiovascular disease and death. On Figure 10 we can see that hypolipidemic therapy received less than 40% of patients in Germany [2] and about the same amount also patients in the Czech Republic. This data (data from 2005) show, that care in the Czech republic (both yellow columns) is fully comparable to the care in Germany (at least in this single aspect) but also show that expected treatments receives less than 50% of patients (target value is of course not 100% because not all patients require this therapy).
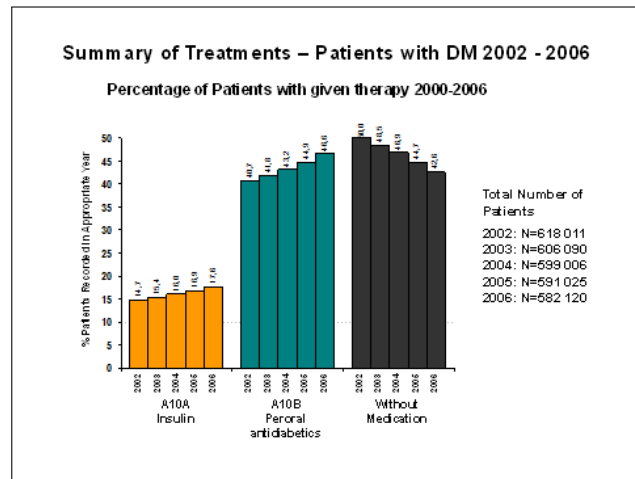

Figure 9: Treatment groups in diabetic patiens (insulins, peroral agents, no medication).
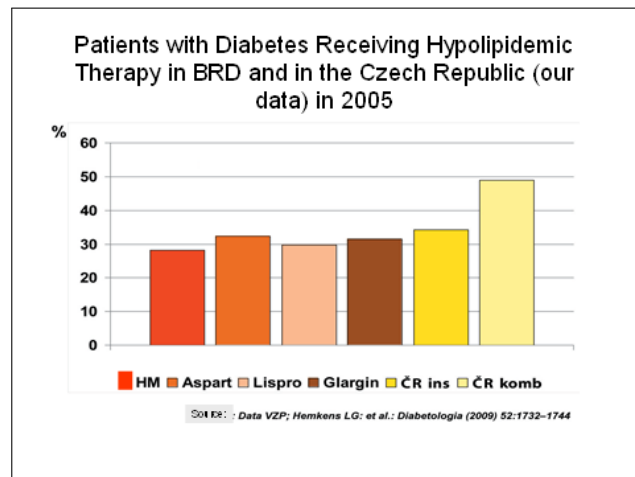

Figure 10: Comparison of percentage of patients treated with hypolipidemic drugs with various treatments of diabetes in BRD (human insulin, short and long acting insulin analogs) in comparison with data from the Czech Republic in two groups (insulin treated and insulin and oral antidiabetics used in combination).
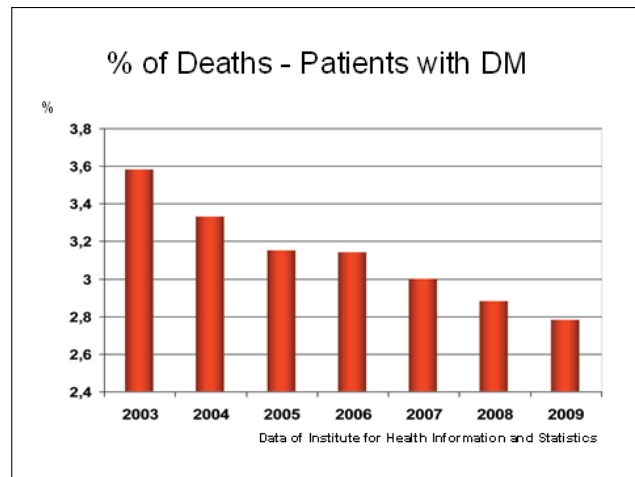

Figure 11: Percentage of deaths of diabetics among all deaths is given for year 2003 to 2009.

Despite the limited resources, better treatments in the last decade result in lower mortality of our patients. On Figure 11, percentage of deaths with known history of diabetes is given. Every year, data are improving and percentage of deaths of patients with diabetes is declining. In Figure 12 the comparison with the situation in Germany is given showing that also in this aspect are outcomes of the care in the Czech Republic comparable to the outcomes in Germany.
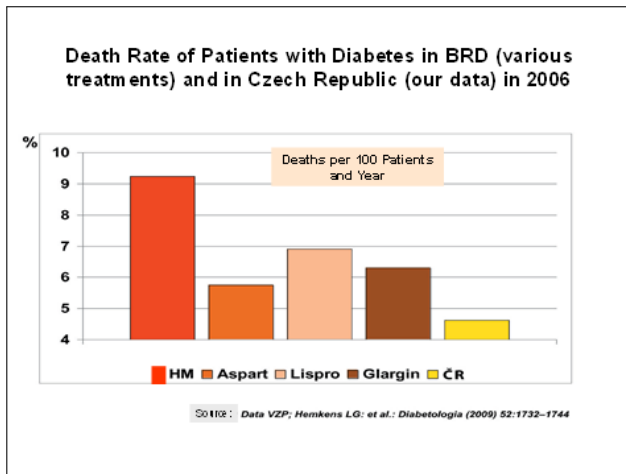

Figure 12: Death Rate of Patients with Diabetes in BRD (various treatments) and in Czech Republic (our data) in 2006.

5   Conclusion

This analysis was done in cooperation with General Health Insurance Company and its goal was not only to give valid data to the policy makers in the Czech Ministry of the Health and in Czech Medical Association, but also to bring attention to the weaknesses of the current organization of the care. From this point of view problem of unequal access to care due to regional situation and to the type of provider who is taking care about the patient is important. Study overcame disadvantage of data sources (from Institute of Health Care Information and Statistics and from medical insurance companies) which were originally obtained or created for other purposes (billing). This would otherwise lead to underestimation of numbers of diabetic patients. Prevalence of diabetes was despite reports from medical community and from situation abroad considered by authorities to be lower. Our analysis bring additional information showed possible financial impact for the future, if problem with prevention, regional differences in the care and incomplete adherence to guidelines will not be properly addressed. We bring attention to the fact, that medical statistics obtained in the settings of national health service (like in the past in the Czech Republic), differs from the statistics of national multi payer insurance system. We showed not only beneficial impact of liberal better funded medical insurance system on outcomes of the care and achievements of the Czech Republic in the care for diabetics in last ten years but we showed also challenges we face now in better coordination and organization of care.

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