

Budget Impact Modelling of Point-of-Care Hba1c Monitoring of Patients with Non-Insulin Dependent Diabetes Mellitus Type II in Russia

Boltyenkov A, Navarro F, Hren R, Topouchian A

Artem Boltyenkov, Siemens Medical Solutions USA, Inc., USA; Felipe Navarro, Siemens Healthcare Diagnostics Inc., USA; Rok Hren, Siemens Healthcare d.o.o., Slovenia; Aline Topouchian, Siemens Healthcare NV, dARE, Belgium

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Objectives:

In patients with non-insulin-dependent diabetes mellitus type II (T2DM), efficient monitoring of glycated hemoglobin (HbA1c) level is essential in ensuring glycemic control. In this study, we assessed the overall budget impact of HbA1c monitoring of patients with non-insulin-dependent T2DM in the point-of-care setting (POC) in Russia.

Methods:

We developed budget impact model (BIM) comparing the strategy of POC HbA1c monitoring every 3 months with the current standard of care strategy which consists of HbA1c testing performed twice a year.

Model design: The BIM was based on the results of a study conducted by Petersen et al. in 2007, has shown that consistent POC-based HbA1c monitoring every 3 months leads to the difference of 1% over a 7-year period. Using BIM, we followed a cohort of non-insulin-dependent patients diagnosed with T2DM in Russia for the period of 15 years and estimated the HbA1c test costs, and costs of complications (amputation, cataract extraction, kidney failure, heart failure, stroke, and microvascular disease) using the local data. All costs were expressed in €.

Population: A cohort of 6.5 million non-insulin-dependent patients monitored for type 2 DM in Russia. We followed the assumption that 60% of diabetic patients receive treatment.

Time horizon/perspective: 15 years from payers' perspective.

Strategies: Monitoring of non-insulin-dependent diabetes patients with POC HbA1c testing every 3 months or the current standard of care strategy which consists of HbA1c testing performed twice a year.

Efficacy of HbA1c monitoring: In the model, we used an average HbA1c level of 8% (64 mmol/mol) for both every 3 months testing strategy and standard of care twice a year testing strategy during the first 7 years. We used an average HbA1c level of 7% (53 mmol/mol) for every 3 months testing strategy and 8% for the standard of care twice a year testing strategy during years 8-15.

POC laboratory costs:

POC average test cost	1.5 EUR
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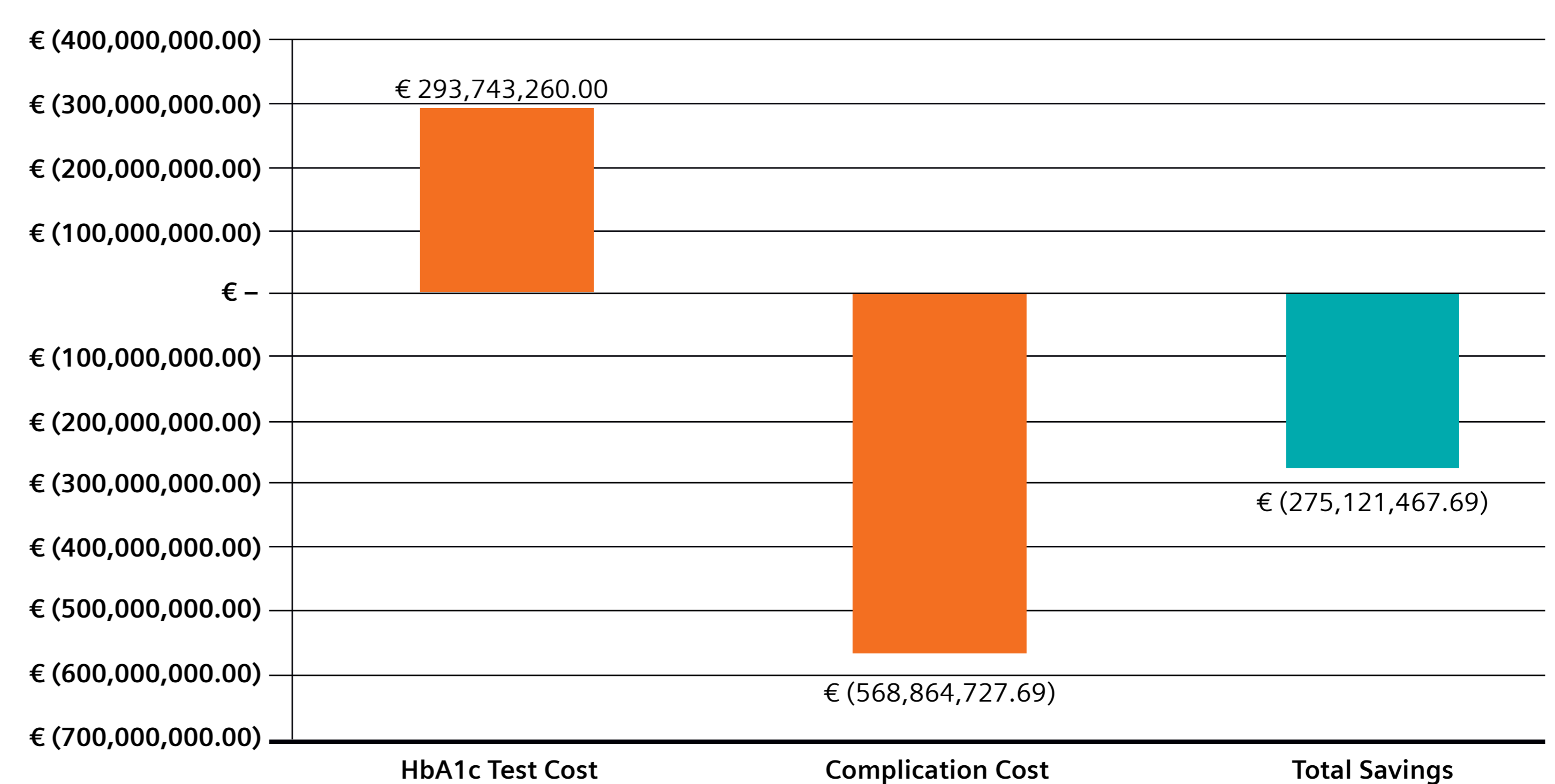
Costs of complications due to type 2 DM: We included local costs of amputation, cataract extraction, kidney failure, heart failure, stroke, and myocardial infarction.

Complication incidence and complication incidence reduction when lowering average HbA1c by 1%:

	Complication Incidence	Complication Incidence Reduction	References
Amputation	0.2%	43%	Johannesson A, Larsson G, Ramstrand N, Turkiewicz A, Wirehn AB, Atroshi I. Incidence of lower-limb amputation in the diabetic and nondiabetic general population. <i>Diabetes Care</i> . 2009;32(2):275-80. Hayer K, Debus ES, Mayerhoff L, Augustin M. Prevalence and regional distribution of lower limb amputations from 2006 to 2012 in Germany. <i>European Journal of Vascular and Endovascular Surgery</i> . 2015;50(6):761-6. Assal JP. (1995). Cost-effectiveness of diabetes education. <i>Pharmacoeconomics</i> . 1995;13(suppl. 1):68-71.
Cataract extraction	20.8%	19%	Prokofyeva E, Wegener A, Ziemer E. Cataract prevalence and prevention in Europe. <i>Acta Ophthalmologica</i> . 2013;91(5):395-405.
Heart failure	5.1%	16%	Sagmeister M, Gessner U, Oggier W, Hirsiger B, Gutzwiler F. An economic analysis of ischaemic heart disease in Switzerland. <i>European Heart Journal</i> . 1997;18(7):1102-9.
Myocardial infarction	20.7%	14%	icks A, Dickhaus T, Hörmann A, Heier M, Gianni G, Kuch B, Meisinger C. Differences in trends in estimated incidence of myocardial infarction in non-diabetic and diabetic people. <i>Diabetologia</i> . 2009;52(9):1636-41. Gandjour A, Kleinschmit F, Lauterbach KW, INTERCARE. European comparison of costs and quality in the treatment of acute myocardial infarction. <i>European Heart Journal</i> . 2002;23(11):858-68.
Stroke	11.4%	12%	icks A, Claessen H, Kivikina T, Nannes M, Weingärtner M, Schwab S, Kolominisky Babas PL. Incidence and relative risk of stroke in the diabetic and the non-diabetic population between 1998 and 2014. <i>PLoS One</i> . 2017;12(11):e0188306. Boehme KW, Buechtele G, Frankenhäuser-Mannus J, Mueller J, Lump D, Boehm BD, Rothenbacher D. Prevalence, incidence and concomitant co-morbidities of type 2 diabetes mellitus in South Western Germany. <i>BMC Public Health</i> . 2015;15:855. Spross F, Blank PK, Sauer TD. Stroke in Switzerland: social determinants of treatment access and cost of illness. <i>Journal of Stroke and Cerebrovascular Diseases</i> . 2014;23(5):926-32.
Kidney failure	0.2%	14%	Pommer W. Prevalence of nephropathy in the German diabetes population. <i>NDF Plus</i> . 2008;1 (Suppl 4):iv2-iv5. Boehme MW, Buechtele G, Frankenhäuser-Mannus J, Mueller J, Lump D, Boehm BD, Rothenbacher D. Prevalence, incidence and concomitant co-morbidities of type 2 diabetes mellitus in South Western Germany. <i>BMC Public Health</i> . 2015;15:855. Guigard AP, Oberholzer J, Benhamou PY, Touzet S, Bacher P, Periformis A, Bayle F, Kessler L, Thivolet C, Badier L, Morel F, Colin C. Cost analysis of human islet transplantation for the treatment of type 1 diabetes in the Swiss-French Consortium GRAGIL. <i>Diabetes Care</i> . 2004;27(4):895-900.

Results:

POC testing in non-insulin-dependent T2DM patients every 3 months saves 275 million EUR when compared to twice a year testing – 42 EUR per patient in the cohort. The main contributor to the saving were lower complication costs due to better diabetes control in the every 3 months testing strategy.



Conclusion:

Findings of our study corroborate those of our earlier studies, where we have shown that the POC HbA1c monitoring in patients suffering from T2DM may reduce diabetes-related health care costs in high-income and middle-income countries. This study has important potential implications for management of the non-insulin-dependent diabetic population and reimbursement of HbA1c testing methodologies in Russia.

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