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# MANAGEMENT OF TYPE 2 DIABETES MELLITUS AT PRIMARY HEALTH CARE LEVEL IN LITHUANIA

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## *Abstract*

***Background.*** *Type 2 diabetes mellitus (T2DM) is a complex disease that leads to continuous medical care with comprehensive, multifactorial strategies for reducing disease risk for patients. There is an ongoing discussion on how to better manage chronic diseases at primary health care facility level. It is recognized that continuous management of chronic diseases needs to find new ways in managing risk and outcomes of chronic diseases.*

***Aim of the study****. To find the elements of value creation management with perspectives of priorities management and to examine the impact of factors on chronic diseases state with prognosis of T2DM progress in primary health care.*

***Materials and methods.*** *The methods of the research were based on the group discussions of managers from primary health care and the survey of patients with T2DM that was conducted after the consultation of family doctor in primary health care facilities in Lithuania. Focus group discussions (n = 48) were conducted from May 2015 to March 2016 in 10 counties of Lithuania (31 executives of public primary health care facilities and 17 executives of private primary health care facilities). From October 2017 to January 2018, the survey of patients (n = 510) with T2DM was conducted (258 from public and 252 from primary health care facilities). Multinomial logistic regression was used for the analysis.*

***Results.*** *The main elements of value management with focus on chronic diseases management were health promotion, quality of life, time management, satisfaction, communication, partnership with health care professionals, values and lifestyle of patients. Significant distribution among sociodemographic (income, place of residence, gender), non - clinical (affiliation to primary health care facility, self - perceived health, satisfaction with T2DM treatment, treatment options) factors were investigated. Age, gender, place of residence, self - perceived health, education, treatment options of T2DM were the factors that predicts the prognosis of T2DM progress.*

***Conclusions.*** *The foundation of value elements with perspectives of priorities management provides insights to develop interventions programs and projects that would increase patient satisfaction with primary health care services. The factors evaluation on T2DM progress is the opportunity to find effective management tools that helps predict a disease evolution. The prediction of T2DM is basis for clinicians and managers in priorities setting and decision making. The results of the research can be ground for the continuous management of T2DM disease improvement in primary health care facility. The determination of elements of value management, the distribution of factors among T2DM disease states, the factors examination on chronic diseases states can be the principles of building theories.*

***Keywords:*** *Primary health care, type 2 diabetes mellitus, elements of value management, quantitative research method, qualitative research method.*

## Introduction

Type 2 diabetes mellitus (T2DM) is a chronic disease, associated with serious complications such as retinopathy, nephropathy, neuropathy, ischemic heart disease, peripheral vascular disease and cerebrovascular disease[1], and in industrialized and developing countries it is the leading cause of death[2]. The Heart Failure Association of the European Society of Cardiology states that the coexistence of heart failure and T2DM is common and has a strong impact on clinical management and prognosis[3]. Different theories explain

1 Mehring M, Donnachie E, Bonke FC, Werner Ch, Schneider A. Disease management programs for patients with type 2 diabetes mellitus in Germany: a longitudinal population-based descriptive study. *Diabetology and Metabolic Syndrome* 2017; 9 (37): 1-8.

2 Burridge LH, Foster MM, Donald M, Zhang J, Russell AW, Jackson CL. A qualitative follow - up study of diabetes patients' appraisal of an integrated diabetes service in primary care. *Health and Social Care in the Community* 2017; 25 (3): 1031-1040.

3 Seferovic PM, Petrie MC, Filippatos GS, Anker SD, Rosano G, Bauersachs J. et al. Type 2 diabetes mellitus and heart failure: a position statement from the Heart Failure Association of the European Society of Cardiology. *European Journal of Heart Failure* 2018; 20: 853-872. doi:10.1002/ejhf.1170

the observed risk factors (cardiovascular, albuminuria, obesity, smoking, undertreatment, etc.) in the impact of T2DM on survival[4]. T2DM increases the risk of cardiovascular diseases, and for patients with T2DM and without a history of cardiovascular diseases, a significantly lower relative survival in women compared with men with T2DM was found[5]. Diabetes mellitus may increase the risk of heart failure in both men and women in all age groups, especially in young people[6]. In Lithuania, the results of the research (n = 606) stated that 98% of patients with coronary heart disease had at least one of four conventional risk factors: hypertension (47.7%), diabetes (12.9%), dyslipidemia (90.1%), smoking (24.1%)[7]. In order to reduce the epidemic of coronary heart disease, much greater emphasis should be given to identify and to improve prevention of conventional risk factors as well as the lifestyle of the patient[8]. A number of factors including diabetes education, perceived and actual hyperglycemia and macrovascular complications (amputation, peripheral arterial disease, ischemic heart disease and stroke) are associated with treatment satisfaction, and self - management education programs should incorporate these factors for ongoing support in patients with T2DM[9]. In Canada, during focus group discussions (n = 79), patients' needs were expressed: assurance of satisfactory follow - up by a family physician, continuous access to services adapted to evolving needs, motivation to adopt and maintain healthy behaviors, maintenance of knowledge about diabetes, psychological support, financial constraints, and collaboration with secondary - level services and proposed solutions for improving services: facilitating access to services, disseminating information about available services, centralizing diabetes information on the internet, offering personalized services and improving interprofessional collaboration[10]. In Lithuania, scientists stated that diagnosis of T2DM in time provides the possibility to reduce expenses for health care system and to prolong a patient's life[11]. Health system reforms aim at better outcomes of patients with T2DM through new models of care, and primary health care is an ideal setting for the management of complex T2DM. There is a growing interest in integrated models of service delivery for patients with T2DM that combine secondary

4 Hendricks SH, van Hateren KJJ, Groenier KH, Landman GWD, Maas AHEM, Bilo HJG. et al. Sex differences in survival of patients with type 2 diabetes in primary care (ZODIAC-50). BMJ Open 2017; ;7: e015870. doi:10.1136/bmjopen-2017-015870

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8 *Ibid*

9 Boels AM, Vos RC, Hermans TGT, Zuithoff NPA, Müller N, Khunti K. et al. What determines treatment satisfaction of patients with type 2 diabetes on insulin therapy? *An observational study in eight European countries.* BMJ Open 2017; 7: e016180. doi:10.1136/bmjopen-2017-0161805

10 Vachon B, Huynh AT, Breton M, Quesnel L, Camirand M, Leblanc J. et al. Patients' expectations and solutions for improving primary diabetes care. *International Journal of Health care Quality Assurance* 2017; 30 (6): 554-567

11 Norkus A, Ostrauskas R, Šulcaitė R. Laiku diagnozuoto 2 tipo cukrinio diabeto ir anksti pradėto gydymo ekonominis įvertinimas [The economic estimates of well – timed diagnostics and early treatment of type 2 diabetes mellitus]. *Medicina* 2005; 41 (10): 877-884

and primary health care expertise and facilitate better coordinated access to a network of health care providers[12]. In Australia, the models of care are specific core design elements such as interdisciplinary teamwork, communication / information exchange, shared care guidelines, and training and education; together with easy access and acceptability of the service for patients with T2DM and health professionals in primary and secondary levels, and a viable funding model for sustainability[13]. Disease management programs for diabetes have been introduced with the aim at improving the quality of health care and the process of disease treatment and reducing health care expenditures[14]. General practitioners or family physicians play an important role in diabetes management: coordinating, continuing, comprehensive care[15]. T2DM is a progressive disease, and pharmacological measures are needed to avoid complications and maintain glycemic control. Moreover, we have to remember that health - related quality of life is also a complex and subjective phenomenon, and additionally the lack of human resources, health care facilities, income disparities and difference of living status have a profound effect on health-related quality of life[16]. Satisfaction with physician-patient interaction is an important factor in achieving better medication adherence that leads to better glycemic control and there is a need to identify strategies to improve satisfaction to improve patient adherence[17]. T2DM has a negative impact on health - related quality of life, satisfaction with life, and a person's life[18] and has multiple socioeconomic implications[19]. Mostly diabetes interventions evaluated the effect on glycated hemoglobin with little consideration on quality of life or self - perceived health[20]. The associations between T2DM state, patient sociodemographic characteristics, non - clinical variables, treatment options have not been fully elucidated yet[21] [26]. The objectives of the study are:

12 Burridge LH, Foster MM, Donald M, Zhang J, Russell AW, Jackson CL. A qualitative follow - up study of diabetes patients' appraisal of an integrated diabetes service in primary care. *Health and Social Care in the Community* 2017; 25 (3): 1031-1040

13 Burridge LH, Foster MM, Donald M, Zhang J, Russell AW, Jackson CL. A qualitative follow - up study of diabetes patients' appraisal of an integrated diabetes service in primary care. *Health and Social Care in the Community* 2017; 25 (3): 1031-1040

14 Mehring M, Donnachie E, Bonke FC, Werner Ch, Schneider A. Disease management programs for patients with type 2 diabetes mellitus in Germany: a longitudinal population-based descriptive study. *Diabetology and Metabolic Syndrome* 2017; 9 (37): 1-8

15 Thepwongsa I, Muthukumar R, Kessomboon P. Motivational interviewing by general practitioners for type 2 diabetes patients: a systematic review. *Family Practice* 2017; 34 (4): 376–383. doi:10.1093/fampra/cmx045

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17 Nasir NM, Arrifin F, Yasin SM. Physician - patient interaction satisfaction and its influence on medication adherence and type 2 diabetic control in a primary care setting. *Medical Journal of Malaysia* 2018; 73 (3): 163-169

18 Rosiek A, Kornatowski T, Frąckowiak - Maciejewska N, Rosiek - Kryszewska A, Wyzgowski P, Leksowski K. Health behaviors of patients diagnosed with type 2 diabetes mellitus and their influence on the patients' satisfaction with life. *Therapeutics and Clinical Risk Management* 2016; 12: 1783–1792.

19 Sheikh BA, Arabiat DH, Holmes SL, Khader Y, Hiyasat D, Collyer D. et al. Correlates of treatment satisfaction and well - being among patients with type 2 diabetes. *International Nursing Review* 2018; 65: 114–121.

20 Vadstrup ES, Frolish A, Perrild H, Borg E, Roder M. Health - related quality of life and self - related health in patients with type 2 diabetes: effects of group - based rehabilitation versus individual counselling. *Health and Quality of Life Outcomes* 2011; 9 (110): 1-8.

21 Sheikh BA, Arabiat DH, Holmes SL, Khader Y, Hiyasat D, Collyer D. et al. Correlates of treatment satisfaction and well - being among patients with type 2 diabetes. *International Nursing Review* 2018; 65: 114–121.

1. To determine the elements of value management of public and private primary health care facilities in the point of view of managers of primary health care facilities.
2. To investigate the factors (sociodemographic, non - clinical) distributions among T2DM disease states in the context of continuous management of primary health care services.
3. To explore the predictions of T2DM progress with other concomitant diseases.

The main aim of the research is to find the elements of value creation management with perspectives of priorities management and to examine the impact of factors on non-communicable diseases state with prognosis of T2DM progress in the context of primary health care services.

## Material and methods

Focus group discussions were conducted from May 2015 to March 2016 in 10 counties of Lithuania. A total of 48 participants were enrolled into the qualitative study: 31 executives of public primary health care facilities and 17 executives of private primary health care organizations. The mean size of the focus group was 5 participants. The mean duration of the focus group discussion was 1.21 h. Participants (primary health care facilities) were selected from the list composed by the Lithuanian Institute of Hygiene at the end of 2012. Selection was made following the principle of 50 / 50, with the intention to include the executives of both public and private primary health care facilities. The second stage of the study was the survey of patients with T2DM after receiving family doctor's services in primary health care facilities in Lithuania. The questionnaire was developed following a methodological process based on three information sources that included consultations with researchers, results of focus groups discussions, scientific literature review. A pilot study was conducted in May 2017 in Lithuania in order to evaluate the suitability of the questionnaire. The executives of primary health care facilities were informed about the pilot study by phone and / or by email. Informed consent forms and questionnaires were distributed to executives or heads of departments or family doctors working in primary health care facilities. The questionnaires were filled out by patients with T2DM after a consultation with a family doctor. The pilot study involved 33 patients with T2DM from private primary health care facilities (8 respondents) and public primary health care facilities (25 respondents). In total, 80 questionnaires were distributed, and 33 questionnaires were completed (response rate, 41%). The reliability of the questionnaire evaluated by Cronbach alfa test was 0.920. Taking into account the respondents' opinion, the questions of the questionnaire were corrected and developed. From October 2017 to January 2018, the survey was conducted and data were collected using the questionnaire given to patients with T2DM in private and public primary health care facilities in Lithuania. Inclusion criteria for this study were as follows: (1) age of ≥ 18 years, (2) diagnosis of T2DM, (3) treatment with diet and physical activities, oral hypoglycemic agents, insulin or both. Those diagnosed with type I and gestational diabetes were excluded. All who met the inclusion criteria were invited to participate. In total, 701 respondents were approached to take a part in the survey, and 510 valid questionnaires (258 from public and 252 from primary health care facilities in Lithuania) were collected, resulting in a response rate of 72.8%.

### Analysis of focus groups research

Qualitative study analysis revealed the opinion of the participants of focus group discussions toward elements of value creation management in the context of perspectives of priorities management of primary health care facility. The study analysis was done based on participants' opinion, insights, and experience. The analytical approach of the qualitative study was based on the Grounded theory and the researchers following the principles of the rigor and quality of the analysis (Figure 1).

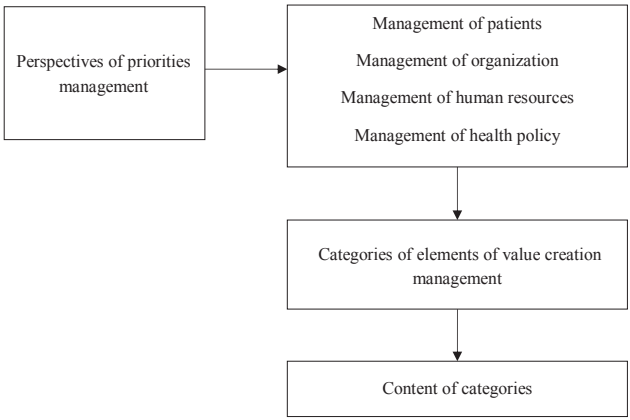


**Fig. 1.** *Proposed methodology of focus groups data analysis*
**Source:** *researchers' own (2015 - 2018 year)*

The data of focus groups research were analyzed as follows[22]:

- The data were categorized into priorities of "Management of organization," "Management of human resources," "Management of patients," "Management of health policy decision - making" from the participant perspective.
- The categories of elements of value creation management were generated and assigned to priorities.
- Each category was defined and differences and similarities were established. If the analysis categories related to the perspectives, it was predefined by the research team.

### Statistical analysis

Statistical analysis was done with IBM SPSS Statistics 25. Quantitative data were normally distributed and were expressed as mean (standard deviation, SD). One factor ANOVA test was used to compare means of quantitative features. Qualitative data were described as number (n) and percentage (%), and the chi-square test for independence

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(homogeneity) was used for the analysis of the data. Multinomial logistic regression was used to determine factors which have statistically significant influence on probability of different states of T2DM disease. Multinomial logistic regression results are presented as coefficients of model, p – value of Wald test, odds ratio (OR) and 95% confidence interval for odds ratio. Observed differences and relations were statistically significant if a p value was < 0.05.

## Results

During focus group discussions, the researchers sought to puzzle out the methods developing the value creation of primary health care facilities, and the elements of modern management are presented in Table 1.

**Table 1.** *Contemporary value management of public and private primary health care facilities*

| **Perspectives of priorities management** | **Elements of value creation management** | |
|---|---|---|
| | ***Public primary health care facilities*** | ***Private primary health care facilities*** |
| *Health policy* | Partnership with health care professionals<br>Management of changes<br>Priorities<br>Lobbying | Management of chronic diseases<br>Management of risk factors<br>Priorities |
| *Organization* | Structure<br>Image<br>Culture<br>Society | Place<br>Time management<br>Culture<br>Environment |
| *Human resources* | Teamwork<br>Knowledge<br>Communication<br>Competencies | Teamwork<br>Vision<br>Communication<br>Authority<br>Trust<br>Competencies |
| *Services* | Quality<br>Health management<br>Consultation<br>Early diagnosis of diseases<br>Health improvement and promotion | Quality<br>Partnership with secondary and tertiary levels<br>Management of results<br>Diagnosis of diseases |
| *Patients* | Health promotion<br>Responsibility for health<br>Quality of life<br>Time management<br>Satisfaction<br>Communication<br>Partnership with health care professionals | Health promotion<br>Lifestyle<br>Values<br>Partnership with health care professionals |

During focus groups research was found that value creation for customers is essential activity of primary health care facility[23]:

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*...To create value for patients, as competition grows in the quality of services. And everyone will automatically try to do the best that the patient would feel comfortable as much as possible...* (man, private health care facility, Vilnius county)

The managers of primary health care facility expressed the elements of modern management of value creation: diagnosis of diseases and treatment results, health strengthening and refreshing, management of risk factors and chronic diseases at primary health care facilities. The managers from private and public primary health care facilities expressed that health promotion and partnership are essential elements of value creation for patients[24]:

*...The facility has to have its own management model, the priority is a patient followed by accessibility, quality, etc.* (woman, public primary health care, Panevėžys county)

The managers of primary health care facilities turned their attention to the quality of services; partnership among primary, secondary, and tertiary levels; development of teamwork, communication, competencies. Based on the opinion of the leaders of both public and private primary health care facilities, appropriate personnel are the facility's capital and the largest investment is human capital[25]:

*... The patient is our priority followed by our employees that is the main capital of the facility. And it is needed to talk to them and to work with them, to solve problems, conflicts, etc...* (woman, public primary health care facility, Marijampolė county)

Among 510 respondents, 348 (68.2%) were women and 162 (31.8%) were men. As much as 77.9% and 83.3% of the women and men, respectively, indicated living in urban areas. The mean age of the participants was 64.58 years (SD = 11.49), and those aged 55 to 65 years accounted for the biggest part of the patients with T2DM (32.00%). The mean age of the women and men was 64.10 (SD = 11.56) and 65.63 years (SD = 11.29), respectively. Table 2 shows the characteristics of the study population.

**Table 2.** *Characteristics of the study population*

| **Variables** | | **n** | **%** |
|---|---|---|---|
| Gender | Female | 348 | 68.2 |
| | Male | 162 | 31.8 |
| Residence | Urban | 406 | 79.6 |
| | Rural | 104 | 20.4 |
| Income | Less than 350 Eur | 313 | 61.4 |
| | More than 350 Eur | 197 | 38.6 |
| Frequency of visits to an endocrinologist | Never | 42 | 8.2 |
| | Once in 3 months | 83 | 16.3 |
| | Once in 6 months | 101 | 19.8 |
| | Once in 12 months | 182 | 35.7 |
| | Once in 24 months | 51 | 10.0 |
| | Less than once in 24 months | 51 | 10.0 |

24 *Ibid.*

25 *Ibid.*

The statistical analysis showed that the biggest part by gender the female were attending in public and private primary health care facilities (Table 3). The most of the respondents living in urban of Lithuania: 93.3% of respondents in private primary health care facilities and 66.3% of respondents in public primary health care facilities. In our survey the most of respondents having T2DM and Cardiovascular disease, respectively 44.8% in private primary health care facilities and 41.6% in public primary health care facilities. In private primary health care facilities the biggest part of respondents were employees of physical work (34.9%). In public primary health care facilities by occupation status of respondents dominated retired (43.8%). Less than one - third (27.5%) of the patients reported having just T2DM; 72.5% and 41.0% of the patients with T2DM had concomitant chronic diseases or cardiovascular diseases, respectively. Arthritis and joint diseases were diagnosed in 9.6% of the respondents; glaucoma, 4.1%; bronchial asthma, 3.3%; kidneys diseases, 2.4%; thyroid diseases, 2.2%; prostate diseases, 1.8%; depression and other mental diseases, 1.6%; and stomach diseases, 0.8%. In the biggest part were female attending private and public primary health care facilities. The most of respondents were living in urban of Lithuania and with income less than 350 EUR. In our survey 34.9% of respondents who visiting the private primary health care facility were employees of physical work when in public primary health care facility the biggest part of respondents were retired (43.8%). Respondents with T2DM and cardiovascular diseases were the biggest part between disease state in private and public primary health care facilities. In the Table 3 are presented distributions between variables and ownership of primary health care facility.

**Table 3.** *Variables distributions among ownership form of primary health care facility*

| Variables | | Ownership of primary health care facility | | Value of Chi - square | p value |
|---|---|---|---|---|---|
| | | *Private, n (%)* | *Public, n (%)* | | |
| Gender | Female | 152 (60.3) | 198 (76.7) | 15.977 | < 0.001 |
| | Male | 100 (39.7) | 60 (23.3) | | |
| Residence | Urban | 235 (93.3) | 171 (66.3) | 57.141 | < 0.001 |
| | Rural | 17 (6.7) | 87 (33.7) | | |
| Income | < 350 EUR | 141 (56.0) | 172 (66.7) | 6.173 | < 0.013 |
| | > 350 EUR | 111 (44.0) | 86 (33.3) | | |
| Occupation status | Retired | 70 (27.8) | 113 (43.8) | 18.645 | < 0.001 |
| | Employees of physical work | 88 (34.9) | 59 (22.9) | | |
| | Employees of intellectual work | 82 (32.5) | 81 (31.4) | | |
| | Other (housewife, unemployed) | 12 (4.8) | 5 (1.9) | | |
| Disease state | T2DM | 86 (36.0) | 54 (22.0) | 21.059 | < 0.001 |
| | T2DM + cardiovascular diseases | 107 (44.8) | 102 (41.6) | | |
| | T2DM + cardiovascular diseases + other concomitant diseases | 46 (19.2) | 89 (36.3) | | |

The respondents indicated that the options of T2DM treatment were diet and physical activities (41.2%), treatment with tablets (40.2%), treatment with insulin (11.0%), treatment with tablets and insulin (7.5%). Respondents with T2DM, T2DM and cardiovascular diseases visiting private primary health care facilities, when in the biggest part respondents with T2DM and cardiovascular diseases and other concomitant diseases visiting public primary health care facilities. The distributions of factors between disease state (T2DM, T2DM along with cardiovascular diseases, T2DM along with cardiovascular and other concomitant diseases) and sociodemographic as well as non - clinical factors are presented in Table 4.

**Table 4.** *Distribution of sociodemographic and non - clinical variables among patients with different disease states*

| Variable | | Disease state, n (%), number of respondents | | | p value |
|---|---|---|---|---|---|
| | | *T2DM* | *T2DM + cardiovascular diseases* | *T2DM + cardiovascular diseases + other concomitant diseases* | |
| Income | < 350 EUR | 63 (45) | 138 (66) | 91 (67.4) | < 0.001 |
| | >350 EUR | 77 (55) | 71 (34) | 44 (32.6) | |
| Residence | Urban | 120 (85.7) | 174 (83.3) | 87 (64.4) | < 0.001 |
| | Rural | 20 (14.3) | 35 (16.7) | 48 (35.6) | |
| Affiliation to primary health care facility | Private | 86 (61.4) | 107 (51.2) | 46 (34.1) | < 0.001 |
| | Public | 54 (38.6) | 102 (48.8) | 89 (65.9) | |
| Gender | Female | 99 (70.7) | 132 (63.2) | 105 (77.8) | 0.015 |
| | Male | 41 (29.3) | 77 (36.8) | 30 (22.2) | |
| Self - perceived health | Good | 64 (45.7) | 156 (74.6) | 110 (81.5) | < 0.001 |
| | Poor | 76 (54.3) | 53 (25.4) | 25 (18.5) | |
| Satisfaction with T2DM treatment | Not satisfied | 14 (10) | 30 (14.4) | 8 (5.9) | 0.045 |
| | Satisfied | 126 (90) | 179 (85.6) | 127 (94.1) | |
| Treatment of T2DM | Physical activity and diet | 55 (39.3) | 79 (37.8) | 68 (50.4) | < 0.001 |
| | Tablets | 69 (49.3) | 84 (40.2) | 39 (28.9) | |
| | Insulin | 15 (10.7) | 26 (12.4) | 11 (8.1) | |
| | Tablets + insulin | 1 (0.7) | 20 (9.6) | 17 (12.6) | |
| Education | Primary | 12 (8.57) | 43 (20.57) | 31 (22.96) | 0.002 |
| | Secondary | 59 (42.14) | 81 (38.76) | 55 (40.74) | |
| | Higher college | 40 (28.57) | 50 (23.92) | 17 (12.59) | |
| | Higher university | 29 (20.72) | 35 (16.75) | 32 (23.71) | |

Using multinomial logistic regression, the control group was patients with T2DM, the case groups were patients with T2DM and cardiovascular diseases, patients with T2DM and cardiovascular diseases and other concomitant diseases. The regression model fit for the research data: the Nagelkerke coefficient of determination $R^2 = 0.333$. The proposed model correctly classified 55.7% of the patients with T2DM, 61.7% of the patients with T2DM and cardiovascular diseases, and 50.0% of the patients with T2DM, cardiovascular and other concomitant diseases (Table 5).

**Table 5.** *The model of multinomial logistic regression*

| State of disease | Variable | B | p value | OR | 95% confidence interval for OR | |
|---|---|---|---|---|---|---|
| | | | | | *Lower bound* | *Upper bound* |
| T2DM + cardiovascular diseases | Residence place (urban vs. rural) | 0.129 | 0.711 | 1.138 | 0.574 | 2.256 |
| | Age | 0.057 | <0.001 | 1.059 | 1.035 | 1.084 |
| | Gender (female vs. male) | -0.224 | 0.385 | 0.799 | 0.481 | 1.326 |
| | Self – perceived health (good vs. poor) | 0.782 | 0.003 | 2.186 | 1.305 | 3.664 |
| | Education (primary vs. higher university) | 0.292 | 0.543 | 1.339 | 0.522 | 3.437 |
| | Education (secondary vs. higher university) | 0.037 | 0.914 | 1.038 | 0.528 | 2.039 |
| | Education (higher college vs. higher university) | -0.178 | 0.625 | 0.837 | 0,409 | 1,711 |
| | Diabetes treatment (physical activities vs. insulin) | -0.566 | 0.138 | 0.568 | 0.269 | 1.198 |
| | Diabetes treatment (tablets vs. insulin) | -0.762 | 0.450 | 0.467 | 0.221 | 0.984 |
| | Satisfaction with treatment (not satisfied vs. satisfied) | 0.714 | 0.061 | 2.043 | 0.968 | 4.312 |
| T2DM + cariodavascular diseases + other concomitant diseases | Age | 0.103 | <0.001 | 1.109 | 1.077 | 1.142 |
| | Residence (urban vs. rural) | -1.258 | <0.001 | 0.284 | 0.138 | 0.585 |
| | Gender (female vs. male) | 0.505 | 0.115 | 1.657 | 0.885 | 3.104 |
| | Self – perceived health (good vs. poor) | 1.04 | <0.001 | 2.828 | 1.462 | 5.470 |
| | Diabetes treatment (physical activities vs. insulin) | 0.133 | 0.759 | 1.142 | 0.489 | 2.665 |
| | Diabetes treatment (tablets vs. insulin) | -0.541 | 0.225 | 0.582 | 0.243 | 1.394 |
| | Satisfaction with treatment (not satisfied vs. satisfied) | -0.337 | 0.522 | 0.714 | 0.254 | 2.003 |
| | Education (primary vs. higher university) | -0.649 | 0.224 | 0.523 | 0.184 | 1.487 |
| | Education (secondary vs. higher university) | -0.442 | 0.255 | 0.643 | 0.3 | 1.376 |
| | Education (higher college vs. higher university) | -1.364 | 0.003 | 0.256 | 0.105 | 0.622 |

In the 1 first part of the Table 5 people who had T2DM with cardiovascular diseases were compared with people who had T2DM only. Findings of the comparison showed that age, self – perceived health, treatment of T2DM were significant predictors of the occurrence of T2DM with cardiovascular diseases. With every increase in age, the odds of having T2DM with cardiovascular diseases increase (OR = 1.059 95% OR CI 1.035-1.084). Poor self – perceived health of respondents increasing the odds of having T2DM with cardiovascular diseases (OR = 2.186 95% OR CI 1.305-3.664). Treatment of T2DM with tablets was associated with 2 fold lower odds (OR = 0.467; 95% OR CI 0.221-0.984) of having T2DM and cardiovascular diseases compared with treatment with insulin.

In the 2 second part of the Table 5 people who had T2DM with cardiovascular diseases and other concomitant diseases compared with people who had just T2DM. The findings of the comparison showed that age of respondents, residence, treatment of T2DM, education were significant predictors of T2DM with cardiovascular diseases and other concomitant diseases. With every increase of age, the odds of having T2DM with cardiovascular diseases increase (OR = 1.109 95% OR CI 1.077-1.142). In urban living respondents having T2DM and cardiovascular diseases, and T2DM with other concomitant diseases is lower than respondents living in rural of country (OR = 0,284 95% OR CI 0.138-0.585). Respondents with higher college education having lower odds (OR = 0.256 95% OR CI 0.105-0.622) of TD2M with cardiovascular diseases and T2DM with other concomitant diseases than respondents with higher university education. Respondents with poor self – perceived health having bigger odds of T2DM with cardiovascular diseases and other concomitant diseases (OR = 2.828 95% OR CI 1.462-5.47).

## Discussion

This study advances understanding of the elements of value creation for patients with T2DM and the factors impact on T2DM development. In this research, we propose the model of the factors having the impact on T2DM prognosis and examine the influence of the factors on disease states.

In the scientific literature, there is ongoing discussion on value creation for patients and the impact of factors on T2DM disease state. Our group discussions revealed the elements of value creation with focus on chronic diseases management. In modern management, value creation is a paradigm involving multiple stakeholders in the marketing process, who work together at various points of the consumption process to create value for patients[26]. It is viewed as a process in which organizations and consumers interact at various stages of consumption to create the service[27]. In our study during group discussions, the priorities in value management were revealed as health policy, organization, human resources, services, patients. The managers of primary health care facilities in Lithuania expressed the importance of chronic disease management for value delivery for patients. In their point of view, it is important to manage effectively the elements of value creation for patients in achieving better outcomes of chronic disease management. It was found that the main elements of

26 Zainuddin N, Tam L, McCosker A. Serving yourself: value self - creation in health care service. *Journal of Services Marketing* 2016; 30 (6): 586-60.

27 *Ibid.*

value creation at patient level are values of patients, health promotion and lifestyle, quality of life, communication and partnership, responsibility for health, time management, satisfaction. In Lithuania, it was found that compared with men, women had significantly higher satisfaction with hospital care[28]. It is stated that social support from family, friends or significant other has a different impact of health locus of control in men and women groups[29]. The researchers investigated how differences in quality of life, effective coverage of diabetes, and service satisfaction associated with differences in the structures, processes, and the context of T2DM services (extending Donabedian's Structure – Process - Outcome model) in six European countries (Finland, Germany, Greece, Netherlands, Spain, United Kingdom)[30]. Using the regression models, it was explained that 44% of variance in service satisfaction, mostly by structure (human resources, equipment, physical accessibility of diabetes care facilities, time access to facilities), process (hours of care, number of follow - up visits, comprehensiveness of information, costs of services, responsiveness of diabetes care, empathy, communication) variables[31]. The models explained 23% of variance in quality of life between the networks, much of which is related to contextual (sociodemographic characteristic, stage of diabetes, lifestyle) variables[32]. The findings of the Brazilian study showed that patients with T2DM (n = 100) were overall satisfied with the duration of diagnosis consultation and to a great extent seemed to understand the key topics of lifestyle changes, disease, its causes, treatment and the most of them seemed to accept T2DM in a positive way[33]. Motivational interviewing used in general practice can improve the outcomes of patients with T2DM as satisfactory with family doctor service, beliefs and understanding of diabetes, motivation for behavioral changes, clinical variables (blood pressure, dyslipidemia, glycemic state), and physical activities[34]. Our study results showed that age, gender, place of residence, and income of patients with T2DM had an impact on self - perceived health. In our study was a statistically significant associations between disease states (T2DM, T2DM with cardiovascular diseases, T2DM with cardiovascular diseases and other concomitant disease) and disease treatment duration, age of patients, duration of visiting the same primary health care facility. Our study showed no statistically significant relationships between satisfaction with treatment and self - perceived health. The Polish study (n = 50) showed that the intensity of severity of health behavior and satisfaction with life of T2DM patients depended on the gender of the patient, and the analysis of patients' behaviors in four categories (proper eating habits, health practices, preventive behaviors, positive mental attitude) showed substantial correla-

28 Bliuvaitė S, Šinkariova L. Sergančiųjų 2 tipo cukriniu diabetu sveikatos kontrolės lokuso, socialinio palaikymo bei pasitenkinimo suteikiama pagalba ligoninėje sąsajos [Health locus of control, social support and patient satisfaction with hospital care interaction among adults with type 2 diabetes]. *Tarptautinis psichologijos žurnalas: biopsichosocialinis požiūris [International Journal of Psychology: A Biopsychosocial Approach]* 2012; 11: 9-29.

29 *Ibid.*

30 Mahdavi M, Vissers J, Elkhuizen S, van Dijk M, Vanhala A, Karampli E. et al. The relationship between context, structure, and processes with outcomes of 6 regional diabetes networks in Europe. *PlosOne* 2018

31 *Ibid.*

32 *Ibid.*

33 Vencio S, Paldanius PM, Blüher M, Giannella - Neto D, Caiado - Vencio R, Strain WD. Understanding the barriers and improving care in type 2 diabetes: Brazilian perspective in time to do more in diabetes. *Diabetology and Metabolic Syndrome* 2017; 9 (46): 1-8. doi 10.1186/s13098-017-0244-y.32.

34 Thepwongsa I, Muthukumar R, Kessomboon P. Motivational interviewing by general practitioners for type 2 diabetes patients: a systematic review. *Family Practice* 2017; 34 (4): 376–383. doi:10.1093/fampra/cmx045

tion of the Health Behavior Inventory and the Satisfaction with Life Scale[35]. The findings of the study in Bangladesh indicated that age, area of residence, education level, social status, family income, expense, tobacco, body mass index, family history, physical exercise and hard diseases had the worst impact on quality of life among all factors of T2DM[36]. The review on the management of T2DM in the Middle Eastern countries has identified that knowledge, beliefs, cultural, and lifestyle factors plays an important role in patients' decisions regarding medication adherence and lifestyle interventions[37]. The study conducted in Nigeria (n = 184) found that knowledge of diabetes mellitus among patients with diabetes was poor and related to age, education level, satisfaction with education received, employment status, and household wealth[38]. In India, the objectives of the study (n = 78) were to explore the relationship between self-efficacy (a person's belief about his / her ability to successfully execute duties and responsibilities), outcome expectancy (a factor contributing to the enhancement of self-management) and self - management (the cornerstone of diabetes care and is crucial to prevent complications of diabetes) among T2DM patients[39]. The results of the study showed that self-efficacy, outcome expectancy and self-management were positively correlated and that self - efficacy and outcome expectancy contributed to self - management of patients with T2DM[40]. The Malaysian study (n = 266) failed to disclose significant direct relationships between diabetes knowledge and quality of life or satisfaction[41]. There was a significant indirect effect of diabetes knowledge on impact of quality of life via attitudes: as the level of diabetes knowledge increased, the negative impact of quality of life was reduced through the mediating factor of attitudes[42]. In Lithuania, it was found (n = 53) that there were no significant associations of patients with T2DM emotional state and quality of life with duration of the disease[43]. No significant differences in emotional state and quality of life were found between males and females with T2DM, who were treated with oral antidiabetic and insulin medications[44]. In Pakistan, T2DM patients (n = 300) attending public and private hospitals were targeted for data collection through questionnaire, and age, duration of

35 Rosiek A, Kornatowski T, Frąckowiak - Maciejewska N, Rosiek - Kryszewska A, Wyzgowski P, Leksowski K. Health behaviors of patients diagnosed with type 2 diabetes mellitus and their influence on the patients' satisfaction with life. *Therapeutics and Clinical Risk Management* 2016; 12: 1783–1792.

36 Miah A, Ma Y. Analysis the significant risk factors on type 2 diabetes perspective of Bangladesh. *Diabetes Metabolic Syndrome* 2018; 12 (6): 897-902

37 Alsairafi ZK, Taylor KMG, Smith FJ, Alattar AT. Patients' management of type 2 diabetes in Middle Eastern countries: review of studies. *Patient Preference and Adherence* 2016; 10: 1051-1062

38 Jasper US, Ogundunmade BG, Opara MCh, Akinrolie O, Pyiki EB, Umar A. Determinants of diabetes knowledge in a cohort of Nigerian diabetics. *Journal of Diabetes and Metabolic Disorders* 2014; 13 (39): 1-8.

39 Lalnuntluangi R, Chelli K, Padhy M. Self - efficacy, outcome expectancy and self - management of type 2 diabetes patients. *Indian Journal of Health and Well-being* 2017; 8 (9): 1040-1043.

40 *Ibid.*

41 Gilis - Januszewska A, Lindström J, Tuomilehto J, Piwonska - Solska B, Topór - Mądry R, Szybinski Z. et al. Sustained diabetes risk reduction after real life and primary health care setting implementation of the diabetes in Europe prevention using lifestyle, physical activity and nutritional intervention (DE-PLAN) project. *BMC Public Health* 2017; 17 (198): 1-7

42 *Ibid.*

43 Lašaitė L, Lašienė J, Kazanavičius G, Goštautas A. Sergančiųjų 2 tipo cukriniu diabetu emocinės būklės ir gyvenimo kokybės sąsajos su lipidų koncentracija, ligos trukme bei vartojamais vaistais [Associations of emotional state and quality of life with lipid concentration, duration of disease, and the way of treating the disease in persons with type 2 diabetes mellitus*]. Medicina* 2009; 45 (2): 85-94.

44 *Ibid.*

disease, number of prescribed medications, medication adherence and treatment satisfaction were found to be significantly associated health-related quality of life[45]. The Malaysian study involved 197 T2DM patients from primary health facilities and reported that patient education level, number of oral antidiabetic medication taken, and type of insulin regime used affected the interaction outcome between a patient with T2DM and a physician[46]. In Jordan, the descriptive correlational study (n = 1002) found that perception about T2DM treatment was worse among women than men, and heart disease as a comorbidity with diabetes was also a significant indicator for low treatment satisfaction[47]. The researchers identified the phases of T2DM progression: Prior to any Diagnosis, Pre - diabetic (diagnosed), Onset of T2DM, Health Maintenance and Prevention, Complications-Minor or Major[48]. In Europe initiated the DE - PLAN project (Diabetes in Europe: Prevention Using Lifestyle, Physical Activity and Nutritional Intervention) and its implemented by the principles of lifestyle intervention[49]. The results of the study (n = 105) showed that T2DM prevention through lifestyle intervention delivered by trained nurses in primary health care level leads to weight reduction of the patients[50]. The beneficial outcomes as cardiovascular risk factors change and diabetes risk reduction can be maintained during long - time observation[51]. In Netherlands, people with T2DM and cardiovascular diseases follow a cognitive behavioral program aimed at modifying dietary behavior, physical activity, smoking behavior and its used methods as motivational interviewing and problems solving treatment focusing on intrinsic motivation for change and self-management[52]. The absolute risk of diabetes - related long - term complications (neuropathy, nephropathy, retinopathy, amputation, dialysis, blindness, stroke, coronary sclerosis) is not communicated and therefore often overestimated by patients, public health media, and health care professionals[53]. The study carried out in the United Arab Emirates (n = 490) reported that the prevalence of T2DM was 23% with hypertension, obesity, and dyslipidemia being the most common T2DM comorbidities and found that levels of estimated glomerular filtration rate and disease duration were the most

45 Iqbal Q, ul Hag N, Bashaar M. Profile and predictors of health related quality of life among type II diabetes mellitus patients in Quetta city, Pakistan. *Health and Quality of Life Outcomes*, 2017: 15 (142). doi 10.1186/s12955-017-0717-6.

46 Nasir NM, Arrifin F, Yasin SM. Physician - patient interaction satisfaction and its influence on medication adherence and type 2 diabetic control in a primary care setting. *Medical Journal of Malaysia* 2018; 73 (3): 163-169

47 Sheikh BA, Arabiat DH, Holmes SL, Khader Y, Hiyasat D, Collyer D. et al. Correlates of treatment satisfaction and well - being among patients with type 2 diabetes. *International Nursing Review* 2018; 65: 114–121

48 Crangle CE, Bradley C, Carlin PF, Esterhay RJ, Harper R, Kearney PM. et al. Exploring patient information needs in type 2 diabetes: a cross sectional study of questions. *PlosOne* 2018; 13 (11): 1-19. e0203429. doi.org/10.1371/journal.pone.0203429

49 Kueh YCh, Morris T, Ismail AAS. The effect of diabetes knowledge and attitudes on self - management quality of life among people with type 2 diabetes. *Psychology, Health and Medicine* 2017; 22 (2): 138-144.

50 *Ibid.*

51 *Ibid.*

52 Lakerveld J, Bot SDM, Chinapaw MJ, van Tulder MW, van Oppen P, Dekker JM. et al. Primary prevention of diabetes mellitus type 2 and cardiovascular diseases using a cognitive behavior program aimed at lifestyle changes in people at risk: design of a randomized controlled trial. *BMC Endocrine Disorders* 2008; 8 (6): 1-11

53 Kunnis N, Freyer M, Müller N, Kielstein V, Müller UA. Expectations and fear of diabetes - related long - term complications in people with type 2 diabetes at primary care level. *Acta Diabetologica* 2018. doi: 10.1007/s00592-018-1217-9

significant risk factors for the development of complications[54]. The major complications of T2DM considered in this study were coronary artery disease, nephropathy, peripheral neuropathy, and retinopathy, while age and renal function were the most useful predictors for the development of T2DM complications[55]. As with any scientific research, there are number of study limitations and future directions. Researchers pointed out the need of study that is adapted for chronic disease in the context of services of primary health care in Lithuania. It is highly recommended to compare the model within other noncommunicable diseases and to find similarities / dissimilarities. The study employed a qualitative (group discussions with managers from primary health care facilities) and a quantitative (survey of patients with T2DM) approach. It is highly recommended for wider perspective to use qualitative method in research the opinion of patients with T2DM. Opinion of family doctors and other front - line employees also important in development of noncommunicable diseases management. For future research it is important to develop the management model of T2DM with focus on value management elements and their impact on management perspectives (organization, culture, communication, human resources, quality, financial management, etc.).

## Conclusions

1. During focus groups research the elements of value management of public and private primary health care facilities in the point of view managers were determined. It was found the value management elements with health policy, organization, human resources, services, patients management perspectives. The priorities management is important for public and primary health care facilities. The managers from public primary health care facilities expressed that partnership with health care professionals, management of changes, lobbying are the main elements of value management in the context of the health policy perspective. Management of chronic diseases and risk factors are the main elements of value management in private primary health care facilities. The element culture of organization is important for public and private primary health care facilities. The managers from public and private primary health care facilities pointed out that teamwork, communication, competencies are the main elements of human resources management. The elements of services management include quality and competencies in the context of primary health care services. In opinion of the managers from primary and public primary health care facilities the main element of patient management is health promotion. Identification of value creation elements provides with opportunities to develop health management programs and projects, increasing patient satisfaction with services provided in primary health care.
2. In the research sociodemographic (age, gender, place of residence) and non – clinical (self - perceived health, treatment options) factors distributions among T2DM disease states were investigated. Evaluation of prognostic factors non - clinical: self

54 Jelinek HF, Osman WM, Khandoker AH, Khalaf K, Lee S, Almahmeed W. et al. Clinical profiles, comorbidities and complications of type 2 diabetes mellitus in patients from United Arab Emirates. *BMJ Open Diabetes Research and Care* 2017; 5: e000427. doi:10.1136/bmjdrc-2017-000427

55 *Ibid.*

- perceived health, treatment options) according to the T2DM course is the cornerstone of patient segmentation and a possibility to find effective solutions for disease management, which would help predict a disease course and possible outcomes.

3. The prognosis of T2DM progress is concerned with improving the accuracy of future disease outcomes and modelling of prognosis can give relevant clinical and non - clinical information in modern primary health care. The prognostic value of T2DM helps for clinicians and managers in decision making, setting the priorities and goals of continuous care of noncommunicable disease.

**Practical implications of the results of the study**

It is highly recommended to define the challenges and possibilities in continuous management and to determine the priorities of risk factors of chronic diseases management in primary health care facility. Searching for the competitive advantage of primary health care facility, it is expedient to create the partnership between primary health care facility and society, between primary, secondary and tertiary health care levels in case to improve friendly and healthy environment for patients. At the level of primary health care facility, it is important to develop structure of an organization with focus on continuous management of chronic diseases, and to strengthen the image and culture of health. The main direction in managing people in primary health care facility is based on knowledge and competencies improvement, communication and teamwork making better. Attention should be paid at the quality of services of primary health care facility and to introduce additional health care services for patients with chronic non - communicable diseases. The employees of primary health care facility can support patients in building their lifestyle with focus on quality of life and health promotion. Effective interventions are important for noncommunicable diseases management in primary health care level and patients involvement in risk factors management can be the priority of T2DM management.

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**Conflicts of interest**

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

**Ethical aspects**

Approval to conduct the study was given by Kaunas Regional Biomedical Research Ethics Committee (17 April 2014, No. BE-2-11). The authors applied to the Lithuania State Data Protection Inspectorate for study's participant personal data protection (27 November 2014, No. DVT2-2009).

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# 2 TIPO CUKRINIO DIABETO VADYBA LIETUVOS PIRMINĖJE SVEIKATOS PRIEŽIŪROJE

***Santrauka.*** *2 tipo cukrinis diabetas yra kompleksinė liga, kurios valdymui reikalinga tęstinė bei suprantama medicininė priežiūra ir rizikos veiksnių mažinimo daugiafunkcinės strategijos. Diskutuojama apie efektyvesnį lėtinių neinfekcinių ligų valdymą pirminėje sveikatos priežiūroje. Pripažįstama, kad reikalingi nauji sprendimai tęstinei lėtinių neinfekcinių ligų rezultatų vadybai. Tyrimo pagrindinis tikslas yra nustatyti vertės pacientams kūrimo elementus ir įvertinti veiksnių riziką 2 tipo cukrinio diabeto eigai. Taikyti kokybinis (pirminės sveikatos priežiūros vadovų grupinės diskusijos) ir kiekybinis (pacientų, sergančių 2 tipo cukriniu diabetu, anoniminė apklausa po šeimos gydytojo konsultacijos) tyrimo metodai. Grupinių diskusijų tyrimas (n = 48) atliktas nuo 2015 m. gegužės mėn. iki 2016 m. gegužės mėn. 10 šalies apskričių. Anoniminė pacientų apklausa (n = 510) atlikta nuo 2017 m. spalio mėn. iki 2018 m. sausio mėn. Duomenys analizuoti naudojant daugianarę logistinę regresiją. Nustatyti pagrindiniai vertės kūrimo elementai, kurie apima sveikatos stiprinimą, gyvenimo kokybę, laiko vadybą, pasitenkinimą, komunikaciją, partnerystę su sveikatos priežiūros specialistais, vertybes, pacientų gyvenimo būdą. Tyrimo rezultatai atskleidė reikšmingus sociodemografinių (pajamos, gyvenamoji vieta, lytis) ir kitų (prisirašymą prie pirminės sveikatos priežiūros, savo sveikatos suvokimas, pasitenkinimas 2 tipo cukrinio diabeto gydymu, gydymo pasirinkimai) veiksnių pasiskirstymą. Respondentų amžius, savo sveikatos supratimas, 2 tipo cukrinio diabeto gydymo pasirinkimai yra pagrindiniai veiksniai, nusakantys kardiovaskulinių ligų atsiradimą. Nustatyta, kad respondentų amžius, išsilavinimas, gyvenamoji vieta, 2 tipo cukrinio diabeto gydymo pasirinkimai yra veiksniai, lemiantys kardiovaskulinių ir kitų lėtinių ligų atsiradimą. Vertės elementų nustatymas yra pagrindas kurti ir įgyvendinti lėtinių neinfekcinių ligų intervencijos programas ir projektus, kurie gali padėti valdyti ligų pasekmes ir didinti pacientų pasitenkinimą teikiamomis sveikatos priežiūros paslaugomis. Veiksnių, lemiančių 2 tipo cukrinio diabeto eigą, nustatymas yra galimybė surasti efektyvias vadybos ligų valdymo priemones. 2 tipo cukrinio diabeto eigos numatymas padeda gydytojams ir vadovams nustatyti prioritetus bei priimti sprendimus. Tyrimo rezultatai gali būti pritaikomi tiek teoriškai, tiek praktiškai lėtinių neinfekcinių ligų valdyme pirminėje sveikatos priežiūroje.*

***Raktiniai žodžiai:*** *Pirminė sveikatos priežiūra, 2 tipo cukrinis diabetas, vertės elementai, kokybinis tyrimas, kiekybinis tyrimas*

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