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Croatian diabetes registry (CroDiab) and implementation of standardised diabetes checklists using Joint Action CHRODIS Recommendations and Criteria

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Abstract

Introduction. Standardized diabetes monitoring checklists is an efficient registry collection tool and diabetes care improvement aid. Aim of this study was to improve the management of diabetes according to international standards and based on Joint Action CHRODIS Recommendations and Criteria, and to improve general practitioners (GPs) awareness of importance of monitoring via diabetes checklists.

Population and methods. Twenty-eight GPs and 1242 diabetic patients were included. GPs were divided in groups regarding the intensity of education and information provided. Quantitative analyses of diabetes quality indicators and their availability as well as qualitative study in intensive group were performed.

Results. Average number of patients with fulfilled checklists per GP increased from 20.2 to 30.8 (52.30%). Most GPs had positive attitude towards checklists but there is still a room for further improvement.

Discussion and conclusions. Checklists are perceived as positive initiatives by GPs; however, there are areas for further improvements. General practitioners education and feedback regarding the checklists may contribute to better monitoring of patients with diabetes.

Key words

- diabetes
- registry
- quality improvement
- quality indicators

INTRODUCTION

Diabetes is one of the major public health problems worldwide and it is estimated that there were 463 millions of people with diabetes in the world in 2019 and that till 2045 that number will increase for more than 50% to 700 million people [1]. It is known that diabetes registries can serve to interventional purposes and are proven to be efficient in quality improvement through implementation of standardized minimum data set i.e. diabetes checklists [2-4].

Diabetes registry in Croatia has a long tradition [5, 6], and during the time, the collection mechanisms have changed from paper-based reports to collection of existing electronically based data. With the change of medical documentation in primary health care setting from predominately paper based to electronically based data in certified platforms, we were also faced with the challenge of incorporating electronic diabetes checklists into the daily routine of general practitioners (GPs). Studies performed in Croatia confirmed that diabetes checklists are efficient in quality improvement in national settings [7, 8] so since 2014 checklists became a part of GPs official application for medical and financial documentation toward National Insurance Fund. Data are then transferred to Croatian Institute of Public Health, holder of diabetes registry. Even though checklists were available since 2014 in their current format, and reporting was stimulated from the National Insurance Fund and Croatian Institute of Public Health, checklists are still not completely implemented and only one third of all diabetes patients are monitored [9].

Aim of this study was to improve the management of diabetes according to international standards and based on JA CHRODIS Recommendations and Criteria (QCR

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tool)(chrodis.eu/wp-content/uploads/2020/10/short-guide-for-the-implementation-of-good-practice_nijz.pdf). Specific aims were to improve general practitioners' awareness of importance of monitoring via diabetes checklists, and to improve their practice in monitoring as well as recognize obstacles in current implementation and area for potential future improvement.

POPULATION AND METHODS

Participants and study design

The study was planned with the help of QCR tool. During the practice design, the tool was used to specify study aims, objectives and methods, but also to clearly define target population. The tool emphasized importance of multidisciplinary approach and linkages across all relevant decision makers and stakeholders and was used to create diverse local implementation working group (LIWG) which consisted of representatives coming from different fields and institutions (Ministry of Health, Croatian Health Insurance Fund, patient representatives, GPs representatives). Sensible selection of working group members was probably the most important part of the project and it greatly contributed to the sustainability of the practice.

Primary target population were general practitioners which provide primary healthcare services to people with diabetes. People with diabetes were included directly in interventions via diabetic patient association and trough distributed leaflets, which were intended for patient education about importance of yearly check-ups. GPs empowerment was planned through education about importance and meaning of diabetes checklists usage.

We included 28 randomly selected GPs allocated in one of three groups: group 1 or "intensive group" received information regarding the study and study protocol, education on registry and checklists, and analysis of their patients' quality indicators monitored in the 2018, and they were also interviewed; group 2 or "medium group" received e-mail with information regarding the study as well as study protocol and results of their patients' quality indicators analysis monitored in the 2018; group 3 or "no intervention group" did not get any information regarding the study.

Data were monitored as a part of regular monitoring of diabetes quality indicators by Croatian Institute of Public Health.

Interviews

We used semi-structured qualitative interviews before and after education about different aspects of checklists including questions regarding diabetes quality indicators, general impression on checklists, checklists usage in everyday work, barriers in everyday usage, necessity of a feedback, motivation for fulfilling checklists, area for improvement, general comments on checklists.

Open predefined questions were as follows: What is your opinion regarding the diabetes checklists? What do you think regarding indicators included in the checklists? How do you use them in your everyday practice? What do you think aggravates work with checklists? What are your suggestions for improvement? Do you think that feedback regarding the data is good and necessary? What motivates you to fulfil the checklists? Do you have additional comment or suggestion?

After six months GPs were also asked to give additional comments on checklists if there were any besides the facts reported in the first interview.

Analyses

We used qualitative and quantitative approach for analysing our data. Quantitative analyses have been used to track changes in GPs baseline performance, measured by share of persons with regularly completed checklists. Additionally, quality of checklists completeness and change of chosen diabetes quality indicators within checklists were measured.

GPs were informed that we were going to analyse quality indicators of their patients in preceding period and compare same trimester of 2018 to 2019 data in order to evaluate percentage of patients with fulfilled diabetes checklists and differences in the main quality indicators (QI). Analysed quality indicators were as follows: body mass index, systolic blood pressure, diastolic blood pressure, total cholesterol, LDL-cholesterol, HDL-cholesterol, triglycerides, fasting glucose, HbA1c, smoking status and alcohol consumption. After six months, researchers contacted GPs by e-mail and phone and presented trend in results of their patients.

Statistical analyses were performed using SPSS (version 21). Normality of distribution was tested using Shapiro-Wilks test, while homogeneity of variance was tested using Levene test. Differences between groups of independent continuous variables were analysed using One-way and Welch's ANOVA. Tukey's HSD and Games Howell test were used for post hoc analysis. Differences before and after intervention were analysed using t-test and Wilcoxon matched paired test for dependent measurement. An error threshold of $\alpha = 0.05$ was used in the interpretation of the results. Interviews were audio recorded, transcribed verbatim, and content was analysed inductively. Two researchers performed qualitative analysis.

RESULTS

Total number of patients included in quantitative analysis was 1242, i.e., 566 patients with fulfilled checklists in Jul-Oct 2018 and 862 patients with fulfilled checklists in Jul-Oct 2019. Average number of patients with fulfilled checklists per general practitioner was 20.2 in Jul-Oct 2018 and 30.8 Jul-Oct 2019 (total increase 52.30%). In group 1 patients with fulfilled checklists per general practitioner were 13.0 in Jul-Oct 2018 and 28.8 Jul-Oct 2019 (increase 121.15%); 27.5 *vs* 33.5 patients (increase 21.82%) in group 2; 18.7 *vs* 29.7 patients (increase 58.82%) in group 3.

Description of chosen quality indicators as well as differences between groups in 2018 and 2019 are presented in *Table 1*.

Before intervention there were no differences between groups in body mass index, diastolic blood pressure, low-density lipoprotein, high-density lipoprotein, triglycerides, smoking and alcohol status (all $p > 0.05$); while systolic blood pressure ($p = 0.048$; group 1 *vs*

Table 1
Differences in the main diabetes quality indicators according to groups before and after intervention. Group 1: intensive intervention; group 2: medium intervention; group 3: no intervention

	2018				2019			
	Group1	Group2	Group3	p	Group1	Group2	Group3	p
BMI	30.37 + 6.53	30.14 + 5.10	30.13 + 5.65	0.931	30.31 + 5.67	29.39 + 4.87	31.71 + 6.39	<0.001
SBP	138.79 + 14.93	135.14 + 13.78	134.02 + 16.83	0.048	135.87 + 15.63	134.10 + 12.42	135.65 + 15.14	0.297
DBP	79.97 + 8.30	80.81 + 6.36	80.11 + 8.53	0.554	79.36 + 8.09	79.58 + 7.10	80.47 + 8.90	0.258
TC	5.18 + 1.10	5.32 + 1.40	4.96 + 1.26	0.025	5.32 + 1.36	5.48 + 3.35	5.00 + 1.21	0.049
LDL	3.10 + 0.93	3.21 + 1.05	2.94 + 1.08	0.059	3.15 + 1.05	3.28 + 1.85	3.07 + 1.09	0.258
HDL	1.31 + 0.37	1.27 + 0.37	1.31 + 0.35	0.650	1.28 + 0.36	1.29 + 0.34	1.32 + 0.36	0.297
TG	1.76 +0 .90	2.04 + 1.04	1.86 + 1.14	0.069	2.07 + 1.84	1.96 + 1.24	1.82 + 0.89	0.124
HbA1c	7.23 + 1.40	7.53 + 1.49	7.37 + 1.48	0.270	7.12 + 1.16	7.36 + 1.31	7.19 + 1.31	0.126
Smoking (%)								
yes	12.50%	15.68%	18.86%	0.442	15.28%	18.95%	22.99%	<0.001
no	76.04%	73.73%	66.86%		62.04%	72.28%	63.60%	
ex	11.46%	10.59%	14.29%		22.69%	8.77%	13.41%	
Alcohol use (%)								
yes	20.22%	16.11%	28.30%	0.390	27.32%	16.03%	27.27%	0.003
no	79.78%	83.89%	71.70%		72.68%	83.97%	72.73%	

Data are presented as mean ± standard deviation and percentages. BMI = body mass index, SBP = systolic blood pressure, DBP = diastolic blood pressure, TC = total cholesterol, LDL = low-density lipoprotein, HDL = high-density lipoprotein, TG = triglycerides.

group 3) and total cholesterol (p = 0.025; group 2 *vs* group 3) differed significantly. After intervention there were significant differences between groups in body mass index (p <0.001; group 1 *vs* group 3 and group 2 *vs* group 3), smoking (p <0.001), alcohol consumption (p = 0.003) and total cholesterol (p = 0.049; group 2 *vs* group 3). There were no differences between groups in other parameters (all p >0.05).

Among all patients, only 161 of them (group 1, 24; group 2, 97; group 3, 40) had completed checklists, both before and after intervention. When analysing differences in selected quality indicators we observed statistically significant increase in total cholesterol and low-density lipoprotein levels (p = 0.001, p = 0.003) in all groups (group 1 p = 0.002; 0.006, group 2 p = 0.009; 0.019, group 3 p = 0.015 and 0.014). There were no statistically significant changes (all p >0.05) in other indicators.

There were not enough data regarding waist and hip circumference and urine albumin/ creatinine ratio as well as feet examination and fundoscopy so in qualitative analysis we aimed to explore availability of that indicators too. Analysis revealed that waist and hip circumference are not perceived as important, urine albumin/creatinine ratio is not available on the primary level and also general practitioners were not aware that if they record feet examination and fundoscopy it would not be recorded as self-performed intervention.

The qualitative research confirmed that most of GPs have positive attitude towards checklists, which can serve as reminders in regular monitoring of people with diabetes. This is how one of the GPs described checklists and their use: *"So, it is just a help…something that I need to check with my patients with chronic condition anyway… Yes, it is exactly checklist or suggestion. For me it is organisational reminder…"*

Besides general attitudes towards checklists, the analysis identified seven themes that represent the baseline for future improvement of checklists and their implementation and even more important for diabetes care on the primary level. Themes were as follows:

- *Albumin/ creatinine index on primary health care level.* GPs were aware of importance of early screening of diabetic nephropathy; however, they all underline that albumin excretion in 24h urine is currently only available test in hospital setting and it is associated with very low compliance of patients. Alternative is measuring albumin/creatinine index again only in nearest hospital, but that possibility is also not convenient for all patients with diabetes in routine monitoring on primary health care level. That all leads to occasional screening of diabetic nephropathy and GPs believe that albumin/creatinine index can be efficiently used in their patients, that this is appropriate index and the activities for their implementation in primary laboratories are needed;
- *Regular checklists feedback to GPs.* All participants had positive attitude towards feedback that included analysis of their patients' indicators and comparison with Croatian average. They find it very useful since that implies that data are not just collected but are really used for public health interventions and improvement of diabetes health care. Furthermore, they believe that feedback can additionally motivate them to use checklists and overcome gaps in monitoring patients with diabetes;

- *Involving nurses in checklists work.* In Croatia primary health care team consist of physician and nurse, with physician being team head. Administratively it implies that the National Insurance Fund recognizes activities performed by physicians and presumes that only administrative work and nursing care is in the nurses' domain. However, GPs believe that nurses are very efficient and qualified and can coordinate and perform monitoring with, if needed, consultation with GPs. That is why they believe it would be beneficial if National Insurance Fund could reduce the administrative workload for nurses and officially recognize monitoring via checklists as nurses' activities too;
- *Reducing the number of indicators.* Participants feel that list of indicators is too extensive. Even if indicators are important, GPs see them as a burden if the list is long. They recommend that list should be shortened and include only available and most important indicators if the coverage of complete diabetic population is priority. By reduction of list to essential indicators, compliance of GPs could be increased;
- *Improvement of application.* GPs see as a redundant work some of the activities with the checklists. Electronically enhanced copying data from other sources and archive data (previous checklists, hospitals) and possibility of overview/browsing including alerts about possible absence of yearly check-ups on all patients with diabetes are adjustments that can further facilitate utilization of checklists;
- *Financial stimulation.* GPs that are health care centres employees and are paid through fixed salaries are not financially stimulated, as are private practitioners for fulfilling the checklists. GPs believe that this situation is discouraging and that additional stimulation from the management of health centres is essential;
- *Additional funding.* Although GPs strongly state that financial aspect is not their main motivator, they suggested that the National Health Insurance Fund should increase funding, not just symbolically as is now the case. They believe that this could increase the proportion of persons with regularly completed checklists.

DISCUSSION

Results of this study revealed increase in average number of patients with fulfilled checklists per general practitioner. Increase was the highest in intervention group as expected; however, in medium group we observed lower increase than in no intervention group. Greatest increase in group 1 can be explained with influence of provided education and interviews while lowest increase in group 2, we believe might be result of negative feedback on checklists when participation in project were not discussed and accepted by participants, i.e., general practitioners were just informed that they will be monitored. This conclusion is emphasized by the results of qualitative analysis where some participants answered that checklists can be seen as a part of monitoring physician performance from Health Insurance Fund and they are not willing to provide the data that can enable that type of monitoring. It implicates that any intervention in the area of checklists needs to be substantially communicated with GPs and their representatives.

Pre- and post-interventional indicators analysis did not reveal any significant improvement in the indicators value as expected from the previous national study [7]. It might be result of relatively small sample and short duration of the study that was determined by the duration of the project. Duration of the study is the main limitation of our investigation.

Qualitative analysis revealed areas for possible future improvements. Albumin/ creatinine index is the parameter that needs to be accessed on the yearly basis in all patients with type 2 diabetes [10]. Since the organization of diabetes care for type 2 diabetics is primarily oriented on the primary health care level in Croatia, it is essential to enable this testing in the primary health care settings. Results of this study additionally confirmed that. Regular checklists feedback to GPs was also revealed as area for potential improvement. Previous studies on feedback on performance compared with usual care showed that the process of care improved by better prescription patterns and a better stimulation to follow the guidelines more closely and intensification of therapy so feedback can be one of the mechanisms to overcome clinical inertia in primary care settings [11, 12]. The results and observation of participants regarding the regular feedback was expected, and we believe that their recognition from GPs side will additionally reinforce feedback acceptance. Since multifaceted professional interventions and organizational interventions that facilitate structured and regular review of patients are effective in improving the process of care [13] involving nurses in checklists work seems to be expected request too. With addition of patient education to organizational interventions and the enhancement of the role of nurses in diabetes care we can expect improvements in patient outcomes and the process of care [13]. Qualitative analysis also revealed number of quality indicators as a challenge and potential for future improvement. However, situation in this field is challenging and we will need to balance between expert recommendation regarding the useful indicators and reduction of number of indicators in order avoid administrative burden of GPs. Previous projects recognised a set of process and outcomes measures that need to be monitored at the individual patient level [14-16] and then might be aggregated across the patient samples of health plans, physicians, or other units. For several measures, including A1C, LDL cholesterol, and microalbuminuria testing, in some studies proportions are approaching 90% but other indicators like alcohol intake, end stage renal disease or laser treatment seem to have low validity and low feasibility [16, 17]. Organizational and systemic factors, in addition to physician factors, significantly affect physician performance and it needs to be supported within a broader environmental conceptual framework [18] that this study and implementation of observed results might support through individual and system models.

Throughout the entire project QCR tool was very useful guide. In the beginning, it gave the structure to the project, which was a backbone for conducting the pilot.

During the project, QCR tool was used to handle the communication with large number of partners. Thanks to it we have managed to coordinate a group work having constantly in mind our final goal - raising awareness about importance of regular and good quality diabetes monitoring both among GPs and patients.

CONCLUSIONS

The results have shown that checklists usage among general practitioners increased after intervention, and that education of general practitioners may contribute to better monitoring of patients with diabetes. According to previously reported data we can anticipate changes in chosen diabetes quality indicators as well [7], but we could not observe full extent of changes during the study since the time lag between education and collection of post interventional data was too short due to project duration and all planned activities. Qualitative research confirmed that most of general practitioners have positive attitude towards checklists, which can serve as reminders in regular monitoring of patients with diabetes. There were many possibilities for improving checklists and quality of care and our future recommendations for diabetes care improvement will be based on them.

This project was planned and prepared with the help of QCR tool, which had proven to be a feasible and practical framework for the designing and implementing our pilot.

Author's contribution

All Authors participated in study design and drafted the manuscript; MS and TP performed field work and statistical and qualitative analysis. All the authors confirmed final version of manuscript for submission.

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Ethical approval

The ethical committee of Croatian Institute of Public Health approved the study.

Informed consent

Informed consent was obtained from all the participants included in the intensive group of the study.

Conflict of interest statement

None of the Authors declares competing financial interests.

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