EFFICIENCY OF THE OUTPATIENT DIABETES CARE SYSTEM IN CZECHIA: A GEODEMOGRAPHIC PERSPECTIVE

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Abstract

The paper examines the intensity and structure of the use of health services and outlines the current functioning thereof in the context of diabetes care in Czechia. The aim is to assess the various healthcare aspects influenced by the settings of the Czech system. The patients studied had all been diagnosed with type 2 diabetes mellitus and used health services in Czechia in 2019. The selected segments of the health system that concern the management of diabetes care comprise outpatient diabetology, general practice and internal medicine. A total of 466,679 patients were included. The variables of age, sex and size category of the municipality of residence of the patient were monitored in the follow-up of the use of outpatient diabetes care. Most diabetes patients used outpatient diabetologist services, whereas less than one-third of patients visited a general practitioner. Furthermore, a large proportion of patients was less likely to be referred to a medical examination than is recommended. Conversely, the overuse of healthcare was evident for those patients that required a higher level of specialization, particularly physicians with the same competencies. We assume that changes in the coordination and provision of diabetes care and an improvement in surveillance would enhance the efficiency of diabetes care and improve the response to the increase in the occurrence of type 2 diabetes in the future.

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INTRODUCTION

The incidence of diabetes worldwide has increased significantly over the last few decades (*IDF*, 2001), and Czechia is no exception. According to the Institute of Health Information and Statistics of the Czech Republic (*Benešová et al.*, 2024), the number of people diagnosed with diabetes mellitus increased from 847 thousand in 2010 to 1,113 thousand in 2023. As the number of diagnosed patients increases, the demand for related health services is also increasing significantly. Therefore, ensuring adequate health services and the long-term sustainability of these services is becoming increasingly topical. Available analyses indicate that regional disparities in the utilization of outpatient diabetes services are evident, with the organizational structure of outpatient providers emerging as a significant contributing factor (*Šídlo – Burcin*, 2020; *Šídlo – Novák*, 2020).

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Furthermore, there is a need to examine more closely not only the amount and structure of affected patients, but also the extent to which they use health services.

Diabetes care in Czechia is covered by three specializations: outpatient diabetology, general practice and internal medicine (*CDS*, 2020). This is the result of historical factors including the fact that, traditionally, only specialists (outpatient diabetologists and internists) are allowed to treat the two types of diabetes. Dispensing for uncomplicated type 2 diabetes mellitus cases by GPs has been possible only since 2010 when the first documentation that governs cooperation between the various specializations was compiled. According to current recommendations, the diagnosis of type 2 diabetes mellitus is generally the responsibility of general practitioners, who initiate treatment and subsequent monitoring. Only in the case of poor compensation or complications do GPs consult the appropriate specialist or refer the patient to specialist care (*CDS*, 2020, 2022).

However, in practice, many patients also seek care from specialists immediately following diagnosis and receive care from a number of physicians in the case of comorbidities or other complications. This is primarily due to the absence of a gatekeeping system. The situation is further compounded by GP prescription restrictions, which in the period under review applied to all drugs except biguanides and sulphonylurea derivatives (only since 2020 GPs have been allowed to prescribe gliptins - DPP-4 inhibitors, the use of GLP-1 analogues is exceptional due to the high financial burden and SGLT2 inhibitors cannot be prescribed by GPs yet). (*Škrha*, 2016; *SGP CzMA*, 2020, 2021, 2023). This is despite the fact that a robust primary care system has been shown to enhance the overall efficiency of the health system, often delays the onset of chronic diseases and reduces costs (*OECD*, 2020; *MoH*, 2020; *WHO*, 2015). Expanding the competencies of GPs in terms of the management of chronic diseases such as diabetes may thus enhance the efficiency of diabetes care and ensure adequate care over the long term.

Health policies aim at creating a network of health service providers in which they are effectively distributed. Therefore, health services tend to be concentrated in areas with higher population densities; in particular, specialists are located predominantly in larger towns and cities (*HPI*, 2022; *Maláková*, 2022; *Ono – Schoenstein – Buchan*, 2014). For example, in Czechia in the studied year 2019, outpatient diabetology facilities were located in municipalities where a total of 57% of the Czech population lived, with more than 77% of these facilities situated in municipalities with more than 10,000 inhabitants, where 50% of the Czech population lived (*GHIC CR*, 2020). Thus, patients in municipalities with smaller populations must, generally, accept a lower level of health services availability (*Maláková*, 2022; *Bourke et al.*, 2012). Although patients are willing to commute, they are usually more likely to choose physicians in their geographical proximity (*Salisbury*, 1989). Men and young people are willing to travel longer distances for healthcare than women and older people, who are more likely to use health services closer to home (*Maláková*, 2022). Moreover, patients in larger settlements use secondary care more often on average than do those living in less urban areas. It can be hypothesized, therefore, that the use of specializations that provide diabetes care differs significantly according to the sex, age and place of residence of the patient. Thus, the question arises as to whether patients prefer to receive diabetes care from general practitioners, whom they consult for other health-related issues and who are generally located closer to them than are specialists, or whether they prefer the services of diabetologists or internists.

Previous studies (*Bhattacharyya – Else*, 1999; *Clarke et al.*, 2008; *Al Nozha*, 2014) have confirmed that suitably adjusted treatment, patient cooperation and regular check-ups lead to the prevention of diabetes complications and reduce long-term costs. According to recommendations by the Czech Diabetes Society, every patient with type 2 diabetes mellitus (regardless of the treatment specialization) should undergo a medical examination every three months, i.e. four times per year (*CDS*, 2020). Accordingly, the following analysis aimed to verify whether the reported number of visits corresponded to this recommendation and to identify differences in this respect according to specialization. The results of previous research strongly suggest that geodemographic aspects influence the number of such visits. It appears that women make a higher average number of primary and secondary care visits than men (*Andrade – Rapp – Sevilla-Dedieu*, 2016; *Bertakis et al.*, 2000). Patients

aged 65 years and over visit their physician more often than those under 65 years of age (*O'Connor et al.*, 2003). In contrast, long traveling times to the physician exerts a negative impact on the frequency of such visits (*Andrade – Rapp – Sevilla-Dedieu*, 2016).

The aim of this paper is to assess those aspects of health care for patients with type 2 diabetes mellitus that may be affected by the settings of the Czech healthcare system. Since it is safe to assume that the structure and intensity of the use of healthcare differ across specializations, we focused on identifying the various differences. We also examined whether any differences exist between specializations according to the patient's sex, age and place of residence, and how they affected patient attendance. We considered a description of patterns of care for patients with type 2 diabetes mellitus, including the influence of patient geodemographic characteristics, to be an important factor in terms of both assessing the functioning and effectiveness of the current system and planning changes with concern to the extent of the capacity and competencies of the various specializations in the future.

DATA AND METHODS

The following analysis was based on sorted anonymized data for 2019 obtained from the General Health Insurance Company of the Czech Republic (GHIC CR). In that year, the GHIC CR covered 5.9 million insured individuals, including 4.5 million adults, which represents approximately 60% of the Czech population (*GHIC CR*, 2024). Nearly all healthcare providers in Czechia have contracts with this health insurance company. Therefore, this is a very reliable source that can be used to analyse the uptake and delivery of health services by outpatient diabetes services. The patients studied had been diagnosed as having type 2 diabetes mellitus (according to the ICD-Code E11 medical procedure), were insured by the GHIC CR and used health services in Czechia in 2019. The selected health services segments consisted of outpatient diabetology, general practice and internal medicine.

We analyzed those patients with complete data information who used health services from at least one of the selected health services providers. Approximately 5% of the patients in the original cohort reported being patients that received care from other specialists, which may have been due to the lack of regular check-ups by a physician concerning the management of diabetes care or, possibly, misreporting. A total of 466,679 patients were included in the following analysis, thus ensuring that it represented a highly robust and sufficiently representative data set.

The dataset obtain the information about geodemographic characteristics of the patients (sex, age group, size category of the municipality of residence) and the number of contacts between patients and their healthcare providers. Although the number of contacts was originally a numerical variable, for simplicity we adjusted it with respect to the statistical frequency distribution. Five and six contacts were merged into one group and the final category consisted of seven or more contacts. We calculated the average number of contacts between patients and their healthcare providers so as to determine the attendance rate, as we refer to it below.

The age-sex structure of the patients both in total and by selected health services was determined for the indication of the demographic characteristics of the patients. The binary logistic regression was applied to estimate the assotiation between receiving care from the chosen specialization and demographic characteristics. We calculated odds ratios with 95%Wald Confidence Limits by all three specializations. The regressions were adjusted for sex (reference group=male), age group (reference group=–39) and size of the municipality (reference group='less than 1,000').

The following section of our analysis investigated the average number of contacts between patients and physicians. The main assumption was that geodemographic characteristics influence attendance. A general linear model (GLM), in which the effect size between the variables studied was described via Partial Eta Squared, was used to test the hypothesis. The number of contacts was chosen as the dependent variable. The independent variables consisted of the selected geodemographic characteristics and the specialization under which the patient received diabetes care. Concerning this part of the analysis, the specialization variable consisted of the studying specializations and their combinations, i.e. 7 categories.

Moreover, a contingency table with standard residuals was employed so as to indicate attendance by specialization in detail. All analyzes in the study were performed using SAS software version 9.4 and Microsoft Excel 365.

RESULTS

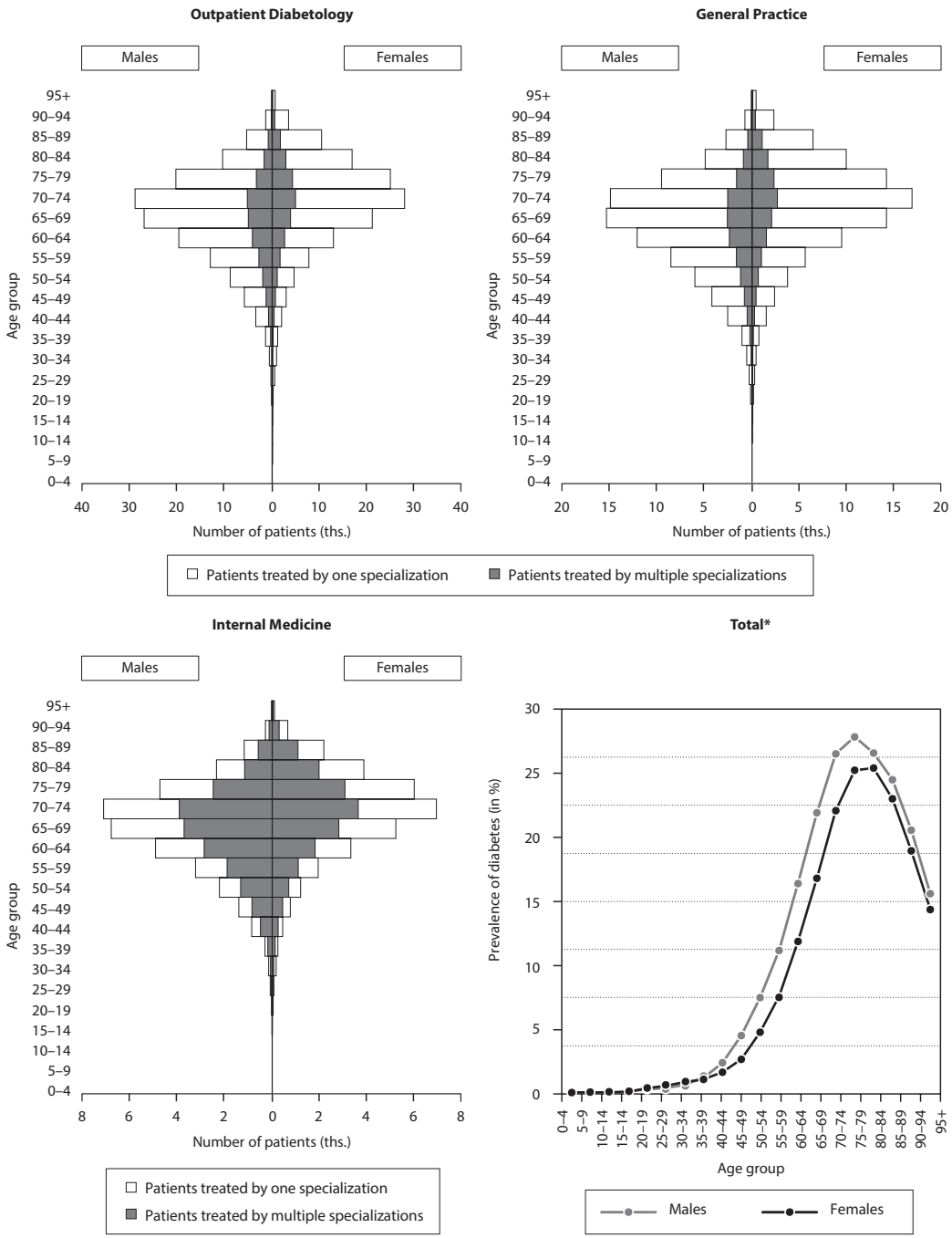
The number of patients receiving diabetes care under the selected specializations increased to the greatest extent for the 70–74 years age group for both men and women (Figure 1). Although more male than female patients were treated up to the age of 70, the opposite trend was observed for the older age groups. Moreover, diabetes prevalence rates in total as estimated for the whole of the country grew with increasing age up to the 75–79 years age group for men and 80–84 years for women. Men exhibited higher prevalence rates than women over time, especially at middle and early retirement age.

The structure of patients treated under the studied specializations was relatively similar; however, a number of differences were observed. Figure 2 illustrates the odds ratios for using the health services provided by the studied specializations, regardless of whether patients received care from that specialization exclusively or in combination with other specializations. Most of the selected variable categories were significant. Compared to women, men faced a significantly higher risk of using specialist care, whereas, in contrast, general practitioner patients were more likely to be women. Patients aged 65 and over faced a substantially higher risk of using outpatient diabetologist services than the lowest age group. The chance of receiving diabetology care rose with the increasing size of the municipality; patients living in the largest cities (100,000 and more inhabitants) were almost twice as likely to receive such care than patients from smaller municipalities (OR 1.94, 95% Cl, 1.90–1.98). In contrast, the situation concerning general practitioners was the opposite. Older patients received health services from general practitioners less often and the odds were lower for town and city inhabitants than for those living in small municipalities. Regardless of whether the patient received diabetes care from an internist only or in combination with another physician, the chance of visiting an internist was higher for almost all the age groups than for the youngest patient's category. The odds were then calculated for patients living in larger municipalities compared to inhabitants of small settlements; the category of municipalities with 5,000–19,999 inhabitants was found not to be statistically significant in the case of internist care.

Although patients are entitled to use the services of multiple specializations, most (87.5%) of the respondents received health care from just one of the specializations considered. The majority of patients that visited a diabetologist or general practitioner received care solely from the one specialization, whereas, in contrast, more than half of patients that received care from internists also used services provided by another specialization. As shown in Figure 1 and Table 1, half of the patients considered received care from a diabetologist and almost a third used the services of a general practitioner exclusively. In contrast, only 6.8% of patients were treated solely by an internist; approximately the same proportion of patients received care from an internist in combination with other specializations. In total, a mere 0.7% of the patients studied received care under all three specializations during the studied year. Although statistically significant differences were determined between the specializations according to the geodemographic characteristics, the association was found to be weak.

One of the most important aspects of receiving health care relates to the attendance rate of patients. Although the highest absolute number of visits was reported for diabetologists, followed by general practitioners, the average number of contacts was relatively low (Table 1). It appears that whether patients receive care under one or more specializations exerts a considerable influence on attendance. The more physicians patients visit, the higher the average number of contacts. Patients who receive services from all three specializations evinced the highest average number of contacts (7.45 contacts), whereas the lowest average number of contacts concerned patients that received care under just one specialization.

Figure 1 Age-sex structure of the patients by selected specializations and prevalence rates by age group (estimate for the whole of Czechia), Czechia, 2019



Note: Total* = estimate for the whole of Czechia.
Source: GHIC CR, 2020.

Figure 2 Changes in patient attendance at selected health service providers according to geodemographic characteristics, Czechia, 2019

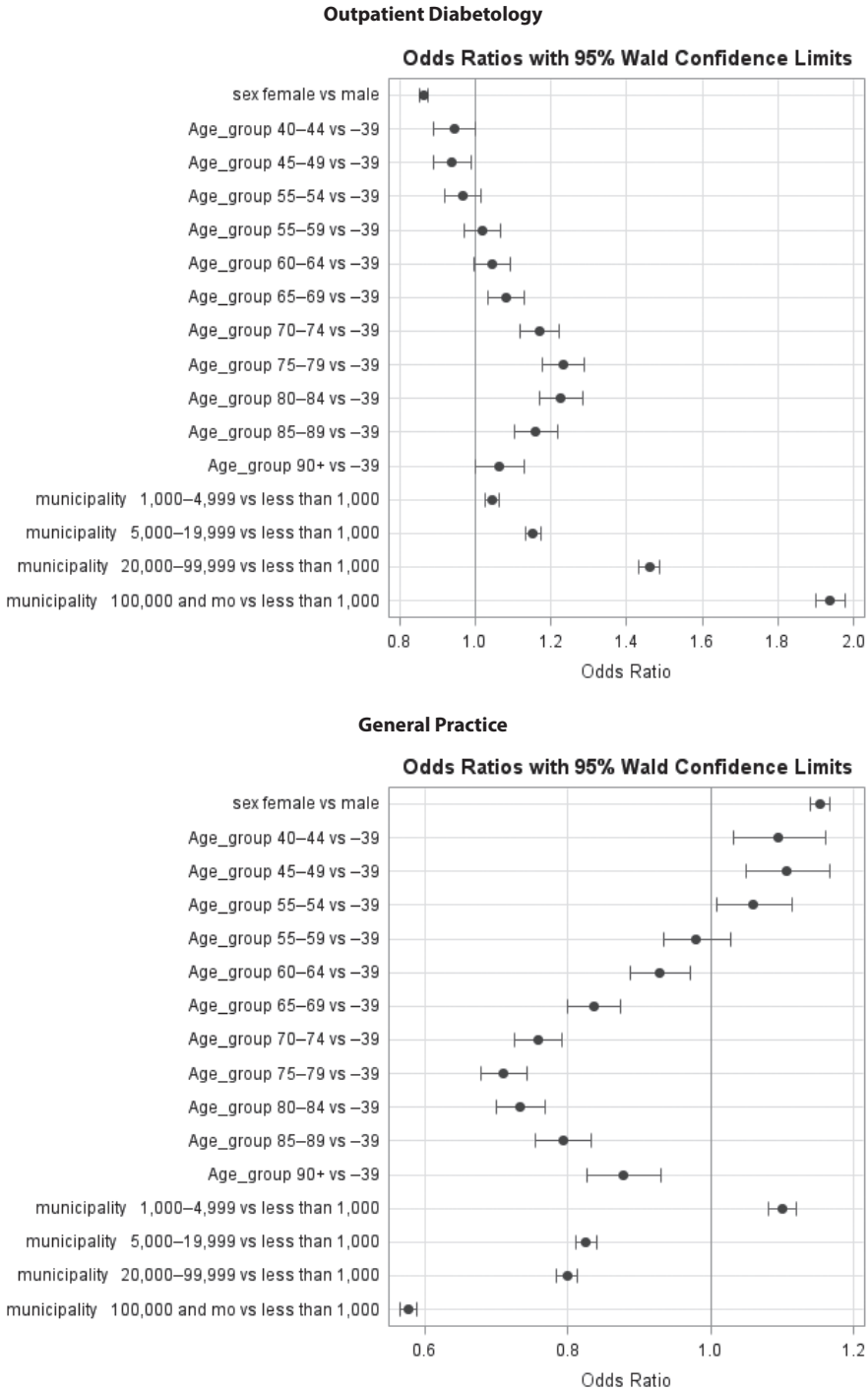
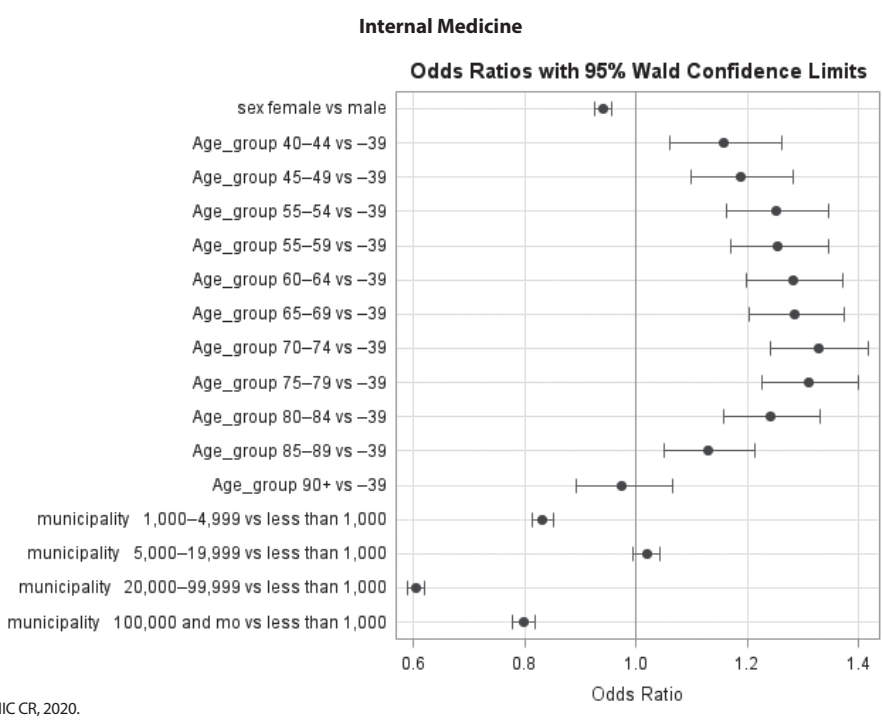


Figure 2 **continuation**



Source: GHIC CR, 2020.

Table 1 Structure of the use of health services by selected specialization, Czechia, 2019

Specialization	Patients (in %)	Contacts (in %)	Average number of contacts
Only DIA	49.95	50.12	3.63
Only GP	30.74	24.37	2.87
Only INT	6.78	5.91	3.15
DIA+INT	6.18	9.53	5.58
DIA+GP	4.54	7.01	5.58
GP+INT	1.11	1.59	5.19
DIA+GP+INT	0.71	1.46	7.45
Total	100.00	100.00	3.62

Note: DIA = outpatient diabetology; GP = general practice; INT = internal medicine.
Source: GHIC CR, 2020.

The following part of the analysis examined the influence of the selected variables on patient attendance rates. As can be seen from the results of the analysis (Table 2), the effect of the geodemographic characteristics was very low. Although the effects of the patients' age group and the size category of the municipality in which they live without including the specialization variable were significant, their effect size was negligible. The sex of the patient was not significant even at the 95% coefficient interval level. While these variables exerted a greater influence when the specialization was included, the influence was still minimal. In contrast, however, significant differences were determined according to the specialization, which

Table 2 Effects of the selected characteristics on patient attendance, Czechia, 2019

Source		P-value	R-Square	
Model		<0.0001	0.1475	

Source	DF	Type III SS	P-value	Partial Eta Squared
Sex	1	6.9147	0.0720	0.0000
Age group	11	495.5568	<0.0001	0.0005
Size of the municipality	4	261.3588	<0.0001	0.0003
Specialization	6	96,210.8232	<0.0001	0.0880
Sex * Specialization	6	142.8446	<0.0001	0.0001
Age group * Specialization	66	4,468.5195	<0.0001	0.0045
Size of the municipality * Specialization	24	3,198.3314	<0.0001	0.0032

Note: The Specialization variable consists of the various specializations and their combinations, i.e. 7 categories.
Source: GHIC CR, 2020.

Table 3 Distribution of patient attendance by selected specialization, Czechia, 2019

Specialization		Number of contacts						
		1	2	3	4	5-6	7+	Total
only DIA	N (in %)	11.06	20.81	22.67	21.07	16.45	7.95	100.00
	Std. Residual	–109.10	33.64	60.20	42.35	–4.83	–35.95	
only GP	N (in %)	31.55	20.29	16.32	14.97	11.97	4.90	100.00
	Std. Residual	175.10	16.36	–33.22	–43.00	–57.79	–71.33	
only INT	N (in %)	27.27	19.22	17.11	15.18	14.01	7.21	100.00
	Std. Residual	49.95	1.60	–9.75	–16.41	–13.34	–14.35	
DIA+INT	N (in %)	0.00	7.06	13.43	21.56	30.73	27.22	100.00
	Std. Residual	–79.54	–52.95	–25.68	13.11	65.89	106.00	
DIA+GP	N (in %)	0.00	7.71	14.47	19.27	31.78	26.76	100.00
	Std. Residual	–67.57	–42.52	–17.85	2.38	60.16	87.75	
GP+INT	N (in %)	0.00	14.56	15.74	17.93	27.16	24.61	100.00
	Std. Residual	–32.79	–7.98	–6.34	–1.34	20.25	37.27	
DIA+GP+INT	N (in %)	0.00	0.00	4.92	12.87	31.56	50.65	100.00
	Std. Residual	–26.20	–27.86	–20.93	–8.57	22.98	81.08	

Note: DIA = outpatient diabetology; GP = general practice; INT = internal medicine.
Source: GHIC CR, 2020.

justified the further investigation of differences in attendance rates.

Although the majority of patients made 3 visits to dibetologists, 2 and 4 visits were also frequent, whereas the majority of patients that visited only general practitioners or internists made just one visit per year (Table 3). Furthermore, almost half of the patients that used the services of internists and even more than half of the general practitioner patients made just one or two visits per year. Patients who combined more than one specialization made a higher average number of visits. More than half of the patients who used the services of more than one specialist made five or more aggregate visits. In addition, a slightly higher proportion of patients who combined the services of general practitioners and internists made two and three visits and a lower proportion made more frequent visits than did the other combinations.

Patients who combined all three specializations made up the highest percentage in the research group that visited seven or more visits per year to their physician.

DISCUSSION

The prevalence of diabetes in Czechia, as in most countries worldwide, has been on the increase for many years (*IDF*, 2001; *IHIS CR*, 2018). The intensity of the morbidity of the condition is highly age-specific. Although the prevalence rate is very low up to the age of 40 years, with increasing age, it increases several times. It is estimated that almost one-fifth of the global population over 65 years of age suffers from diabetes; in North America and the Caribbean region the disease affects as much as 27.0% of the population (*IDF*, 2019). In developed countries, the highest prevalence rates relate to the 70 to 85 age group (*Lin et al.*, 2018). For example, the 75–79 age group has the highest prevalence rate (25.5%, and as high as 28.5% for men) in Canada (*PHA*, 2011). In Germany in 2010, the prevalence of type 2 diabetes mellitus peaked at the age of 80–89 years for men (26.3%) and 90–99 years for women (24.9%) (Tamayo et al., 2016). These trends are consistent with the results of our research, which indicated that prevalence rates increase significantly as people reach middle and older ages to reach a peak for the 75–79 age group for men (27.8%) and the 80–84 age group for women (25.4%). The differences according to sex are influenced by both the overall age structure of the population and the prevailing health and mortality conditions. Compared to women, men are generally more likely to suffer from heart disease, strokes and diabetes, and are diagnosed with type 2 diabetes mellitus on average several years earlier than are women (*Crimmins, E.M. et al.*, 2019; *Wändell – Carlsson*, 2014). Therefore, the prevalence of diabetes is significantly higher for men than for women, as supported by our results and previous research. In addition, women live on average longer than men (*Zarulli, V. et al.*, 2018), which explains why the absolute number of women with type 2 diabetes mellitus is considerably higher in the highest age groups. Continuous growth in prevalence rates and the overall number of people with diabetes in Czechia can be expected in the future as a result, as in other countries, to population aging (*Tamayo et al.*, 2016; *Charvat*, 2015; *Kalyani – Golden – Cefalu*, 2017).

Of the three studied specializations, the care of patients with diabetes in Czechia is primarily covered by outpatient diabetologists. In a number of other Central and Eastern European countries, the majority of patients also consult outpatient specialists (diabetologists, endocrinologists or internists in the context of a specific organization) rather than primary care physicians (*Chin – Zhang – Merrell*, 2000; *Doničová – Brož – Sorin*, 2011). In contrast, in many other countries general practitioners act as gatekeepers and refer patients to specialist physicians only when deemed necessary; hence, most patients with type 2 diabetes mellitus are treated by general practitioners only (*Chevreul – Berg Brigham – Bouché*, 2014; *Thomsen et al.*, 2012). The low involvement of general practitioners in diabetes care serves to confirm that primary care in Czechia is relatively weak. Unfavorable factors for general practitioners include restrictions in terms of the issuance of prescriptions for a variety of modern drugs such as GLP-1 analogues, glyphlosins and thiazolidinediones (*Škrha*, 2016). Moreover, patients are entitled to visit specialist practices with minimal restrictions and make extensive use of this option. Strengthening primary care could help to broaden the options for the care of diabetes patients. Furthermore, the increased involvement of general practitioners would act to relieve the pressure on specialists in order for them to devote more attention to patients with complications and severe disease courses, for whom secondary care is essential.

Although the majority of patients use the services of only one of the three specialties, approximately one in eight combine these specializations. In the case of combinations of general practitioner and specialist, it is reasonable to assume that these are, at least partially, patients who have not been clearly dispensed and require a combination of primary and secondary care physicians. In part, this may comprise a form of cover in the absence of a regular physician. However, combining specializations may lead to the overuse of health services, especially in the case of the use of both outpatient diabetologists and internists, who have the same treatment options at their disposal. Although the proportion of patients that use care from more than

one specialization is relatively small, the amount of care provided and the resulting costs are significant.

Although it is recommended that patients with diabetes attend check-ups every three months (*CDS*, 2020), many patients do so significantly less frequently. The lowest average number of visits was reported for patients treated only by a general practitioner. In this case, more than half of the patients were treated just once or twice a year. Patients who visited internists were found to do so on average slightly more often, and the highest attendance related to patients who visit outpatient diabetologists; however, even in this case almost a third of patients attended only one or two check-ups annually. The trend toward higher attendance rates for specialists than for general practitioners was confirmed by previous studies, which further indicated that patients who attend specialists evince a higher rate of comorbidity and diabetic complications and receive a higher total reimbursement than patients that attend primary physicians (*Chin – Zhang – Merrell*, 2000). These results correspond to the parameters of the healthcare system, in which patients with diabetic complications (generally requiring more costly care) are referred to specialists, while GPs primarily manage the healthcare of patients without complications. However, we cannot fully confirm whether these are indeed patients with complications, since it was not possible to determine this information from the results of the analysis of the data set.

Our results did not confirm the strong impact of geodemographic characteristics on the utilization of diabetes care. The structure of patients in terms of sex and age group differed only slightly between the three specializations and the sex and age group variables were found to have a very weak impact on the attendance of patients. Although patients living in larger cities were more likely to use the services of outpatient diabetologists than those from smaller municipalities, the effect of the place of residence by municipality size category on the number of visits was low. Thus, if patients are able and willing to travel to another municipality for care, they make the same average number of visits as urban patients whose physicians are nearer to home. Thus, it can be concluded that concentrating physicians in larger population centers is appropriate to the needs of patients.

Differences were expected in terms of the level of knowledge and personal approach of the patients in the sample. A survey on the awareness of diabetes in the Czech population (*Ispos Healthcare*, 2014) revealed that most patients felt that the treatment of diabetes should, ideally, be the responsibility of specialists from the outset of treatment (54%), whereas only a very low percentage of respondents (4%) believed that care should be provided solely by general practitioners. The most common reason cited for the provision of care primarily or exclusively by specialists comprised the belief that physicians who specialize in the treatment of diabetes have more information on, and experience of, the disease than do general practitioners. In contrast, patients who receive care from GPs believed that they know their patients well and have a better general overview of other diseases, and that diabetes is not such a serious disease that it should be treated solely by specialists. The results appear to suggest, therefore, that the attitudes of patients are related to their knowledge and awareness of the disease and their specific condition. Hence, it seems that in order to increase the proportion of patients that use the services of general practitioners, it will be necessary to provide patients with sufficient information on the treatment options available and the severity of their condition.

A question remains, therefore, as to the level of detail of the information that patients should be provided with and the selected approach to diabetes care. General practitioners should be able to provide adequate care for patients; however, there should also be the option to refer patients to specialists if necessary. At the same time, it is unclear whether specialists return patients to the care of general practitioners when possible or retain patients over the long term even though it would be possible for GPs to care for the patient. Therefore, the effective coordination of care for patients with diabetes between the various health care providers available is essential in terms of both providing the appropriate treatment for patients and the overall efficiency of the health system.

CONCLUSION

This study was devoted to the intensity and structure of the utilization of healthcare and provided an outline of the current operation of health services in Czechia

with respect to diabetes. Based on our results, the strong effect of geodemographic characteristics on the use of diabetes care was not confirmed. Care for patients with type 2 diabetes mellitus is provided primarily by outpatient diabetologists, with less than one third of patients using the services of general practitioners. Moreover, a significant proportion of patients undergo medical check-ups less frequently than is recommended. Conversely, the overuse of the healthcare system is evident concerning patients who use more than one specialization, especially those that have the same competencies. We propose that the implementation of changes in terms of the coordination and provision of diabetes care and improvements in surveillance would improve the efficiency of diabetes care and better respond to the increases expected in the incidence of type 2 diabetes mellitus in the future.

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