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Adoption of the ADA/EASD guidelines in 10 Eastern and Southern European countries: Physician survey and good clinical practice recommendations from an international expert panel



Cardio-Metabolic Academy Europe East, Maciej Banach^{a,b,c}, Dan Gaita^d, Martin Haluzik^e, Andrej Janez^f, Zdravko Kamenov^{g,h}, Peter Kemplerⁱ, Nebojsa Lalic^{j,k}, Ales Linhart^l, Dimitri P Mikhailidis^{m,n}, Aleksandra Nocoń^{o,*}, Jose Silva Nunes^{p,q,r}, Nikolaos Papanas^s, Joao Filipe Raposo^{a,t}, Manfredi Rizzo^{u,v}, Anca Pantea Stoian^w

^a Department of Hypertension, Medical University of Lodz, Poland

^b Polish Mother's Memorial Hospital Research Institute, Lodz, Poland

^c Cardiovascular Research Centre, University of Zielona Gora, Zielona Gora, Poland

^d Institute of Cardiovascular Diseases Victor Babes University of Medicine and Pharmacy, Timisoara, Romania

^e Diabetes Centre, Institute for Clinical and Experimental Medicine, Prague, Czech Republic

^f Department of Endocrinology, Diabetes and Metabolic Diseases, University Medical Center, Ljubljana, Slovenia

^g Department of Internal Diseases, Medical Faculty, University of Sofia, Bulgaria

^h Center for Prevention of Diabetes and its Complications, Clinic of Endocrinology and Metabolic Diseases, Alexandrovska University Hospital, Sofia, Bulgaria

ⁱ Department of Internal Medicine and Oncology, Semmelweis University, Budapest, Hungary

^j Faculty of Medicine, University of Belgrade, Serbia

^k Clinic for Endocrinology, Diabetes and Metabolic Diseases, Clinical Center of Serbia, Belgrade, Serbia

^l 2nd Department of Internal Medicine, First Faculty of Medicine, Charles University and General University Hospital, Prague, Czech Republic

^m Department of Clinical Biochemistry, Royal Free Hospital Campus, University College London Medical School, University College London (UCL), London, UK

ⁿ Mohammed Bin Rashid University (MBRU) of Medicine and Health Sciences, Dubai, United Arab Emirates

^o Novo Nordisk, Poland

^p Department of Endocrinology, Diabetes and Metabolism, Central Lisbon University Hospital Centre, Lisbon, Portugal

^q NOVA Medical School/ Medical Science College, New University of Lisbon, Lisbon, Portugal

^r Health and Technology Research Center, Lisbon Health Technology School, Lisbon, Portugal

^s Diabetes Centre, Second Department of Internal Medicine, Democritus University of Thrace, Alexandroupolis, Greece

^t APDP Diabetes Portugal, Lisbon, Portugal

^u Department of Health Promotion, Mother and Child Care, Internal Medicine and Medical Specialties (PROMISE), University of Palermo, Italy

^v Division of Endocrinology, Diabetes and Metabolism, Department of Medicine, University of South Carolina, Columbia, SC, USA

^w Diabetes, Nutrition and Metabolic Diseases Department, "Carol Davila" University of Medicine, Bucharest, Romania

* Corresponding author at: Novo Nordisk Pharma Sp. z o.o., ul. Krakowiaków 46, PL 02-255 Warsaw, Poland.

E-mail address: avn@novonordisk.com (A. Nocoń).

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ABSTRACT

Aims: Evidence from cardiovascular outcomes trials (CVOTs) of glucagon-like peptide-1 receptor agonists and sodium-glucose cotransporter-2 inhibitors was reflected in the most recent guidelines from the American Diabetes Association (ADA) and the European Association for the Study of Diabetes (EASD). The aim of the present study was to assess the adoption of the ADA/EASD guidelines in a convenience sample of physicians from Eastern and Southern Europe, the barriers to the implementation of these guidelines and the measures needed to facilitate their implementation.

Methods: Attendees at two international diabetes conferences could volunteer to respond to a fully anonymous survey. Responses were analysed descriptively and a panel of experts from around the region was consulted to interpret the survey results.

Results: Responses (n = 96) from 10 countries were analysed. Most participants (63.4%) considered the ADA/EASD guidelines fundamental to their practice. All respondents saw the value of the CVOT-based ADA/EASD recommendations and 77–80% generally implemented them. Measures suggested to improve adherence to the ADA/EASD guidelines included aligning reimbursement policy with the guidelines (54.4%), publishing guidelines in a simple and concise form (42.4%) and translating guidelines into local languages (33.3%).

Conclusions: Aligning reimbursement with recent evidence and providing short summaries of the ADA/EASD guidelines in local languages could facilitate physician adherence.

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1. Introduction

Diabetes (DM) is a global health emergency [1] and the World Health Organization (WHO) estimates that approximately 8.5% of the global adult population is affected, with type 2 diabetes mellitus (T2DM) constituting the majority of cases [2]. Cardiovascular (CV) disease (CVD) is widely recognised as the leading cause of death in people with T2DM [1,3–4], including stroke, coronary artery disease, heart failure, and peripheral artery disease [1]. In addition to these macrovascular complications, T2DM is also associated with microvascular complications, including diabetic nephropathy, neuropathy and retinopathy [5]. In Central and Eastern Europe, the direct (i.e. health system) costs of managing the complications of DM are estimated at €218.50–758.90 per patient per year [6] and, with >26 million people with T2DM in the region [7]. DM places a considerable burden on already stretched healthcare systems.

Cardiovascular outcomes trials (CVOTs) published in recent years [8–18] have changed the treatment landscape of T2DM, providing evidence that specific glucagon-like peptide-1 receptor agonists (GLP-1RAs) (dulaglutide [8], liraglutide [13], semaglutide [12] and the no longer marketed albiglutide⁹) and sodium-glucose cotransporter-2 inhibitors (SGLT2is) (canagliflozin [17–18], dapagliflozin [16] and empagliflozin¹⁵) improve CV outcomes in people with T2DM. This crucial new evidence was reflected in both the 2018 joint consensus statement from the American Diabetes Association (ADA) and the European Association for the Study of Diabetes (EASD) [19] (hereafter referred to as the ADA/EASD

guidelines, updated in 2019) [20] and in the 2019 guidelines from the European Society of Cardiology (ESC), developed in collaboration with the EASD [21] (hereafter referred to as the ESC guidelines).

Although clinical standards of care and practice guidelines are an important step towards improving patient care, they are not always readily adopted by physicians [22–25]. Numerous factors hindering physician adherence to clinical practice guidelines have been described [26], including organisational challenges such as time pressure [23,25,27] or restricted reimbursement [25], lack of familiarity with the guidelines [23,25,27] and concerns about their applicability [23,25]. A further challenge lies in the large number of international, national, and local guidelines or practice standards, which are often complex and may contradict each other [28]. Indeed, a recently published study suggests that, among physicians from Central and South-Eastern Europe, health insurance constraints and clinical experience are more influential than clinical guidelines as drivers of the selection of insulin regimens in people with T2DM [29].

In the present study, we surveyed attendees at two DM-related conferences. The aim of the survey was to investigate the adoption of the ADA/EASD guidelines in a convenience sample of physicians from Eastern and Southern Europe, to assess the barriers to their effective adoption and to identify possible measures that could facilitate more effective and efficient uptake at a local level. To substantiate the results from the survey, we also provide suggestions from the Cardio-Metabolic Academy Europe East & South Expert Panel (a panel of experts) on the possible measures that physicians,

local professional societies and health policymakers could use to facilitate the adoption of the ADA/EASD guidelines and, ultimately, improve the care of people with T2DM.

2. Subjects, materials and methods

2.1. Study overview

A comprehensive 15-question survey was developed based on international expert discussions taking place at the First Meeting of the Faculty of the Cardiometabolic Academy, a panel of expert diabetologists and cardiologists from Eastern and Southern Europe, aiming to improve CV outcomes in DM, with the support of Novo Nordisk.

The survey, in English language, was distributed as a paper copy at two DM-related conferences: the Novo Nordisk RiSE Conference held in Lisbon, Portugal (18–19 October 2019) and the 2019 Congress of the Central European Diabetes Association (CEDA) held in Sofia, Bulgaria (31 October–2 November 2019). The survey was laid out at the Novo Nordisk booth, allowing the conference attendees to respond on a voluntary basis. Data collection was fully anonymous, and no personal information was collected. After completing the survey, respondents placed their copies in a ballot box. Approximately 340 physicians attended the conferences at which the survey was distributed, of whom approximately 90 attended the RiSE Conference and approximately 250 attended the CEDA Congress. However, the response rate could not be calculated, because of the voluntary and anonymous nature of the survey.

2.2. Survey description

The survey included 15 questions (see [Supplementary Material](#)). It mainly inquired about the implementation of the 2018 ADA/EASD guidelines [19], as the ESC guidelines [21] were published shortly before the responses were collected and were not expected to be widely implemented at the time. The 2019 update to the ADA/EASD guidelines [20] was not included, as this was published after the survey had already been conducted.

Following the initial questions aiming to characterise the respondents, the survey inquired about the influence of clinical guidelines in general, the ADA/EASD guidelines [19] and the ESC guidelines [21] on the respondents' clinical practice, with each ranked on a Likert scale of 1 (I never use them) to 4 (they are fundamental to my practice). The perceived value and implementation in the respondents' own practice was also assessed for three CVOT-based ADA/EASD recommendations: inclusion of GLP-1RAs or SGLT2is in glycaemic management of people with T2DM and established atherosclerotic CVD; use of SGLT2is in people with T2DM, atherosclerotic CVD and heart failure; and use of SGLT2is or GLP-1RAs with known effects on reducing the progression of chronic kidney disease (CKD) in people with T2DM and CKD. Respondents who saw the value of the ADA/EASD recommendations but did not always implement them were asked to identify barriers to fuller implementation of these guidelines and rank these barriers in the order of importance. All respondents

were also requested to express their views on several pre-selected measures that could potentially improve adherence to the ADA/EASD guidelines, as well as to provide their own suggestions. Finally, the survey inquired about how often the treatment options discussed within the ADA/EASD guidelines are communicated to patients through a shared decision-making process. Responses were analysed descriptively. The number of non-responses (including non-valid responses and no responses) was quantified for each question. Survey results are presented as the number and percentage of respondents selecting each option, with the number of valid responses as the denominator.

2.3. Expert involvement

The experts forming the Cardio-Metabolic Academy Europe East & South Expert Panel, who have in-depth knowledge of the local health systems and regulations in several of the studied countries (Bulgaria, Czech Republic, Greece, Hungary, Poland, Portugal, Romania, Serbia and Slovenia), provided their suggestions for possible measures that could be implemented locally to facilitate the adoption of the ADA/EASD guidelines. The experts also commented on the survey results, relating survey outcomes to the particularities of local healthcare systems and the challenges that people with T2DM and their treating physicians face in each country.

3. Results

3.1. Respondent characteristics

A total of 99 physicians completed the survey, and questionnaires from 96 respondents were included in the analysis. One questionnaire was excluded, due to the respondent's country of practice not being stated on the form, which prevented interpretation of the data. Two further questionnaires were excluded because the respondents were cardiologists, who are not routinely involved in diabetes management in most countries, and it was not considered appropriate to pool their responses with those of diabetologists and internal medicine specialists.

Respondent characteristics, based on the responses to Questions 1–5, are presented in [Table 1](#). The respondents represented 10 different countries from Southern and Eastern Europe. The most widely represented country was Bulgaria ($n = 19$, 19.8%), followed by Romania ($n = 16$, 16.7%) and Portugal ($n = 13$, 13.5%). Most respondents ($n = 53$, 55.2%) practised only in the public sector and just under a third ($n = 28$, 29.2%) practised in both the public and private sector. Respondents commonly worked in specialist hospitals ($n = 59$, 61.5%) or diabetology clinics ($n = 36$, 37.5%); 31 respondents (32.3%) also had an individual practice and these were usually located in urban areas ($n = 28$, 29.2%), with only 3 respondents (3.1%) having an individual practice in a rural area. However, both the sector and setting of practice varied widely by country ([Supplementary Table 1](#)), most likely reflecting differences in the organisation of diabetes care between health systems. For example, all respondents from Portugal worked in specialist hospitals compared with only 37.5% of respondents from

Table 1 – Respondent characteristics.

Characteristic	n	Percentage of valid responses
Total respondents	96	100
Country		
Bulgaria	19	19.8
Romania	16	16.7
Portugal	13	13.5
Serbia	12	12.5
Greece	8	8.3
Poland	8	8.3
Macedonia	7	7.3
Albania	5	5.2
Lithuania	5	5.2
Czech Republic	3	3.1
Sector		
Public	53	55.2
Private	15	15.6
Both	28	29.2
Practice setting [†]		
Specialist hospital	59	61.5
Diabetology clinic	36	37.5
Individual practice in an urban area	28	29.2
Individual practice in a rural area	3	3.1
Specialty [†]		
Endocrinology/diabetology	78	82.1
Internal medicine	30	31.6
General practice/family medicine	0	0
Other	3	3.2
Diabetology/nutrition	1	1.1
Paediatrics	1	1.1
Not specified	1	1.1
NR	1	N/A
Professional experience (years)		
<2	5	5.2
2–5	18	18.8
5–10	32	33.3
10–20	23	24.0
>20	18	18.8

N/A: not applicable; NR: not reported.

[†] Indicates questions in which respondents could select all applicable answers (i.e. more than one per respondent), so the percentages presented do not add up to 100%.

Greece (Supplementary Table 1). The most common specialty was endocrinology/diabetology (n = 78 of 95 responses, 82.1%), followed by internal medicine (n = 30, 31.6%). The respondents represented a wide range of levels of professional experience (Table 1), although few were relatively junior — only 5 respondents (5.2%) had < 2 years of experience practising their main specialty.

3.2. Perceived influence of clinical guidelines on routine practice

Based on the responses to Question 6, clinical guidelines were regarded as highly influential, with 62 of 94 valid responses (66.0%) stating that clinical guidelines are fundamental to their practice and a further 31 respondents (33.0%) stating that they consult them often. The results were very similar for Question 7, in which the respondents were asked to consider how influential the ADA/EASD guidelines are on their clinical practice (Fig. 1). However, the ESC guidelines (Question 8) were less likely to be considered fundamental (n = 25

of 93 valid responses, 26.9%), with respondents frequently stating that they consult them often (n = 56, 60.2%) or only occasionally (n = 11, 11.8%) and one respondent (1.1%) stating that they never use them.

With regard to the specific ADA/EASD recommendations (Questions 9–11), all respondents saw the value of the three CVOT-based ADA/EASD recommendations presented in the survey: the use of SGLT2is or GLP-1RAs with a proven CV benefit in patients with atherosclerotic CVD, the use of SGLT2is in patients with atherosclerotic CVD in whom heart failure is also present or of concern, and the use of SGLT2is (or, if contraindicated, GLP-1RAs) shown to reduce the progression of CKD in patients with CKD. Most respondents stated that they implement these recommendations generally (76.9–80.0%) or sometimes (18.9–22.0%). For each ADA/EASD recommendation, only 1 respondent stated that they see the value of the recommendation but never implement it (Table 2).

Although this survey focused on specific recent (2018¹⁹) additions to the ADA/EASD guidelines, these guidelines discuss various treatment options and provide treatment

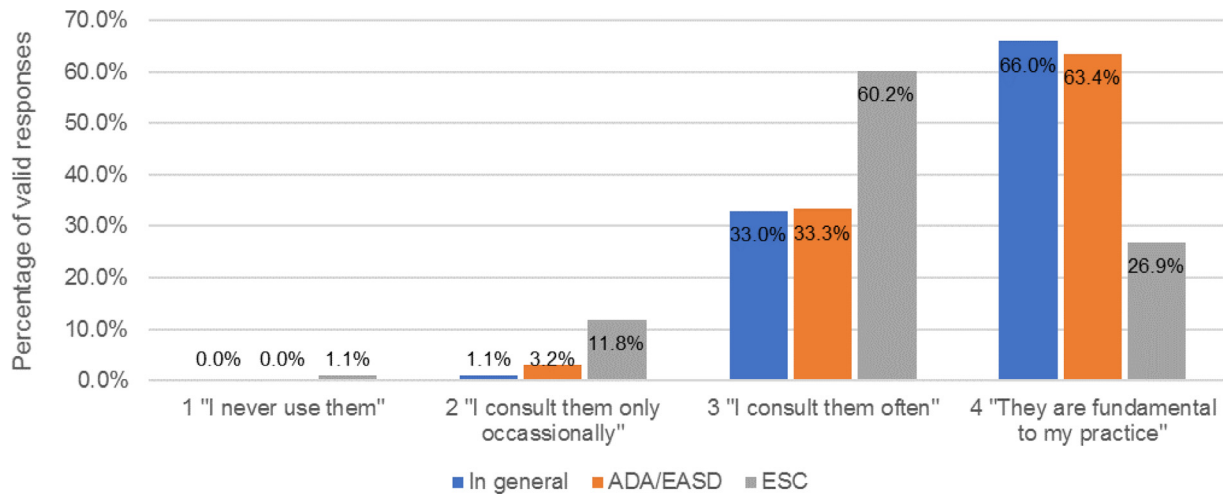


Fig. 1 – Perceived influence of clinical guidelines on the respondents' clinical practice. ADA: American Diabetes Association; EASD: European Association for the Study of Diabetes; ESC: European Society of Cardiology. The number of non-valid responses/non-responses was 2 (2.1% of survey respondents) for the perceived influence of clinical guidelines in general, 3 (3.1%) for the perceived influence of the ADA/EASD guidelines and 3 (3.1%) for the perceived influence of the ESC guidelines.

algorithms for a range of clinical scenarios [19]. Therefore, Question 15 asked how often the guideline-recommended therapeutic options are discussed with patients in a shared decision-making process. The majority of respondents stated that they discuss therapy options with their patients most of the time/always ($n = 51$, 54.3%) or sometimes ($n = 41$, 43.6%). Only 2 respondents (2.1%) never or rarely discussed therapy with patients and 2 respondents did not provide a valid response to this question.

3.3. Barriers to implementation of the ADA/EASD guidelines

Respondents who stated in Questions 9–11 that they see the value of the ADA/EASD recommendations on GLP-1RA and SGLT2i use but implement them only sometimes or never were asked to identify key barriers that prohibit them from implementing the ADA/EASD guidelines more fully (Question 12) and rank the top 3 barriers in the order of importance (Question 13). However, the respondents did not strictly adhere to this instruction and occasionally responded to Questions 12 and 13 independently of their responses to Questions 9–11. Overall, 38 respondents identified barriers to implementing the ADA/EASD guidelines. The most commonly cited barriers were related to restricted access to medication: reimbursement regulations posing a barrier to prescribing in line with the ADA/EASD guidelines ($n = 21$, 55.3%) and the presence of national/local/institutional guidelines or treatment pathways that take precedence over the ADA/EASD guidelines ($n = 9$, 23.7%). The other most frequently selected barrier was that the respondents preferred to use their own clinical judgment, or formal or informal institutional protocols, rather than the ADA/EASD guidelines ($n = 7$, 18.4%). Barriers to the implementation of the ADA/EASD guidelines are summarised in Fig. 2.

Restrictions on reimbursement were commonly considered among the 3 most important barriers to guideline

implementation, ranking as the most important barrier in 24 of 36 valid responses (66.7%) and as the second most important barrier in 4 of 20 valid responses (20%). The full results for the ranking of barriers to ADA/EASD guideline implementation in order of importance (Question 13) are presented in Supplementary Table 2.

3.4. Measures to facilitate physician adherence to the ADA/EASD guidelines

The measures that the respondents thought could improve adherence to the ADA/EASD guidelines are summarised in Fig. 3. Consistent with the perception of reimbursement restrictions as a key barrier to the implementation of the ADA/EASD guidelines, more than half of the respondents ($n = 49$ of 90 valid responses, 54.4%) stated that ensuring that reimbursement policy follows recent evidence/guidelines would facilitate adherence to these guidelines. The second most frequently cited measure was publishing the guidelines in a simple and concise form — e.g. as a booklet and/or webpage ($n = 38$, 42.2%) — followed by translating them into the local language ($n = 30$, 33.3%). None of the respondents offered additional ideas to facilitate adherence to the ADA/EASD guidelines.

Reflecting the varied and independent nature of health-care systems in Eastern and Southern Europe, the measures suggested to facilitate ADA/EASD guideline adherence varied by country. For 8 of the 10 countries studied, 50% or more of valid responses stated that ensuring that reimbursement policy follows recent evidence/guidelines would facilitate adherence to the ADA/EASD guidelines (Supplementary Table 3). In contrast, aligning reimbursement regulations with recent evidence/guidelines was selected in just 1 of 7 valid responses (14.3%) from Greece, where publishing a simplified, concise version of the guidelines was considered more valuable (5 of 7 valid responses, 71.4%). Implementing IT systems that enable access to patients' complete health records was

Table 2 – Perceived value and implementation of CVOT-based ADA/EASD recommendations.

Response	“Among patients with type 2 diabetes who have established ASCVD, SGLT2 inhibitors or GLP-1 receptor agonists with proven cardiovascular benefit are recommended as part of glycemic management”		“Among patients with ASCVD in whom HF coexists or is of special concern, SGLT2 inhibitors are recommended”		“For patients with type 2 diabetes and CKD, with or without CVD, consider the use of an SGLT2 inhibitor shown to reduce CKD progression or, if contraindicated or not preferred, a GLP-1 receptor agonist shown to reduce CKD progression”	
	n	Percentage of valid responses	n	Percentage of valid responses	n	Percentage of valid responses
Do not see the value	0	0.0%	0	0.0%	0	0.0%
See the value but never implement it	1	1.1%	1	1.1%	1	1.1%
See the value and sometimes implement it	18	18.9%	18	19.4%	20	22.0%
See the value and I generally implement it	76	80.0%	74	79.6%	70	76.9%
NR	1	N/A	3	N/A	5	N/A

ADA: American Diabetes Association; ASCVD: atherosclerotic cardiovascular disease; CKD: chronic kidney disease; CVD: cardiovascular disease; CVOT: cardiovascular outcomes trial; EASD: European Association for the Study of Diabetes; GLP-1: glucagon-like peptide-1; HF: heart failure; NR: not reported; SGLT2: sodium-glucose cotransporter-2

considered particularly valuable by respondents from Lithuania (3 of 5 valid responses, 60%) and Romania (8 of 16 valid responses, 50.0%). Expert commentary on measures to facilitate adherence to the ADA/EASD guidelines is provided in [Box 1](#).

4. Discussion

Nearly 100 physicians from 10 Eastern and Southern European countries responded to the survey; most were endocrinologists/diabetologists and/or internal medicine specialists. The respondents represented a wide range of professional experience levels and practice settings across both the public and private sector. Clinical guidelines had a substantial influence on the respondents' practice, both guidelines in general and the ADA/EASD guidelines [19] specifically. Respondents appeared less likely to consult the ESC guidelines [21]; however, these guidelines were published only 2 months before the survey was conducted. The vast majority of respondents discussed ADA/EASD guideline-recommended therapeutic options with their patients at least sometimes. All respondents saw the value of the CVOT-based recent updates to the ADA/EASD recommendations, and most reported routine implementation of these recommendations in their practice. Where barriers to implementing the ADA/EASD guidelines were identified, these were most frequently related to reimbursement restrictions, followed by the presence of national/local/institutional guidelines or treatment pathways that take precedence over the ADA/EASD guidelines (these local guidelines and protocols may also reflect cost-containment measures and restrict patient access to T2DM therapies with proven CV benefits), and physician preference to use own clinical judgment/ formal or informal institutional protocols rather than the ADA/EASD guidelines. With regards to improving adherence to the ADA/EASD guidelines, most respondents pointed to ensuring reimbursement policy follows recent evidence/guidelines, followed by publishing the guidelines in a simple and concise form, and translating them into local language. However, there were some notable differences between the studied countries in terms of the proposed measures to facilitate guideline adherence. Across several countries studied, most respondents stated that aligning reimbursement regulations with recent evidence and guidelines would facilitate improved adherence to the ADA/EASD guidelines. In contrast, among the respondents from Greece, a simplified and shortened form of the guidelines was considered more valuable. This cross-country variability probably reflects the diverse organisation of health systems around Eastern and Southern Europe.

Policymakers and professional societies might adopt the most recent clinical evidence differently in different countries, as described in a recent publication [30]. In the [supplementary material](#), the authors collated information from local authorities, specialist associations, general practice and primary care associations to summarise how CVD prevention and management and the results of CVOTs are incorporated into national guidelines [30]. Although the local guidelines from several countries in Eastern and Southern Europe discussed both issues, the Lithuanian, Serbian and

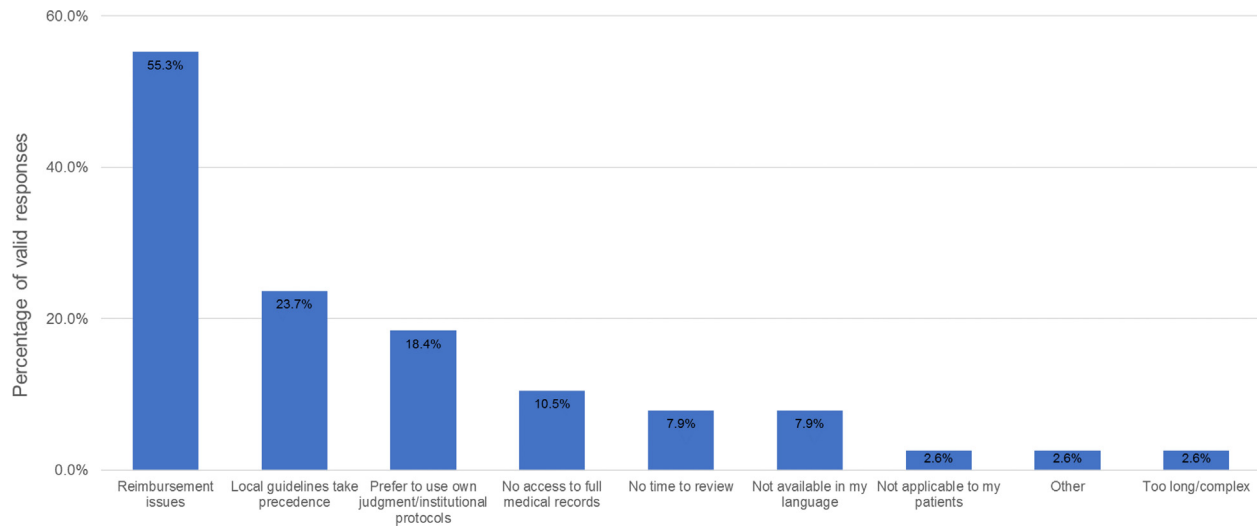


Fig. 2 – Perceived barriers to implementing the ADA/EASD guidelines. ADA: American Diabetes Association; EASD: European Association for the Study of Diabetes. Respondents could select all applicable answers (i.e. more than one per respondent), so the percentages presented do not add up to 100%. 58 respondents (60.4%) did not provide a valid response.

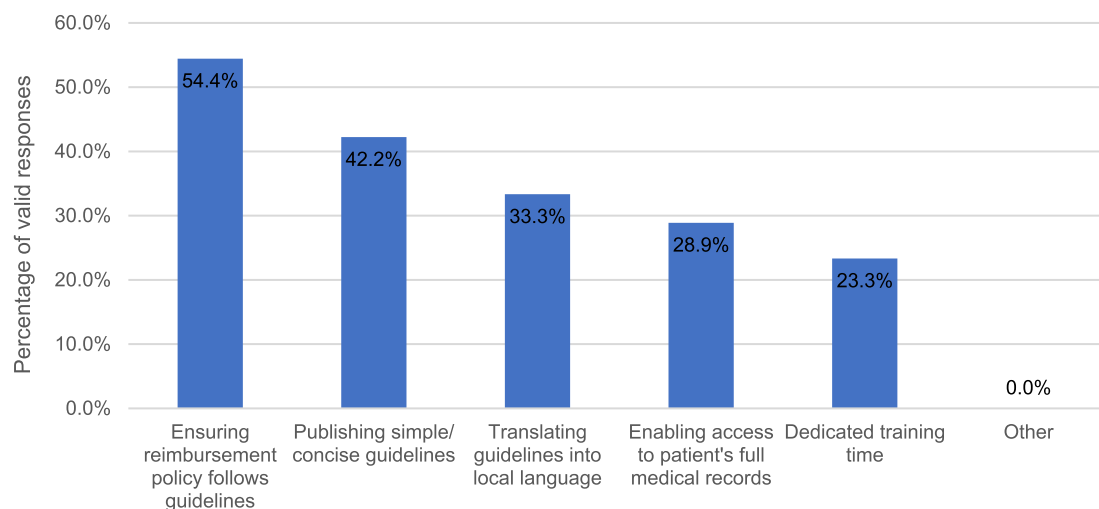


Fig. 3 – Proposed measures to facilitate adherence to the ADA/EASD guidelines. ADA: American Diabetes Association; EASD: European Association for the Study of Diabetes. Respondents could select all applicable answers (i.e. more than one per respondent), so the percentages presented do not add up to 100%. The number of non-valid/non-responses was 6 (6.3% of survey respondents).

Romanian guidelines did not [30]. Local guidelines, especially if published in the local language, could have substantial influence on clinical practice. It is therefore important for these guidelines to be aligned with the most recent published evidence and guidelines from international high-profile clinical societies, such as the ADA and the EASD. Establishing strong cross-specialty collaboration between local clinical societies representing diabetologists, cardiologists and nephrologists is the first step towards reflecting the international guidelines in clinical practice at the local level. In Romania, collaboration between the local diabetology and cardiology societies has recently become stronger and more active in response to calls to intensify cross-specialty efforts [31]. Similar effective collaborations in other countries across

the region would lead to more people with T2DM receiving comprehensive care that addresses CV and kidney disease risk.

Another relevant issue is the concordance between clinical practice guidelines and reimbursement policy. The results from our survey suggest that, even in countries where local guidelines discuss CVD prevention and the results of CVOTs, reimbursement may still pose a key barrier to the wider implementation of guideline-recommended therapy. Despite the immense overall burden of the condition, T2DM may not always be considered a top priority by health policymakers, potentially owing to the complications of T2DM gradually building up over time. Importantly, the costs of complications, including those related to hospital stay, represent the

majority of the economic burden related to DM. In a recent nationwide survey in Hungary, only 11.7% of all DM-related costs paid by the National Insurance Fund were attributable to antidiabetic therapy [32]. It is therefore crucial that the old policy of “save now, pay later” is rejected and that policy-makers recognise the health, societal and economic benefits of preventing the complications of T2DM.

Publishing a shortened version of the guidelines and translating them into local languages was seen as beneficial for adherence to the ADA/EASD guidelines by 42% and 33% of the respondents, respectively. Among calls for concise, evidence-based and practical guidelines that can be readily implemented, with outcomes that can be easily measured [33], the ADA/EASD guidelines may appear long and complex. Indeed, the results of our survey suggest that adherence to these guidelines could be improved if the information were provided in a simple and concise form (e.g. as a booklet and/or webpage) and translated into local languages. In some countries (e.g. Hungary), a much shorter version of the guidelines has already been prepared, primarily for general practitioners.

Importantly, the results pertaining to local translation of the guidelines should be viewed in light of the limitations of this study—namely, the survey being distributed at conferences conducted in English and capturing very few physicians practising in rural areas. Survey participants may therefore have underestimated the benefits arising from local translation of the ADA/EASD guidelines relative to their colleagues whose command of the English language may not be sufficient to fully comprehend them. Distributing a similar survey in the local language to a random sample of physicians would potentially result in local translation and simplification of the ADA/EASD guidelines being considered even more important for facilitating their uptake. The complexity of the guidelines and language barriers are relatively easy to combat for local professional societies, which have the combined skills and knowledge to translate and summarise the ADA/EASD guidelines, as well as to put them into the local context. The results of our survey warrant a call for action from local clinical societies in that respect.

Access to patients' full medical records was thought to be a factor that could improve adherence to the ADA/EASD guidelines in <30% of responses. Although a comprehensive IT system that provides access to patients' full medical history would undoubtedly be beneficial, the restrictions associated with the lack of such a system can sometimes be overcome with a sufficiently detailed patient interview, provided that visit time per patient is not severely restricted. However, time constraints on physicians may be substantial. In our survey, dedicated training time during working hours was considered a potential measure to improve adherence to the ADA/EASD guidelines by approximately 23% of the respondents, which is likely to reflect increased time pressure in some countries and practice settings. However, national training requirements, which could reflect the availability of time for physician education, appeared to have little influence on the perceived usefulness of dedicated training time. The highest percentage of respondents stating that dedicated training time could improve adherence to the ADA/EASD guidelines practised in Portugal, Serbia and Lithuania.

Although no mandatory continuing medical education (CME) requirements exist in Portugal, both Serbia and Lithuania do operate a compulsory CME policy [34]. This suggests that restricted training time may affect physicians even in countries that recognise the importance of continued education, as evidenced by the implementation of national CME policies. It is also worth noting that the survey was distributed at 2 conferences (i.e. among physicians clearly seeking opportunities for professional development), so there is a possibility that the role of training time would be even more prominent if a completely random sample of physicians was surveyed.

Although the research presented here provides insights into the implementation of the ADA/EASD guidelines in several Eastern and Southern European countries, it is not without limitations, of which the two major ones are the small number of responders and their heterogeneity in terms of country or type of practice. Not all countries in the region were captured in the survey, for example, there were no respondents representing Hungary or Slovakia. As mentioned above, distributing the survey at conferences could also have led to selection bias by targeting physicians who are willing to expand their knowledge base, can effectively communicate in English and, potentially, obtain sponsorship to attend the event. This selection bias potentially contributed to the inclusion of only a small number of physicians who practise in rural areas in the survey. In addition, specialties such as general practice, cardiology, and nephrology were underrepresented amongst the respondents which is likely to reflect their low levels of attendance at the two conferences, suggesting that multidisciplinary involvement in diabetes management may not yet be widespread practice. However, this method of survey distribution was necessary to maintain the complete anonymity of the respondents during the data collection process. The number of responses pertaining to the identification of barriers to guideline implementation (Questions 12 and 13) was lower than expected. Most respondents stated that they generally implement the ADA/EASD recommendations in their practice and did not provide insights into barriers to their implementation. Although the survey was fully anonymous, physicians could be unwilling to identify shortcomings in their practice and more open when providing insights into measures that could improve adherence to guidelines. Indeed, the response rate to the relevant question (Question 14) was high. Finally, the survey focused primarily on the seminal 2018 ADA/EASD guidelines which brought CV risk prevention in T2DM into focus. Only a single question pertained specifically to the ESC guidelines, which had been published shortly before the survey was conducted, and were not expected to be widely cascaded into clinical practice by the time of the survey. Although the ADA/EASD guidelines were updated in 2019, this update was published after the survey had already been conducted and, as such, was not incorporated into the survey.

The results and expert recommendations presented here should be viewed in the wider context of the broad literature regarding the effective implementation of clinical practice guidelines. Although we investigated specific measures that could improve guideline adherence, such as aligning reimbursement with recent evidence and publishing a concise

form of the guidelines in local languages, other important factors not captured in our survey have been described in the literature. More than 20 years ago, Cabana et al. described potential barriers to physician adherence to guidelines [26]. Although most of these barriers were incorporated into our questionnaire in some form, the questions included in our survey did not inquire about respondent self-efficacy (respondents' confidence in being able to manage patients in line with the guidelines) and outcome expectancy (respondents' belief that adherence to the guidelines will produce a specific beneficial effect). Furthermore, we did not capture potential patient factors that could affect the adherence of physicians to clinical guidelines. A cross-sectional study of primary care practitioners in Austria revealed that patient non-compliance and a lack of patient education and involvement are additional important factors that influence the receipt of guideline-recommended care [24].

Despite its limitations, the survey provided valuable insights into the adoption of the most recent professional guidelines in the field of T2DM across a wide range of countries and practice settings. Accompanied by expert recommendations on the measures that can be taken to improve the uptake of the international guidelines in Eastern and Southern Europe, this publication could be an important step towards opening cross-speciality discussions between local diabetology, cardiology and nephrology societies. If such collaboration becomes widespread, it could ultimately lead to more comprehensive care of people with T2DM, with a focus on preventing CV and renal complications and well as achieving and maintaining glycaemic control.

However, it is important that the effects of any physician- or patient-directed efforts to improve guideline adherence are measured using care quality indicators. A well-known example exists in primary care in England, which operates a voluntary reward and incentive scheme known as the Quality and Outcome Framework [35]. Points are awarded for meeting pre-defined indicators of quality of care [36] and the aim of the scheme is to reward primary care physicians for the quality of the care that they provide to patients and to help to standardise improvements in the delivery of primary care. Implementing similar initiatives in Eastern and Southern Europe could facilitate the adherence of physicians to guidelines and ultimately allow the delivery of the best evidence-based care to people with T2DM in the region.

5. Conclusions

Self-reported physician adherence to ADA/EASD guidelines appears to be high in the 10 Eastern and Southern European countries studied, although there remains room for improvement. Where barriers to implementation of these guidelines were identified, they were frequently related to restrictions in access to medication, mostly due to reimbursement limitations. Ensuring reimbursement policy follows recent evidence and guidelines, publishing the ADA/EASD guidelines in a simple and concise form and translating the guidelines into local languages were the measures most frequently considered to facilitate improved adherence to the ADA/EASD guidelines. Efforts from policymakers to align reimbursement with

recent evidence and from local professional societies to provide summaries of the ADA/EASD guidelines in the local language could encourage more physicians to treat their patients in accordance with most recent evidence-based guidelines, and allow more people with T2DM in Eastern and Southern Europe to receive the best possible treatment.

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Contributors

The authors are listed alphabetically, and all contributed equally to this study. AN and MR designed the survey and were responsible for data collection. Europe East & South Expert Panel of the Cardio-Metabolic Academy (MB, DG, MH, AJ, ZK, PK, NL, AL, DPM, SN, NP, JR and APS) interpreted the data and provided expert advice. All authors contributed to the preparation of the manuscript and approved its final version prior to submission.

Declaration of competing interest

MH: Presentations and consultations: Novo Nordisk, Eli Lilly, Novartis, Sanofi Aventis, Johnson&Johnson, Astra Zeneca, Novatin, Medtronic, Mundipharma, Boehringer Ingelheim, Zentiva. Grants/research: Eli Lilly, BMS, AstraZeneca, Sanofi Aventis.

NP: Presentations, consultations and advisory boards: Astra-Zeneca, Boehringer Ingelheim, Eli-Lilly, Elpen, Galenica, MSD, Mylan, Novo Nordisk, Pfizer, Sanofi-Aventis, Takeda, TrigoCare International, Vianex. Participation in sponsored studies: Astra-Zeneca, Eli-Lilly, GSK, MSD, Novo Nordisk, Novartis and Sanofi-Aventis.

APS: Presentations, consulting, advisory boards and clinical trials: Astra Zeneca, Coca-Cola, Eli Lilly, Merck, Medtronic, Novo Nordisk, Roche, Sanofi.

JSN: Consultation and trainings: Abbott, AstraZeneca, Bial, Boehringer Ingelheim, Eli Lilly & Company, Janssen Pharmaceuticals, Medinfar, Merck SA, Merck Sharp & Dohme, Mundipharma, Novartis Pharmaceuticals, Novo Nordisk, Roche, Sanofi, Servier, and Tecnimed.

DG: Educational activities: AstraZeneca, Berlin-Chemie, Boehringer Ingelheim, Merck, Mylan, Novartis, Novo Nordisk, Pfizer, Sanofi and Servier.

PK: Consultation and/or honoraria: Novo Nordisk, Sanofi-Aventis, Eli-Lilly, Boehringer-Ingelheim, Astra-Zeneca, Egis, MSD, DiCare, Wörwag-Pharma, Richter-Gedeon, Novartis.

MB: Speakers Bureaus: Amgen, Daichii Sankyo, KRKA, Herbapol, MSD, Novartis, Novo-Nordisk, Polpharma, Sanofi-Aventis, and Servier. Consulting: Abbott Vascular, Akcea,

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NL: Declarations of interest: none.

MR is currently Director, Clinical, Medical and Regulatory Department, Novo Nordisk Europe East LM, formerly Europe East and South. AN is a full-time employee of Novo Nordisk.

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Appendix A. Supplementary material

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