Application of 2021 American Diabetes Association Glycemic Treatment Clinical Practice Recommendations in Primary Care

Caitlin Colling,[1,2] Steven J. Atlas,[2,3] and Deborah J. Wexler[1,2]

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OBJECTIVE

We aimed to identify the proportion of primary care patients meeting criteria for sodium–glucose cotransporter 2 inhibitors (SGLT2is) and glucagon-like peptide 1 receptor agonists (GLP-1 RAs) for cardiorenal comorbidities per 2021 American Diabetes Association (ADA) Standards of Care recommendations using readily available electronic health record (EHR) characteristics.

RESEARCH DESIGN AND METHODS

We applied 2021 ADA recommendations to a primary care cohort of 13,350 adults with type 2 diabetes (T2D).

RESULTS

We found that 33% of patients with diabetes would be eligible for an SGLT2i or GLP-1 RA based on cardiorenal comorbidities, 13% of patients met criteria for an SGLT2i based on heart failure or albuminuric chronic kidney disease (CKD), and 18% of patients met criteria for either agent based on atherosclerotic cardiovascular disease or CKD with an albumin-to-creatinine ratio of ≤300 mg/g.

CONCLUSIONS

This EHR algorithm identified one-third of primary care patients with T2D as meeting criteria for SGLT2i and GLP-1 RA based on strict comorbidity definitions according to 2021 ADA recommendations.

The accumulating evidence regarding the cardiovascular and renal benefits of sodium–glucose cotransporter 2 inhibitors (SGLT2is) and glucagon-like peptide 1 receptor agonists (GLP-1 RAs) has led to major changes in medication recommendations for individuals with type 2 diabetes (T2D) and atherosclerotic cardiovascular disease (ASCVD), heart failure (HF), or chronic kidney disease (CKD). Starting in 2018, the American Diabetes Association (ADA) and European Association for the Study of Diabetes recommended the use of SGLT2is or GLP-1 RAs for patients with cardiovascular disease on metformin, with annual ADA updates incorporating emerging evidence (1–3). The 2021 ADA *Standards of Medical Care in Diabetes* (Standards of Care) further refined its clinical practice recommendations. We developed an algorithm using

[1]Diabetes Unit, Massachusetts General Hospital, Boston, MA
[2]Harvard Medical School, Boston, MA
[3]Division of General Internal Medicine, Massachusetts General Hospital, Boston, MA

Corresponding author: Caitlin Colling, ccolling@partners.org

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readily available electronic health record (EHR) characteristics and the ADA 2021 clinical practice recommendations to automate the identification of primary care patients with T2D who could be candidates for an SGLT2i or GLP-1 RA.

RESEARCH DESIGN AND METHODS

The study used data from the Primary Care Practice Based Research Network (PBRN) at Massachusetts General Hospital in Boston, MA. The PBRN comprises 18 primary care practices affiliated with Massachusetts General Hospital (4). The cohort includes adult patients aged ≥18 with T2D monitored in the PBRN between 1 January 2017 and 31 December 2017. T2D is defined using validated algorithms based on EHR problem lists, diagnosis codes, and hemoglobin A_{1c} (HbA_{1c}) results and includes diet-controlled T2D but excludes patients with type 1 diabetes (5). Patient characteristics, comorbid conditions, laboratory results, and medications were obtained from an electronic data repository. Estimated glomerular filtration rate (eGFR), HbA_{1c}, and BMI are reported as the value closest to the last visit date in 2017. The urine albumin-to-creatinine ratio (UACR) is the most recent value from 2015–2017.

ASCVD was identified using *International Classification of Diseases* (ICD) 9/10 codes, EHR problem lists, and procedure codes. Hypertension and HF were identified using ICD-9/10 codes and EHR problem lists. Retinopathy and pancreatitis were identified with ICD-9/10 codes. CKD meeting the criteria for SGLT2i therapy was defined as an eGFR <60 mL/min/1.73 m^2 or UACR >300 mg/g in accordance with ADA Standards of Care Recommendation 11.3.b (6).

The 2021 ADA guidelines were applied to the cohort to identify patients for whom a GLP-1 RA or SGLT2i would be recommended. Individuals with kidney failure (eGFR <15 mL/min/1.73 m^2 or on dialysis) or prior kidney transplant were excluded. To operationalize the guidelines, patients were considered candidates for SGLT2i if they met either of the following criteria: *1*) diagnosis of HF with reduced (HFrEF) or preserved (HFpEF) ejection fraction and eGFR ≥30 mL/min/1.73 m^2, or *2*) diagnosis of CKD with eGFR ≥30 mL/min/1.73 m^2 and UACR >300 mg/g. Patients were considered candidates for either SGLT2i or GLP-1 RA if they had ASCVD without HF or CKD without UACR >300 mg/g in accordance with 2021 ADA Standard of Care recommendation 11.3.c (6). Patients with HF or CKD with eGFR <30 mL/min/1.73 m^2 and no history of pancreatitis were candidates for GLP-1 RA (Fig. 1).

Baseline characteristics were reported for the entire population and subgroups of patients considered candidates for SGLT2i and GLP-1 RA. Analyses were conducted using JMP 15 software (SAS Institute, Cary NC). The Mass General Brigham Institutional Review Board (Boston, MA) approved the research.

RESULTS

The primary care network included 13,350 patients with T2D. Mean age was 65.2 ± 13 years, and 47.0% were women (Supplementary Material). We found 12% had HF, 22.1% had ASCVD, and 23.0% had CKD, with many patients having more than one condition. The most recent HbA_{1c} was <7% (53 mmol/mol) in 51.8%, and 55.1% had a BMI ≥30 kg/m^2.

Overall, 33.2% (*n* = 4,435) of patients were recommended an SGLT2i or GLP-1 RA based on ADA 2021

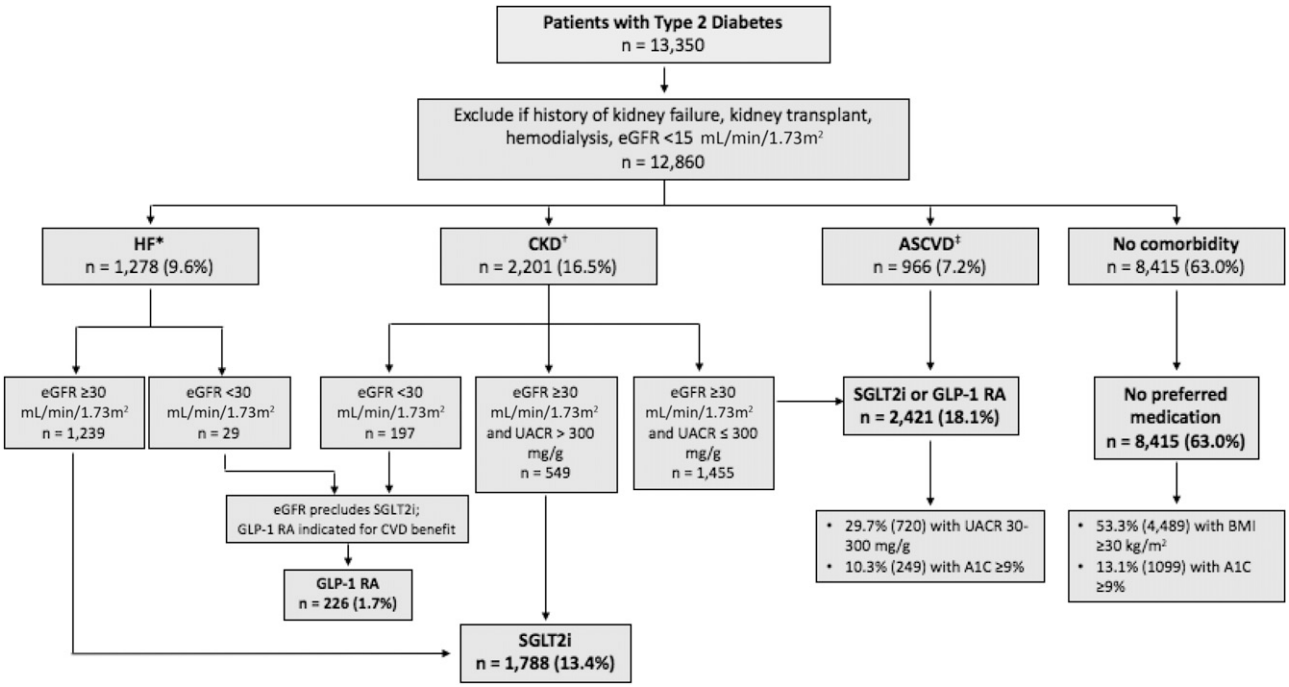

Figure 1—Algorithm assigning preferred medication class according to 2021 ADA recommendations. *HF includes patients with or without a history of CKD or ASCVD. †CKD includes patients without history of HF. ‡ASCVD includes patients without CKD or HF.

guidelines. Thirteen percent of patients ($n = 1,788$) were considered candidates for SGLT2i based on history of HF or CKD with UACR >300 mg/g. Two percent of patients ($n = 226$) who had HF or CKD with eGFR precluding SGLT2i use were candidates for GLP-1 RA. Patients with CKD without albuminuria or ASVCD alone accounted for 18% ($n = 2,421$) of the population, for whom either agent was recommended. Other factors, such as obesity or HbA_{1c} >9% (75 mmol/mol), may favor use of GLP-1 RA in accordance with ADA recommendations (Fig. 1 and Supplementary Material).

CONCLUSIONS

The introduction of SGLT2is and GLP-1 RAs has led to rapid changes in recommendations for the medical management of T2D. This study examined a large primary care population and found that one in three patients are candidates for either medication class based on one strict implementation approach relying on readily available EHR data to identify patients who would derive benefit.

Most of T2D care is provided in the primary care setting (7). Many barriers to effective management of T2D in primary care have been identified, including limited time and resources, lack of confidence in knowledge, and uncertainty about clinical responsibilities (8,9). The complexity of new diabetes medication guidelines and the novelty of these agents may delay their use. Prescribing of these classes is further complicated by slight differences in endocrinology, cardiology, and nephrology guidelines, varying views of specialists about their responsibilities in prescribing, and patient resistance to additional medications if they have achieved their HbA_{1c} target (10,11).

There is a critical role for education and systems to support primary care providers in uptake of new medications and care paradigms, including clinical decision support, insurance coverage information, and prior authorization. As such, this algorithm uses a conservative approach to identify patients eligible for these medication classes that could be used in real-time decision support. The algorithm may underestimate medication eligibility by using strict definitions and not accounting for patients with a high ASCVD risk. The updated guidelines recommend either class for patients with a high ASCVD risk, which is harder to operationalize using EHR data but could be included where risk calculators are available.

Additional prescribing considerations, such as obesity or severe hyperglycemia, were not incorporated in this algorithm. The 2021 ADA Standards of Care recommend preferential use of GLP-1 RAs or SGLT2is for patients not meeting glycemic targets with a compelling need to minimize weight gain or promote weight loss. Of the 63% ($n = 8,415$) patients without a cardiorenal comorbidity, 53% ($n = 4,489$) have obesity and could be considered candidates for either class. While the 2021 ADA recommendations do not suggest preferential use of SGLT2is for patients with CKD without severely increased albuminuria (>300 mg/g), recent evidence and nephrology guidelines would support use of SGLT2is in these patients (12,13). This algorithm recommends SGLT2is for patients with EHR-identified HF without specifying reduced ejection fraction, because of limited ability to distinguish between HFrEF and HFpEF using EHR data. While this approach may include some patients with HFpEF, in general, HFpEF is underrecognized, and EHR diagnoses of HF are more likely to indicate HFrEF (14,15). Despite these limitations, this algorithm identified patients who have been shown to have the greatest benefit from SGLT2is and GLP1-RAs in clinical trials.

Evidence from cardiovascular outcome trials of glucose-lowering medications demonstrates cardiac and renal benefits of GLP-1 RAs and SGLT2is, which are now recommended for patients with cardiorenal comorbidities independent of HbA_{1c}. Application of the 2021 ADA guidelines to an academic primary care network using an EHR algorithm reveals that 33% of primary care patients with T2D would be recommended treatment with one of these classes based on strict comorbidity definitions. Further work is required to evaluate the uptake of new recommendations and to assess the need for additional support for providers caring for patients with diabetes to implement evidence-based therapy in a timely manner.

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Author Contribution. C.C. performed the analyses and drafted the manuscript. C.C., S.J.A., and D.J.W. conceived of the project. C.C. and D.J.W. take responsibility for the accuracy of the results. S.J.A. and D.J.W. contributed to study design, interpretation of the data, and revision of the manuscript for important intellectual content. C.C. is the guarantor of this work and, as such, had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

References

1. American Diabetes Association. 8. Pharmacologic approaches to glycemic treatment: *Standards of Medical Care in Diabetes—2018*. Diabetes Care 2018;41(Suppl. 1):S73–S85
2. American Diabetes Association. 9. Pharmacologic approaches to glycemic treatment: *Standards of Medical Care in Diabetes—2021*. Diabetes Care 2021 ;44(Suppl. 1):S111–S124
3. Davies MJ, D'Alessio DA, Fradkin J, et al. Management of hyperglycemia in type 2 diabetes, 2018. A consensus report by the American Diabetes Association (ADA) and the European Association for the Study of Diabetes (EASD). Diabetes Care 2018;41: 2669–2701
4. Atlas SJ, Chang Y, Lasko TA, Chueh HC, Grant RW, Barry MJ. Is this "my" patient? Development and validation of a predictive model to link patients to primary care providers. J Gen Intern Med 2006;21:973–978
5. Grant RW, Cagliero E, Sullivan CM, et al. A controlled trial of population management: diabetes mellitus: putting evidence into practice (DM-PEP). Diabetes Care 2004;27: 2299–2305
6. American Diabetes Association. 11. Microvascular complications and foot care: *Standards of Medical Care in Diabetes—2021*. Diabetes Care 2021;44(Suppl. 1):S151–S167
7. Davidson JA. The increasing role of primary care physicians in caring for patients with type 2 diabetes mellitus. Mayo Clin Proc 2010;85 (Suppl.):S3–S4
8. Rushforth B, McCrorie C, Glidewell L, Midgley E, Foy R. Barriers to effective management of type 2 diabetes in primary care: qualitative systematic review. Br J Gen Pract 2016;66:e114–e127
9. Gao Y, Peterson E, Pagidipati N. Barriers to prescribing glucose-lowering therapies with cardiometabolic benefits. Am Heart J 2020;224: 47–53
10. Grant PJ, Cosentino F. The 2019 ESC Guidelines on diabetes, pre-diabetes, and cardiovascular diseases developed in collaboration with the EASD: new features and the 'Ten Commandments' of the 2019 Guidelines are discussed by Professor Peter J. Grant and Professor Francesco Cosentino, the Task Force chairmen. Eur Heart J 2019;40:3215–3217

11. Das SR, Everett BM, Birtcher KK, et al. 2020 Expert Consensus Decision Pathway on Novel Therapies for Cardiovascular Risk Reduction in Patients With Type 2 Diabetes: a report of the American College of Cardiology Solution Set Oversight Committee. J Am Coll Cardiol 2020;76: 1117–1145
12. Kidney Disease: Improving Global Outcomes (KDIGO) Diabetes Work Group. KDIGO 2020 Clinical Practice Guideline for Diabetes Management in Chronic Kidney Disease. Kidney Int 2020;98(4S):S1–S115
13. Heerspink HJL, Stefánsson BV, Correa-Rotter R, et al.; DAPA-CKD Trial Committees and Investigators. Dapagliflozin in patients with chronic kidney disease. N Engl J Med 2020;383:1436–1446
14. Heidenreich PA, Natarajan S, Bahrami H. Accuracy of administrative coding to identify reduced and preserved left ventricular ejection fraction. J Card Fail 2019;25:486–489
15. van Riet EE, Hoes AW, Limburg A, Landman MA, van der Hoeven H, Rutten FH. Prevalence of unrecognized heart failure in older persons with shortness of breath on exertion. Eur J Heart Fail 2014;16:772–777