Primary Care Health Care Use for Patients With Type 2 Diabetes During the COVID-19 Pandemic

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The coronavirus disease 2019 (COVID-19) pandemic may have delayed care for chronic disease (1). We sought to examine factors associated with total and virtual health care use for primary care visits for patients with type 2 diabetes (T2D) during the pandemic.

Using our electronic medical record, we identified patients in the Cleveland Clinic Health System with a diagnosis of T2D with a prepandemic primary care visit between 1 August 2019 and 14 March 2020 (period 0), with follow-up data collected during two pandemic periods: period 1, from 15 March 2020 to 30 June 2020, when in-person visits were rapidly converted to virtual (telephone or video); and period 2, from 1 July 2020 to 15 November 2020, when in-person visits resumed. We obtained demographic characteristics including age, sex, race, insurance type, median income estimated by zip code based on the American Community Survey 2014–2018 5-year estimates (2), and baseline glycated hemoglobin (HbA1c).

Patient characteristics were summarized with appropriate descriptive statistics. We assessed factors associated with completing any follow-up visits using logistic regression and then assessed factors associated with completing virtual visits using a mixed-effects logistic regression model with a random intercept at the patient level. All statistical analyses were performed in R (cran.r-project.org), and statistical significance was established at two-sided P values <0.05.

There were 76,015 patients with T2D who completed a primary care visit in baseline period 0. The median age was 66.2 years (SD 13.2), 50.7% were women, 21.7% were Black, 71.0% were White, and 7.4% were other race, with insurance distribution 43.2% for private, 46.5% Medicare, 9.5% Medicaid, and 0.8% other insurance, median income $59,000 (SD $22,000 [3% missing]), and baseline HbA1c categories of ≤7% (53 mmol/mol) (59.6% of patients), >7–8% (>53–64 mmol/mol) (19.5%), >8–9% (>64–75 mmol/mol) (9.3%), and >9% (>75 mmol/mol) (11.3%), with 0.3% missing.

The total number of primary care visits for this patient population was 191,928 in period 0 (3.5% virtual), 56,524 in period 1 (67.4% virtual), and 80,483 in period 2 (22.2% virtual). In the model adjusted for age, sex, race, median income (per $10,000), insurance type, and HbA1c category (≤7% [53 mmol/mol], >7–8% [53–64 mmol/mol], >8–9% [≥64–75 mmol/mol], and >9% [≥75 mmol/mol]), we found higher odds of any visit completion with increasing age per 1 year (odds ratio 1.008, 95% CI 1.007–1.010, period 1; 1.009, 1.008–1.010, period 2) and for Black patients (1.288, 1.238–1.339, period 1; 1.087, 1.043–1.133, period 2) as well as for those with Medicare and Medicaid insurance. Men had lower odds of a visit for both periods (0.871, 0.846–0.897, period 1; 0.848, 0.823–0.875, period 2). There were slightly lower odds of any visit completion with increasing median income per $10,000 (0.964, 0.957–0.971, period 1; 0.981, 0.973–0.988, period 2). Compared with patients with a baseline HbA1c ≤7% (53 mmol/mol), patients in all HbA1c categories >7% (53 mmol/mol) had higher odds of a visit in period 1, while patients with a baseline HbA1c >9% (75 mmol/mol) had lower odds of a visit in period 2 (0.825, 0.785–0.867).

The model predicting subsequent completion of the subset of virtual visits (Table 1) shows lower odds of completing follow-up virtual visits with increasing age and for men. Black patients had...
higher odds of completing virtual visits, as did patients with Medicare or Medicaid insurance and those with an HbA1c of >9% (75 mmol/mol). The proportion of patients who had any HbA1c tested during pandemic period 1 or 2 was 53.3%, 57.9%, 55.2%, and 49.2% for the HbA1c categories of ≤7% (53 mmol/mol), >7–8% (>53–64 mmol/mol), >8–9% (>64–75 mmol/mol), and >9% (>75 mmol/mol), respectively.

In this study of primary care visit use, for patients with T2D with a pre-pandemic visit, we found specifically for virtual visits that those with uncontrolled T2D (HbA1c >9% [>75 mmol/mol]), Black patients, and those with Medicare or Medicaid insurance had higher odds, while older and male patients had lower odds, of visit completion.

Our findings that the lowest percentage of HbA1c test completion was among patients with an HbA1c >9% (>75 mmol/mol) and that patients with HbA1c >9% also had higher odds of completing virtual visits during the COVID-19 pandemic as well as lower odds of completing visits in the later period when visits returned to being in person suggest that offering alternate visit types such as phone or video may be a mechanism to improve access and care to patients with uncontrolled T2D even post-pandemic. In addition, the higher odds of Black patients and those with Medicare and Medicaid using virtual visits may suggest a preference for these visit types that should be offered to patients after COVID-19. The care of patients with diabetes during the pandemic has been an important area of focus (3,4), and telemedicine is an important tool to continue providing care. While future work will focus on clinical outcomes by visit type, our findings suggest a role for offering alternate visit types to patients, especially those with uncontrolled T2D.

**Table 1—Model predicting use of primary care virtual visits for patients with type 2 diabetes with adjustment for COVID-19 pandemic period**

|                              | Odds ratio | 95% CI       | P      |
|------------------------------|------------|--------------|--------|
|                              | Lower      | Upper        |        |
| Pre-pandemic, period 0       | 1.000      |              |        |
| COVID-19 pandemic, period 1  | 103.609    | 99.978–107.372 | <0.001 |
| COVID-19 pandemic, period 2  | 9.157      | 8.848–9.477  | <0.001 |
| Age (per 1 year older)       | 0.981      | 0.979–0.982  | <0.001 |
| Male vs. female              | 0.789      | 0.765–0.814  | <0.001 |
| White                        | 1.000      |              |        |
| Black                        | 1.261      | 1.212–1.311  | <0.001 |
| Other race                   | 1.029      | 0.968–1.094  | 0.356  |
| Insurance                    |            |              |        |
| Private                      | 1.000      |              |        |
| Medicare                     | 1.225      | 1.181–1.271  | <0.001 |
| Medicaid                     | 1.226      | 1.162–1.293  | <0.001 |
| Other                        | 0.335      | 0.269–0.419  | <0.001 |
| Income (per $10,000 increment)| 1.034      | 1.026–1.042  | <0.001 |
| HbA1c (per 1 mmol per l)     |            |              |        |
| ≤7% (53 mmol/mol)            | 1.000      |              |        |
| >7–8% (>53–64 mmol/mol)      | 1.013      | 0.974–1.054  | 0.520  |
| >8–9% (>64–75 mmol/mol)      | 0.951      | 0.902–1.004  | 0.070  |
| >9% (>75 mmol/mol)           | 1.086      | 1.033–1.142  | 0.001  |

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**Author Contributions.** A.D.M.-H. designed the project, researched the data, and wrote the manuscript. E.R.P. created the data set, performed statistical analyses, and reviewed and edited the manuscript. B.H. performed the statistical analyses and reviewed and edited the manuscript. K.M.P. reviewed and edited the manuscript. A.D.M.-H. 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.

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