

# Improving Glycemic Control in Diabetes Through Virtual Interdisciplinary Rounds

Abby F. Hoffman, PhD; Cindy Leslie Roberson, PharmD; Pamela Cohen, BA; Victoria Lee Jackson, PharmD; John Yeatts, MD; Patrick Gregory, PharmD; Samantha Wong, MD; and Susan E. Spratt, MD

**D**iabetes affects 37.3 million Americans and is anticipated to affect 60.6 million by 2060.<sup>1</sup> Patients with diabetes have a higher rate of mortality, decreased quality of life, and increased risk of cardiovascular and chronic renal disease. Diabetes is predominant in the Black community, which contributes to health disparities.<sup>1,2</sup> Consequently, diabetes is a major contributor to the total cost of care, directly responsible for \$237 billion in medical costs in 2017.<sup>3</sup> As such, care delivery models that reward health systems for reducing costs and improving quality, such as accountable care organizations (ACOs), incentivize diabetes care improvement at the population level.<sup>4,5</sup>

Using electronic health data to proactively identify patients at risk for costly complications, population health methods can focus on patient, provider, or system-level interventions to reduce risk.<sup>5-7</sup> Provider-focused strategies include clinical decision support, active or passive reminders synchronous or asynchronous at the time of care, and provider education about guidelines, new medication, or technology.<sup>8</sup> Treating diabetes on an individual or population basis requires addressing multiple pharmaceutical, behavioral, and lifestyle factors to reduce risk of complications. This puts primary care providers (PCPs) at the forefront of helping patients assess and individualize the risks and benefits of an array of interventions, including initiating prescriptions or referring to other experts who can.

The use of therapies that improve outcomes is often delayed by clinical inertia, or inadequate treatment optimization in response to inadequate glycemic control or sustained hyperglycemia.<sup>7</sup> Clinical inertia results from multiple barriers that stem from the provider (time constraints, lack of knowledge, variability in adherence to guideline recommendations), patient (financial constraints, transportation, nonadherence, adverse effects), and system levels (lack of affordable medication, health care, and clinical decision support).<sup>9,10</sup> Innovative models that mitigate clinical inertia in diabetes care have emerged.<sup>11</sup> A telementoring approach involving remote team-based training and ongoing support for PCPs and community health workers treating patients with diabetes demonstrated an improvement in hemoglobin A<sub>1c</sub> (HbA<sub>1c</sub>) compared with

## ABSTRACT

**OBJECTIVE:** A team-based disease management approach that considers comorbid conditions, social drivers of health, and clinical guidelines improves diabetes care but can be costly and complex. Developing innovative models of care is crucial to improving diabetes outcomes. The objective of this analysis was to evaluate the efficacy of virtual interdisciplinary diabetes rounds in improving glycemic control.

**STUDY DESIGN:** Retrospective cohort study using observational data from July 2018 to December 2021.

**METHODS:** This study employed difference-in-differences analysis to compare change in hemoglobin A<sub>1c</sub> (HbA<sub>1c</sub>) in a group of patients whose providers received advice as part of virtual interdisciplinary rounds and a group of patients whose providers did not receive rounds advice. Patients with diabetes were identified for rounding (1) based on attribution to an accountable care organization along with an upcoming primary care appointment and an HbA<sub>1c</sub> between 8% and 9% or (2) via provider referral.

**RESULTS:** The rounded group consisted of 481 patients and the comparison group included 1806 patients. There was a 0.3-point reduction in HbA<sub>1c</sub> (95% CI, 0.1-0.4) associated with rounds overall. In a subanalysis comparing provider adoption of recommendations among those rounded, provider adoption was associated with an HbA<sub>1c</sub> reduction of 0.5 points (95% CI, 0.1-0.9) at 6 months post rounds, although there was no significant difference in the full year post rounds.

**CONCLUSIONS:** Interdisciplinary rounds can be an effective approach to proactively provide diabetes-focused recommendations. This modality allows for efficient, low-cost, and timely access to an endocrinologist and team to support primary care providers in diabetes management.

*Am J Manag Care.* 2024;30(3):e78-e84. doi:10.37765/ajmc.2024.89518

a matched cohort.<sup>12</sup> For patients without the physical or financial means to access specialty care, a retrospective cohort study of patients with diabetes with an HbA<sub>1c</sub> of 8% or higher found that endocrinology e-consultations demonstrated improvement in HbA<sub>1c</sub> similar to in-person visits.<sup>13</sup> Embedded pharmacists within primary care clinics improved prescribing for patients with diabetes.<sup>14</sup> Finally, an extensive outpatient rounds model with 9 team members that included home visits and regular PCP

follow-up has been described, but clinical outcomes are as yet unavailable.<sup>15</sup> Although these existing models are promising, they all require providers to identify participating patients or intensive workforce needs. Systemwide identification of patients for proactive review by a team of specialists has not been extensively explored.

The purpose of this study was to describe and estimate the impact of diabetes-focused virtual interdisciplinary rounding (IDR) on glycemic control. We hypothesized that rounds would reduce clinical inertia and increase prescribing of appropriate medications to improve glycemic control through improved endocrinologist access and medication education via promotion of timely advice. We describe and evaluate this replicable innovation, which has the potential to provide health systems with a process to improve quality of care for patients with diabetes.

## METHODS

This retrospective cohort study employed a difference-in-differences analysis using programmatic and clinical data from a clinically integrated network (CIN) to evaluate the impact of IDR on the HbA<sub>1c</sub> values of patients with diabetes. This analysis was deemed exempt by the Duke University Institutional Review Board protocol as a quality improvement project.

### Quality Improvement Program

IDR is implemented within Duke Health's Population Health Management Office, which provides care management and quality oversight to deliver value-based care within a CIN and ACO. The office employs an endocrinologist, pharmacist, and project manager to support PCPs by providing IDR.

Patients are identified for weekly IDR in 2 ways. First, patients may be referred by a PCP, care manager, or other health care team member. Second, and more frequently, patients are identified through a monthly report generated using electronic health record (EHR) data. The report includes patients who are 18 years or older, have received a diagnosis of diabetes, have an HbA<sub>1c</sub> between 8% and 9%, are not already under the care of an endocrinologist, and have an upcoming primary care appointment. Patients with an HbA<sub>1c</sub> between 8% and 9% were selected because previous iterations of IDR that included patients with higher HbA<sub>1c</sub> levels found they needed more intensive intervention (eg, motivational interviewing to discuss

## TAKEAWAY POINTS

Virtual interdisciplinary rounds leveraged the expertise of an endocrinologist, pharmacist, and program coordinator to provide advice to primary care providers treating patients with diabetes who were either proactively identified based on clinical characteristics or referred to rounds for additional support (eg, optimization of medication therapy).

- ▶ In the year after the intervention, patients' mean hemoglobin A1c decreased 0.3 points (95% CI, 0.1-0.4) more than that of the comparison group.
- ▶ Rounds proactively allowed for efficient, low-cost, and timely access to an endocrinologist and team to support primary care providers in diabetes management.

fear of insulin, more support around medication nonadherence). Although IDR often refers patients to additional resources, the program is optimized for patients who are managing relatively well but need updates to their medication regimen or help with paying for medications.

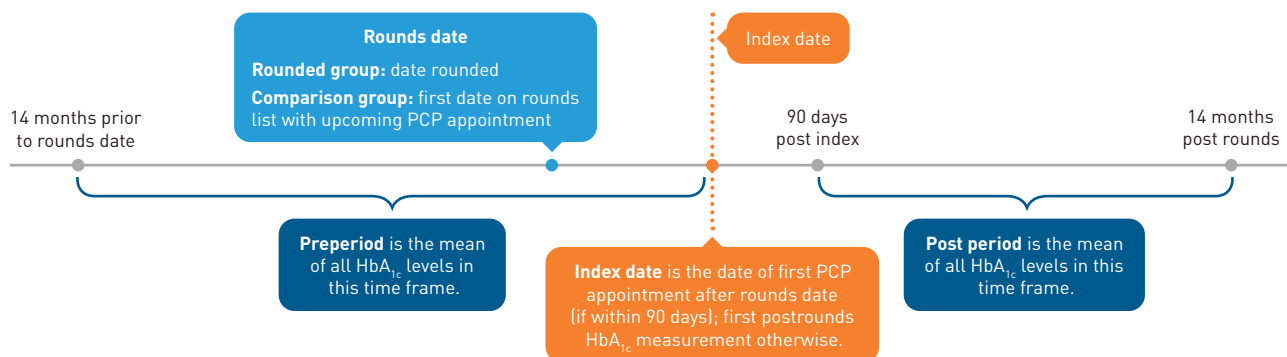
Each month, the project manager prioritizes patients from the monthly report by upcoming primary care visit and sends a list to the pharmacist. The pharmacist conducts a chart review for medication-related information, including EHR-integrated refill adherence data from Surescripts. She investigates alternatives for cost savings and possible therapeutic intensification. The 1-hour IDR among the pharmacist, endocrinologist, program coordinator, and occasionally the referring care manager includes a thorough review of 6 to 8 patients' medical records.

The endocrinologist communicates the team's suggestions to the PCP via secure communication through the patient's EHR that becomes part of their medical record. Most recommendations are around medication initiation, discontinuation, titration, or affordability. For example, IDR providers often suggest titrating basal insulin with addition of a glucagon-like peptide 1 receptor agonist (GLP-1 RA) for prandial coverage in select patients. Addition of a GLP-1 RA is sometimes preferred over initiation or titration of prandial insulin to lessen hypoglycemia risks. A medication might be discontinued if the patient has developed a contraindication such as declining kidney function or if a new medication is recommended. The team may improve medication access by suggesting drugs aligned with the patient's formulary, ensuring utilization of a preferred pharmacy or referral to a pharmacy technician to identify drug coupons or patient assistance programs.

Other IDR team recommendations may include reevaluation of current diabetes status through laboratory analysis or other care team referrals. For example, patients with a low body mass index or a history of diabetic ketoacidosis may be reevaluated for pancreatic insufficiency to guide therapy with insulin management. Referrals may include diabetes education, a nutritionist, or care management for any social (eg, food, transportation) or behavioral needs.

### Study of the Program

The data for the evaluation ranged from July 2018 through December 2021 and were obtained from 3 primary sources: programmatic data, a program management worksheet, and EHR data. Programmatic

**FIGURE 1.** Timing of HbA<sub>1c</sub> Period Comparison Between the Rounded and the Comparison Groups in Relation to the Index Date

HbA<sub>1c</sub>, hemoglobin A<sub>1c</sub>; PCP, primary care provider.

\*The figure shows a timeline of data used to identify the pre- and post periods for rounds analysis.

data provided a history of all patients identified as candidates for rounds, the patient's ACO-attributed insurer at the time of review, the patient's PCP, and the date of the patient's next PCP appointment at the time they were on the rounds list. A program management worksheet included a complete list of all patients who were reviewed during rounds, the date of the rounds, an indication of whether each patient was referred, and an indication (based on chart review) of whether the PCP adopted rounds recommendations. Historical EHR data included all HbA<sub>1c</sub> levels in the 14 months before and after the review date and patient demographics.

This study included 2 primary groups: those included in IDR and a comparison group. The IDR or "rounded" group was made up of all patients reviewed between November 1, 2019, and June 1, 2021. In the rare case that a patient was rounded on more than once, only their first review was included. Patients may have been rounded on more than once if the patient was re-referred by their health care team or the IDR team requested additional laboratory tests or information. The comparison group contained all patients who were on the monthly report (ie, identified as eligible for rounds) with a PCP appointment scheduled within the next month. The comparison group was much larger because the IDR team, which covers between 6 and 8 patients per week, did not have sufficient time to review the complete list. A given patient cannot be in both the rounded and comparison groups.

To assess the HbA<sub>1c</sub> difference between the rounded and comparison groups, both groups were first assigned a "rounds date" (Figure 1). For the rounded group, this was the date of rounds. For the comparison group, the rounds date was the first date the patient appeared on the rounds list with an upcoming PCP appointment. The rounds date was followed by the index date, or the date a provider may act on rounds advice. The index date was the date of the next primary care visit within 90 days of rounds or the next HbA<sub>1c</sub> measurement if no primary care visit occurred. Because HbA<sub>1c</sub> tests calculate an average blood glucose level over 2 to 3 months, HbA<sub>1c</sub> levels were

counted in the postindex period 3 months after the index date. HbA<sub>1c</sub> levels taken between the index date and the start of the postindex period were omitted from the analysis. The primary outcome was change in the patient's HbA<sub>1c</sub> level between the preindex period and postindex period.

### Statistical Analysis

The primary analysis was a generalized estimating equation with a gaussian family, identity link, and exchangeable correlation to account for the panel structure of the data (the patient-HbA<sub>1c</sub> level). The model was estimated as a difference-in-differences analysis where the main coefficient of interest was the interaction between indicators for pre-/postindex date plus 3 months and rounded group status. The model was adjusted for patient-level characteristics identified from the EHR and programmatic data including age, race/ethnicity, area deprivation index, health insurance, PCP practice type, calendar date, primary insurer, and chronic conditions (dementia, chronic kidney disease, congestive heart failure, coronary artery disease, and hypertension).

A secondary analysis tested whether the impact of rounds was persistent over time. This analysis employed a quarterly series of difference-in-differences equations comparing the difference in HbA<sub>1c</sub> level between the rounded group at 3 (> 1.5-4.5 months), 6 (> 4.5-7.5 months), 9 (> 7.5-10.5 months), and 12 (> 10.5-14 months) months post index date and the 14 months prior to the index date. This model was adjusted for the same covariates as the primary model.

Another secondary analysis used difference-in-differences to compare change in HbA<sub>1c</sub> in the 6 and 14 months post index for patients whose providers did and did not accept the rounds recommendations. In this case, the population included only patients who were in rounds and had recommendations from the rounds team that were actionable by a PCP (n = 438; eg, a recommendation to add a medication or refer to another provider). The model adjusted for the same variables as the primary analysis and also adjusted for whether the patient was referred by a provider. As with the primary

**TABLE 1.** Population Characteristics Between Exposure and Comparison Groups<sup>a</sup>

Characteristics	A. Primary model: characteristics between rounded vs not rounded			B. Secondary model: characteristics among rounded by provider acceptance		
	Not rounded	Rounded	P	Did not accept advice	Accepted advice	P
	n = 1806	n = 481		n = 222	n = 216	
Preindex HbA <sub>1c</sub> , mean (SD)	8.27 (0.77)	9.02 (1.78)	< .001	8.89 (1.81)	9.19 (1.80)	.083
Postindex HbA <sub>1c</sub> , mean (SD)	7.95 (1.16)	8.37 (1.86)	< .001	8.54 (2.00)	8.14 (1.34)	.061
Provider referral, n (%)	—	115 (24.26%)		36 (16.29%)	61 (28.91%)	.002
Age in years, mean (SD)	65.65 (12.28)	60.76 (13.02)	< .001	61.30 (13.08)	60.49 (12.40)	.51
Female, n (%)	873 (48.42%)	266 (55.30%)	.007	128 (57.66%)	118 (54.63%)	.52
Race/ethnicity, n (%)			< .001			.71
Black/non-Hispanic	640 (35.44%)	137 (28.48%)		67 (30.18%)	60 (27.78%)	
Hispanic	45 (2.49%)	7 (1.46%)		5 (2.25%)	2 (0.93%)	
Other/non-Hispanic	39 (2.16%)	9 (1.87%)		3 (1.35%)	5 (2.31%)	
Unknown	212 (11.74%)	200 (41.58%)		85 (38.29%)	87 (40.28%)	
White/non-Hispanic	870 (48.17%)	128 (26.61%)		62 (27.93%)	62 (28.70%)	
High ADI, n (%)	379 (25.20%)	85 (26.48%)	.63	45 (29.61%)	37 (24.83%)	.35
Dementia, n (%)	62 (3.43%)	19 (3.95%)	.59	9 (4.05%)	5 (2.31%)	.3
Chronic kidney disease, n (%)	641 (35.49%)	147 (30.56%)	.043	68 (30.63%)	62 (28.70%)	.66
Congestive heart failure, n (%)	109 (6.04%)	29 (6.03%)	> .99	16 (7.21%)	11 (5.09%)	.36
Coronary artery disease, n (%)	381 (21.10%)	70 (14.55%)	.001	32 (14.41%)	31 (14.35%)	.99
Hypertension, n (%)	1538 (85.16%)	377 (78.38%)	< .001	177 (79.73%)	170 (78.70%)	.79
Insurance, n (%)			< .001			.005
Commercial	495 (27.41%)	142 (29.52%)		59 (26.58%)	76 (35.19%)	
Medicaid	60 (3.32%)	3 (0.62%)		2 (0.90%)	1 (0.46%)	
Medicare	576 (31.89%)	56 (11.64%)		22 (9.91%)	30 (13.89%)	
Medicare Advantage	675 (37.38%)	107 (22.25%)		68 (30.63%)	34 (15.74%)	
Unknown	0 (0.00%)	173 (35.97%)		71 (31.98%)	75 (34.72%)	
Practice, n (%)			< .001			.77
Community	67 (3.71%)	5 (1.04%)		3 (1.35%)	2 (0.93%)	
System-owned	1271 (70.38%)	233 (48.44%)		113 (50.90%)	110 (50.93%)	
System-affiliated	437 (24.20%)	66 (13.72%)		34 (15.32%)	27 (12.50%)	
Unknown	31 (1.72%)	177 (36.80%)		72 (32.43%)	77 (35.65%)	

ADI, area deprivation index; HbA<sub>1c</sub>, hemoglobin A<sub>1c</sub>.

<sup>a</sup>Data are presented as mean (SD) for continuous measures and n (%) for categorical measures. There are some missing values in each panel. In panel A, 298 do not have a postindex HbA<sub>1c</sub> value, 462 do not have an ADI value, and 3 do not have a value for female sex. In panel B, 171 do not have a postindex HbA<sub>1c</sub> value, 6 are missing provider referral data, and 137 are missing an ADI value.

analysis, both secondary analyses used generalized estimating equations with a gaussian family, identity link, and exchangeable correlation. Stata 17 (StataCorp LLC) was used for all calculations.

## RESULTS

There were 481 patients in the rounded group and 1806 in the comparison group. Compared with the comparison group, the rounded group patients had a higher HbA<sub>1c</sub> in the preindex period (9.0% vs 8.3%;  $P < .001$ ), were younger (mean age in years, 60.8 vs 65.7;  $P < .001$ ), were more often female (55.3% vs 48.4%;  $P = .007$ ), and more often had unknown race (41.6% vs 11.7%;  $P < .001$ ), with lower prevalence of coronary artery disease (14.6% vs 21.1%;  $P = .001$ ),

chronic kidney disease (30.6% vs 35.5%;  $P = .043$ ), and hypertension (78.4% vs 85.2%;  $P < .001$ ). Both groups had varying insurance plans, with fewer patients in the rounded group on Medicaid (0.6% vs 3.3%;  $P < .001$ ). Both groups were similar with regard to area deprivation index score, prevalence of dementia, and congestive heart failure. Of the rounded group, 115 (23.9%) were referred by PCPs rather than identified from the rounds list ( $n = 295$ ; 61.3%) or referred by care management ( $n = 71$ ; 14.8%) (Table 1).

Patients who were rounded on decreased their HbA<sub>1c</sub> by 0.3 points (95% CI, 0.1-0.4;  $P < .01$ ) more than the comparison group, adjusting for patient characteristics (Table 2). The quarterly series of equations estimates that the HbA<sub>1c</sub> improvement is persistent (Figure 2). The rounded group had significantly lower HbA<sub>1c</sub> levels

**TABLE 2.** Impact of Rounds on HbA<sub>1c</sub><sup>a</sup>

	Unadjusted		Adjusted	
	Coefficient	95% CI	Coefficient	95% CI
Rounded	0.71	0.56-0.86	0.33	0.19-0.47
Post rounds	-0.28	-0.33 to -0.22	-0.27	-0.32 to -0.21
Rounded*post rounds	-0.31	-0.45 to -0.17	-0.28	-0.44 to -0.12
Provider referral			N/A	
Age			-0.02	-0.02 to -0.01
Female			-0.04	-0.12 to 0.03
Race/ethnicity				
Black/non-Hispanic			Reference	
Hispanic			-0.06	-0.31 to 0.19
Other/non-Hispanic			-0.04	-0.27 to 0.19
Unknown			-0.15	-0.29 to -0.01
White/non-Hispanic			-0.16	-0.25 to -0.07
High ADI			0.05	-0.04 to 0.15
Dementia			-0.03	-0.25 to 0.19
Chronic kidney disease			0.08	-0.01 to 0.16
Congestive heart failure			0.11	-0.07 to 0.29
Coronary artery disease			0.15	0.05-0.24
Hypertension			-0.16	-0.28 to -0.03
Insurance				
Commercial			Reference	
Medicaid			0.19	-0.08 to 0.46
Medicare			0.10	-0.03 to 0.24
Medicare Advantage			0.21	0.07-0.34
Unknown			0.72	0.19-1.25
Practices				
System-owned			Reference	
Community practices			0.15	-0.11 to 0.41
System-affiliated			0.15	0.06-0.24
Unknown			0.06	-0.21 to 0.32
Exposure date			0.00	0.00-0.00
Constant	8.25	8.22-8.29	15.66	9.29-22.03
N of observations	12,283		9916	
N of patients	2286		1182	

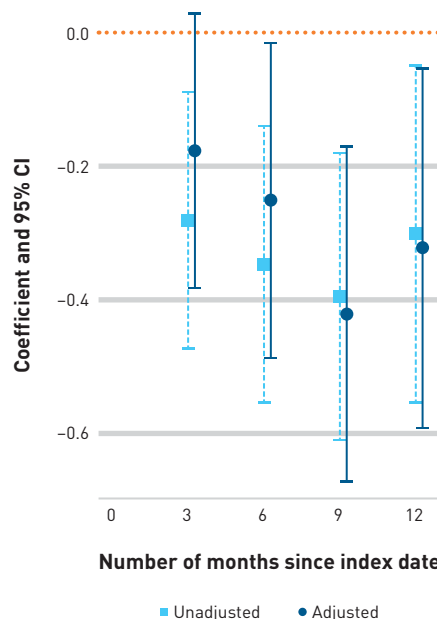
ADI, area deprivation index; HbA<sub>1c</sub>, hemoglobin A<sub>1c</sub>; N/A, not applicable.

<sup>a</sup>The table shows the results of a generalized estimating equation with a gaussian family, identity link, and exchangeable correlation. The equation produces unadjusted and adjusted outcomes for the difference-in-differences analysis comparing mean 14-month change in HbA<sub>1c</sub> for rounded vs comparison populations. The coefficient of interest is the interaction term on rounded\*post rounds.

at 6 months (0.3; 95% CI, 0.1-0.5; *P* = .04), 9 months (0.4; 95% CI, 0.2-0.7; *P* < .01), and 12 months (0.3; 95% CI, 0.05-0.6; *P* = .02); mean HbA<sub>1c</sub> levels were lower at 3 months, but the differences were not significant in the adjusted model.

There were 438 rounded patients whose providers received actionable rounds recommendations. Of these, 216 (49.3%) adopted rounds recommendations and 222 (50.7%) did not (Table 1). In the first 6 months of the postindex period, HbA<sub>1c</sub> decreased by 0.5 more points in the group whose providers accepted advice vs those

**FIGURE 2.** Decrease in HbA<sub>1c</sub> After Rounds by Quarter<sup>a</sup>



HbA<sub>1c</sub>, hemoglobin A<sub>1c</sub>.

<sup>a</sup>The figure shows results of a series of generalized estimating equations comparing 3, 6, 9, and 12 months after the index date to the year prior to the index date.

whose providers did not (95% CI, 0.1-0.9; *P* < .01) (Table 3). However, there was no difference in HbA<sub>1c</sub> based on whether providers accepted rounds advice by 14 months after the rounded date (not shown); thus, the effect did not persist.

## DISCUSSION

This analysis found a significant decrease in HbA<sub>1c</sub> associated with onetime, asynchronous, interdisciplinary rounds to support PCPs in treating patients with diabetes. HbA<sub>1c</sub> reductions appear to persist for over a year after the index date. These findings rise to the level of clinical significance. A 1-point reduction in HbA<sub>1c</sub> is associated with 1.7% decrease in annual health care costs along with significant reductions in diabetes-related complications.<sup>16,17</sup> These findings suggest that rounds may be a simple and effective tool to improve clinical control of diabetes in an ACO.

The American Diabetes Association advises that the care team should avoid clinical inertia and prioritize timely and appropriate intensification of behavior change and/or pharmacologic therapy when patients are not at their recommended targets.<sup>7</sup> Rounds support PCPs in overcoming inertia to provide better care by targeting the

appropriate patient at an actionable time with an expert team. Rounds target patients with HbA<sub>1c</sub> levels higher than 8%, at which point physician-directed interventions such as education and audit-and-feedback have been shown to be effective, reducing HbA<sub>1c</sub> by 0.33 and 0.44 percentage points, respectively.<sup>8</sup> Further limiting patients with HbA<sub>1c</sub> levels less than 9% narrows the population to patients who, IDR providers have found, have needs they are able to address with onetime provider advice. Outside the targeted group, patients referred by their PCP may also be responsive to change as the provider, in seeking help, signals a desire to improve diabetes control.

Timing the advice to arrive within 2 weeks prior to a patient's primary care appointment ensures that the PCP receives the information in a timely manner for action. If the patient does not keep their appointment, the advice exists as part of the medical record labeled "Diabetes Virtual Rounds" so that it can be found easily by the provider who sees the patient next.

In addition to providing well-timed advice to the appropriate patients, the rounds team has the requisite skills to help PCPs combat therapeutic inertia in several ways as identified by the American Diabetes Association. Access to an endocrinologist is associated with patients achieving their HbA<sub>1c</sub> goal.<sup>18</sup> However, there is a documented shortage of endocrinologists and an expected wait for a nonurgent visit of over 6 months in the Southeastern region of the US.<sup>19,20</sup> Analogous to rounds, electronic consultations with an endocrinologist can provide the same support to patients, can reduce specialist access concerns, and have been shown to produce HbA<sub>1c</sub> reductions similar to in-person clinic visits.<sup>13,21</sup> As such, the increase in access to an endocrinology expert's opinion likely drives improvement and supports integration of evidence-based care. Inclusion of a pharmacist in rounds provides guidance with medication adherence, optimization, selection, and education. Pharmacist-clinician partnerships have been demonstrated to improve diabetes outcomes in clinic settings as well as increase implementation of guideline-directed medical therapy, which could reduce clinical inertia.<sup>14,22</sup> Finally, the program coordinator is able to guide the team regarding patient resources. Together, the team is able to remind PCPs about upcoming health maintenance and diabetes education opportunities for patients and strategize about improving medication access.

**TABLE 3.** Impact of Provider Acceptance on HbA<sub>1c</sub><sup>a</sup>

	Unadjusted		Adjusted	
	Coefficient	95% CI	Coefficient	95% CI
Accepted	0.26	-0.07 to 0.58	0.15	-0.13 to 0.44
Post acceptance	-0.33	-0.61 to -0.05	-0.19	-0.53 to 0.15
Accepted*post acceptance	-0.49	-0.85 to -0.12	-0.50	-0.93 to -0.08
Provider referral			0.35	-0.08 to 0.77
Age			-0.04	-0.05 to -0.02
Female			-0.06	-0.31 to 0.20
Race/ethnicity				
Black/non-Hispanic			Reference	
Hispanic			0.68	-0.02 to 1.38
Other/non-Hispanic			-0.47	-1.07 to 0.13
Unknown			-0.08	-0.49 to 0.33
White/non-Hispanic			-0.03	-0.31 to 0.26
High ADI			0.07	-0.25 to 0.39
Dementia			0.17	-0.46 to 0.79
Chronic kidney disease			0.28	-0.02 to 0.57
Congestive heart failure			0.45	-0.09 to 1.00
Coronary artery disease			0.23	-0.10 to 0.55
Hypertension			-0.03	-0.40 to 0.34
Insurance				
Commercial			Reference	
Medicaid			-0.96	-2.44 to 0.53
Medicare			0.31	-0.09 to 0.71
Medicare Advantage			0.49	0.11-0.87
Unknown			0.80	0.20-1.41
Practices				
System-owned			Reference	
Community practices			0.41	-0.86 to 1.69
System-affiliated			0.57	0.20-0.94
Unknown			Omitted due to collinearity	
Exposure date			0.00	0.00-0.00
Constant	8.91	8.67-9.14	30.63	10.07-51.18
N of observations	1023		701	
N of patients	438		295	

ADI, area deprivation index; HbA<sub>1c</sub>, hemoglobin A<sub>1c</sub>.

<sup>a</sup>The table shows the results of generalized estimating equations with a gaussian family, identity link, and exchangeable correlation. The equation produces unadjusted and adjusted outcomes for the difference-in-differences analysis comparing change in HbA<sub>1c</sub> within the rounded population by whether the provider accepted rounds advice. The coefficient of interest is the interaction term on accepted\*post accepted.

Although targeting, timing, and the integration of an interdisciplinary clinical team show promise in supporting PCPs in reducing HbA<sub>1c</sub> levels, the exact pathway for HbA<sub>1c</sub> reduction is not immediately clear from this study. Although providers following IDR advice was associated with an HbA<sub>1c</sub> reduction at 6 months, only half of providers followed advice, and the reduction was not maintained among this group for the full study period. As such, there may be additional, unexamined ways in which rounds might

spur HbA<sub>1c</sub> improvement. For example, having the rounds note, through colleague interactions, may leverage PCPs' professionalism to encourage diabetes management, whether or not the management exactly follows rounds recommendations.<sup>23</sup> Rerounding at 6 months to identify barriers (eg, affordability of medication, adverse effects, medication titration) or a qualitative study discussing perceptions of rounds with PCPs could further illuminate this pathway.

### Limitations

This study has several limitations. First, the patient population included in this analysis is from 1 CIN and may lack applicability to other institutions. However, many health systems are forming networks and may have similar infrastructure to enact such a program. Second, the rounded group included referred patients who had higher HbA<sub>1c</sub> levels and different characteristics overall from the patients identified proactively (both rounded and comparison groups). We mitigated this concern by adjusting for important patient characteristics, such as comorbidities, that are associated with difficulty in attaining glycemic control. Finally, we assessed whether the provider indicated in the patient's chart that they followed rounds recommendations, not whether the patient adhered to them (eg, through filling new medications). These would be difficult to ascertain, and provider recommendation is a reasonable surrogate.

## CONCLUSION

IDR may reduce HbA<sub>1c</sub> by improving access to endocrinology and pharmacist expert advice to PCPs regarding diabetes management. This model is unique because it combines e-consultation with a population-based service through proactive identification of patients with elevated HbA<sub>1c</sub> levels. The small team-based approach provides efficiency in workflow, with 6 to 8 patients per hour vs 2 to 3 in traditional practice; a focused goal on the management of diabetes; and consistency in recommendations with minimal health system burden. Rationale for PCP nonadoption of recommendations may be explored to further assess improvement in workflow for HbA<sub>1c</sub> reduction and barriers to implementation. IDR may provide a sustainable and replicable part of the solution in removing barriers to providing optimal diabetes care. ■

### Acknowledgments

The authors thank Brooke Alhanti and Amanda Brucker for their input on evaluation methods, as well as Andi Endriga for her work retrieving electronic health record data.

**Author Affiliations:** Duke Population Health Management Office (AFH, CLR, PC, JY, PG, SES), Durham, NC; Express Scripts (VLJ), Durham, NC; Division of General Internal Medicine (JY) and Division of Endocrinology, Metabolism, and Nutrition (SES), Department of Medicine, Duke University School of Medicine, Durham, NC; Eshelman School of Pharmacy, University of North Carolina at Chapel Hill (PG), Chapel Hill, NC; Duke University School of Medicine (SW), Durham, NC.

**Source of Funding:** This project was supported by Duke Health's Population Health Management Office as part of its routine quality improvement work.

**Author Disclosures:** Ms Cohen owns shares of Novo Nordisk. Dr Jackson owns stock in several pharmaceutical companies via a mutual fund. Dr Spratt

owns stock in the following companies, which may or may not sell or produce diabetes-related products: Amgen, GE, Johnson & Johnson, Medtronic, Merck, Pfizer, Procter & Gamble, Organon, Viatrix, and Walmart. The remaining authors report no relationship or financial interest with any entity that would pose a conflict of interest with the subject matter of this article.

**Authorship Information:** Concept and design (AFH, CLR, PG, SES); acquisition of data (AFH, CLR, PC, VLJ, PG, SES); analysis and interpretation of data (AFH, PC, VLJ, PG, SES); drafting of the manuscript (AFH, CLR, PC, VLJ, SW); critical revision of the manuscript for important intellectual content (AFH, CLR, JY, PG, SW, SES); statistical analysis (AFH); provision of patients or study materials (CLR, PC, JY, SW); obtaining funding (JY); administrative, technical, or logistic support (PC); and supervision (PG, SES).

**Address Correspondence to:** Susan E. Spratt, MD, Duke Population Health Management Office, 3100 Tower Blvd, Ste 1100, Durham, NC 27707. Email: Susan.Spratt@duke.edu.

## REFERENCES

- Lin J, Thompson TJ, Cheng YJ, et al. Projection of the future diabetes burden in the United States through 2060. *Popul Health Metr*. 2018;16(1):9. doi:10.1186/s12963-018-0166-4
- Dal Canto E, Ceriello A, Rydén L, et al. Diabetes as a cardiovascular risk factor: an overview of global trends of macro and micro vascular complications. *Eur J Prev Cardiol*. 2019;26(suppl 2):25-32. doi:10.1177/2047487319878371
- American Diabetes Association. Economic costs of diabetes in the U.S. in 2017. *Diabetes Care*. 2018;41(5):917-928. doi:10.2337/dci18-0007
- Siegel KR, Ali MK, Zhou XL, et al. Cost-effectiveness of interventions to manage diabetes: has the evidence changed since 2008? *Diabetes Care*. 2020;43(7):1557-1592. doi:10.2337/dci20-0017
- Golden SH, Maruthur N, Mathioudakis N, et al. The case for diabetes population health improvement: evidence-based programming for population outcomes in diabetes. *Curr Diab Rep*. 2017;17(7):51. doi:10.1007/s11892-017-0875-2
- Konyu KJ, Yogasingam S, Lépine J, et al. Quality improvement strategies for diabetes care: effects on outcomes for adults living with diabetes. *Cochrane Database Syst Rev*. 2023;5(5):CD014513. doi:10.1002/14651858.CD014513
- ElSayed NA, Aleppo G, Arora VR, et al; American Diabetes Association. 1. Improving care and promoting health in populations: *Standards of Care in Diabetes—2023*. *Diabetes Care*. 2023;46(suppl 1):S10-S18. doi:10.2337/dc23-S001
- Tricco AC, Ivers NM, Grimshaw JM, et al. Effectiveness of quality improvement strategies on the management of diabetes: a systematic review and meta-analysis. *Lancet*. 2012;379(9833):2252-61. doi:10.1016/S0140-6736(12)60480-2
- Pantalone KM, Misra-Hebert AD, Hobbs TM, et al. Clinical inertia in type 2 diabetes management: evidence from a large, real-world data set. *Diabetes Care*. 2018;41(7):e113-e114. doi:10.2337/dci18-0116
- Khunti S, Khunti K, Seidu S. Therapeutic inertia in type 2 diabetes: prevalence, causes, consequences and methods to overcome inertia. *Ther Adv Endocrinol Metab*. 2019;10:2042018819844694. doi:10.1177/2042018819844694
- Agarwal S, Griffith ML, Murphy EJ, Greenlee C, Boord J, Gabbay RA. Innovations in diabetes care for a better "new normal" beyond COVID-19. *J Clin Endocrinol Metab*. 2021;106(1):e377-e381. doi:10.1210/clinem/dgaa704
- Blecker S, Paul MM, Jones S, et al. A Project ECHO and community health worker intervention for patients with diabetes. *Am J Med*. 2022;135(5):e95-e103. doi:10.1016/j.amjmed.2021.12.002
- Patel PS, Jiang B, Marcelli M, Mediwal SN, Vasudevan MM. Electronic consultation: an effective alternative to in-person clinical care for patients with diabetes mellitus. *J Diabetes Sci Technol*. 2019;13(1):152-153. doi:10.1177/1932296818807472
- Wei ET, Gregory P, Halpern DJ, et al. Impact of a clinical pharmacist on provider prescribing patterns in a primary care clinic. *J Am Pharm Assoc* (2003). 2022;62(1):209-213.e1. doi:10.1016/j.japh.2021.10.007
- Hale GM, Joseph T, Moreau C, et al. Establishment of outpatient rounds by an interprofessional chronic care management team. *Am J Health Syst Pharm*. 2018;75(10):598-601. doi:10.2146/ajhp170106
- Stratton IM, Adler AI, Neil HA, et al. Association of glycaemia with macrovascular and microvascular complications of type 2 diabetes (UKPDS 35): prospective observational study. *BMJ*. 2000;321(7258):405-412. doi:10.1136/bmj.321.7258.405
- Lage MJ, Boye KS. The relationship between HbA<sub>1c</sub> reduction and healthcare costs among patients with type 2 diabetes: evidence from a U.S. claims database. *Curr Med Res Opin*. 2020;36(9):1441-1447. doi:10.1080/03007995.2020.1787971
- Pantalone KM, Misra-Hebert AD, Hobbs TM, et al. The probability of A1C goal attainment in patients with uncontrolled type 2 diabetes in a large integrated delivery system: a prediction model. *Diabetes Care*. 2020;43(8):1910-1919. doi:10.2337/dci19-0968
- Lu H, Holt JB, Cheng YJ, Zhang X, Onufrak S, Croft JB. Population-based geographic access to endocrinologists in the United States, 2012. *BMC Health Serv Res*. 2015;15:541. doi:10.1186/s12913-015-1185-5
- Vigersky RA, Fish L, Hogan P, et al. The clinical endocrinology workforce: current status and future projections of supply and demand. *J Clin Endocrinol Metab*. 2014;99(9):3112-3121. doi:10.1210/jc.2014-2257
- Wasly JH, Rao SK, Essien UR, et al. Initial experience with endocrinology e-consults. *Endocrine*. 2017;55(2):640-642. doi:10.1007/s12020-016-1053-z
- Hwang AY, Gums TH, Gums JG. The benefits of physician-pharmacist collaboration. *J Fam Pract*. 2017;66(12):E1-E8.
- McWilliams JM. Clinician professionalism: "out of the box" thinking to improve care quality. *NEJM Catalyst*. January 7, 2022. Accessed February 12, 2024. <https://catalyst.nejm.org/doi/full/10.1056/CAT.22.0008>

Visit [ajmc.com/link/89518](https://ajmc.com/link/89518) to download PDF