Professional continuous glucose monitoring: A retrospective cohort study comparing one vs two pharmacist-driven encounters

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Abstract:

Introduction: Continuous glucose monitoring (CGM) is a burgeoning approach to measuring glycemia, but the ideal implementation method to optimize outcomes while streamlining clinical procedures is unknown. Furthermore, literature on the impact of pharmacist-driven professional CGM (proCGM) is lacking.

Objectives: The primary objective was to compare the change in hemoglobin A1c from baseline to 6 months after pharmacist-driven proCGM implementation with one vs two proCGM data interpretation encounters. A secondary objective was to describe changes in proCGM report metrics for participants with two encounters.

Methods: In this retrospective single-center study, adults with diabetes identified via Current Procedural Terminology code 95250 or 95251 undergoing pharmacist-driven proCGM implementation with A1c measured within 6 months were included. Patients with additional CGM during the follow-up period were excluded. Patients were categorized as having one pharmacist-driven (RPh1) or two pharmacist-driven (RPh2) encounters for proCGM data analysis for a single sensor. A1c change was analyzed via paired and independent sample *t* tests and analysis of covariance. ProCGM report metrics were analyzed via paired *t* tests.

Results: Sixty-six RPh1 and 56 RPh2 patients were included. Demographics were similar between groups, except RPh1 patients were younger, had higher body mass index, used less bolus insulin, and had less baseline hypoglycemia ($P = .003$, $P = .008$, $P = .002$, and $P = .001$, respectively). Baseline A1c was 8.2% and 8.3% with a mean reduction by 6 months of 0.75% and 0.87% for RPh1 and RPh2, respectively, and a mean follow-up A1c of 7.4% for both groups. Significant A1c improvement was seen in each group compared with baseline ($P < .001$), with no significant difference between groups ($P = .655$). There was a significant rise in time in range from the first to second encounter without a significant increase in time below range ($P < .001$ and $P = .34$, respectively).

Conclusion: Pharmacist-driven proCGM implementation can significantly improve glycemic control, but no difference was seen in A1c lowering between the two-implementation method.

Keywords: blood glucose self-monitoring | clinical pharmacist | clinical pharmacy services | diabetes mellitus

Article:

Continuous glucose monitoring (CGM) is a burgeoning approach to measuring glycemia, but the ideal method of implementation to optimize patient outcomes while streamlining clinical procedures is unknown. CGM technology allows patients and health care providers to monitor a patient's glucose levels through a filament inserted subcutaneously into the interstitial fluid. Glucose trends can be monitored over the course of the entire day with some devices reporting the interstitial glucose level every 5 minutes. Given the extensive knowledge of a patient's glucose trend provided by CGM reports, providers can personalize medication adjustments and lifestyle recommendations for each patient.[1]

CGM devices can be categorized as those for personal use or professional use. Personal CGM devices measure glucose levels that are displayed to the patient; devices may require the patient to retrieve their glucose data by scanning the personal CGM device with a reader, or they may continuously record glucose levels and send alerts to patients for specific glucose thresholds.[2] Literature on the use of personal CGM has demonstrated a significant decrease in hemoglobin A1c from baseline up to 1.1% and compared with self-monitored blood glucose ranging from a 0.4% to 0.6% A1c reduction; additionally, studies have shown increased adherence to monitoring glucose and reduced time spent in hyper- and hypoglycemia.[3-7] Of note, frequency of personal CGM sensor use has been shown to be associated with glycemic improvement.[8]

In contrast, professional CGM (proCGM) data has historically been blinded to the patient and provider during wear until the provider scans the proCGM device with a reader; however, there are newer devices that allow for proCGM devices to be unblinded to the patient.[9] ProCGM devices are usually limited to short-term or intermittent use. Improvement in A1c from baseline to 6 months has varied widely from 0.18% to 1.3% with proCGM.[10-14] Health care providers have utilized the information from proCGM data to implement medication changes in up to 95.9% of patients.[10-12] Evidence to support specific methods of proCGM implementation and frequency of visits, however, is limited. One study demonstrated improved A1c for pharmacist-driven proCGM with in-office interpretation encounters compared with physician-driven proCGM with results and interventions relayed by telephone. However, results comparing one vs two in-office interpretation encounters for a single proCGM sensor were conflicting with some analyses favoring two visits and others showing no difference.[11]

Patient encounters for proCGM can provide reimbursement of $126.87 for Current Procedural Terminology (CPT) code 95250 (patient education, sensor placement and removal, and downloading at least 72 hours of data) and $39.17 for CPT code 95251 (interpretation and analysis of at least 72 hours of data.[12] Pharmacists can bill CPT code 95250 as state laws and scope of practice allow and generate significant revenue for their institutions to support pharmacist salaries. On the other hand, pharmacists are typically unable to bill CPT code 95251 themselves, and this CPT code can only be billed once per month.[15]

While the economic impact of billing CPT codes 95250 and 95251 has been established, this study sought to investigate the clinical impact of providing an additional patient encounter to interpret and analyze proCGM data. Furthermore, although frequent use of personal CGM has

been linked to better glycemic outcomes,[8] similar associations between frequency of encounters for proCGM use have not been established. There is a critical need to further investigate optimal use of proCGM technology, as determining the best implementation method will help to strike the balance between ensuring appropriate allocation of resources while optimizing patient care.

In this study, pharmacists within one physician-owned clinic utilized proCGM devices capable of recording glucose data for 14 days by conducting either one or two office visits to interpret proCGM data from a single sensor and make clinical interventions. This study sought to investigate whether a one-step or two-step pharmacist-driven proCGM implementation method was more effective at improving A1c within a 6-month follow-up period. The primary objective was to compare the change in hemoglobin A1c from baseline to 6 months for participants with one vs two interpretation visits. Secondary objectives were to: (a) Describe and compare interventions made for participants with one vs two interpretation visits, and (b) Describe changes in average interstitial glucose and time in range, hyperglycemia, and hypoglycemia from the first to the second encounter for the subset of participants with two interpretation encounters and CGM reports available in the electronic medical record.

1. Methods

1.1. Clinical procedures and study device

The setting of this study was an outpatient clinic with internal medicine, endocrinology, and clinical pharmacy services. Three clinical pharmacists working under a collaborative practice agreement could manage chronic disease states, including diabetes, after a referral from a physician within the practice. The FreeStyle Libre Pro (Abbott Diabetes Care, Alameda, California) was used in the clinic, which is a proCGM system approved by the Food and Drug Administration in September 2016. This device records interstitial glucose for up to 14 days, and health care professionals can retrieve data multiple times during the sensor's 14-day duration of use.

Pharmacist utilization of proCGM at this facility has been previously reported.[16] In brief, pharmacists could place and activate a proCGM sensor for a patient during an in-person visit, followed by two visits to retrieve and interpret the sensor's data and make clinical interventions as deemed appropriate. As each sensor could collect glucose data over a period of 14 days, the first interpretation visit typically occurred 1 week after sensor placement with the second approximately 2 weeks after placement. The pharmacist would interpret the reports, print a copy for the patient, and review the data with the patient. During the second encounter, emphasis was placed on reviewing the data with the patient with respect to the interventions made at the previous visit. Participants following the above procedures were categorized as “RPh2” for the study.

Although the protocol guiding care included the two visits for CGM data interpretation and interventions,[16] it was found in a previous study that many patients only had one visit.[11] Although it was not reported why patients had only one visit, factors such as sensor loss, patient preference or time constraints, and patient loss to follow-up likely played a role. It is also possible that the pharmacist may have preemptively decided to only have one follow-up visit. Participants with one pharmacist-driven encounter for data interpretation were categorized as “RPh1” for this study.

1.2. Study design and participants

This was a retrospective single-center study. Electronic medical records were queried for patients who had CGM-specific CPT code 95250 or 95251 billed between September 26, 2016 and August 1, 2019. Patients were included if they were 18 years of age or older, had a diagnosis of diabetes, had proCGM implemented by a pharmacist with data available for interpretation (defined as at least 72 hours of data) and had A1c measured within 6 months of proCGM implementation. Patients with additional CGM use (professional or personal) during the six-month follow-up period were excluded. Participants were categorized as having one pharmacist-driven (RPh1) or two pharmacist-driven (RPh2) encounters for CGM data analysis for a single proCGM sensor. Data collection included demographics, CGM data, CGM-associated interventions, and A1c during the six-month follow-up period.

1.3. Statistical analysis

Comparison of demographic characteristics and baseline measurements were made using *t* tests for quantitative variables and chi-squared tests for categorical variables. Analysis of covariance models were used to compare RPh1 and RPh2 groups on six-month follow-up A1c, controlling for baseline A1c. The last A1c measurement within the six-month follow-up period was used for analysis. Age, body mass index, baseline bolus insulin usage, and baseline hypoglycemia were considered as additional covariates due to differences in these parameters between groups, but they were not found to affect primary outcome results ($P = .25$) and were, therefore, not included in the model.

Clinical interventions were recorded for each encounter (ie, for the single RPh1 encounter and for both RPh2 encounters) and categorized as pharmacological or nonpharmacological. Data regarding pharmacological interventions captured the medication class and type of adjustment (ie, initiate, increase dose, discontinue, decrease dose, change timing of administration, or change formulation or delivery). A participant may have experienced changes to multiple medication classes at a single encounter or multiple types of changes per medication class changed. Nonpharmacological interventions included lifestyle interventions (diet, exercise, or weight loss) and patient education (hypoglycemia management, medication administration, or medication adherence).

For RPh2 patients with both CGM reports viewable in the electronic medical record, the following changes from the first to the second CGM report for a single proCGM sensor were analyzed via paired *t* tests: average interstitial glucose, percentage of time in range (80-140 mg/dL), percentage of time below range (<80 mg/dL), and percentage of time above range (>140 mg/dL).

A power analysis was conducted and the study was powered to detect a mean difference in A1c between groups of 0.5% or larger using 80% power, a 5% significance level, and a SD estimate of 1.35% based on previous literature.[11]

This study was approved by the High Point University Institutional Review Board (protocol number 201806-710). Due to the retrospective nature of the study and minimal risk to participants, requirement of informed consent was waived.

2. Results

2.1. Participants

One-hundred twenty-two instances of pharmacist-driven proCGM implementation were included in this study (Figure 1). Overall, the average age was 66.4 years, body mass index 32.5 kg/m^2, baseline A1c 8.2%, and a total daily dose of insulin of 36.2 units. The majority of patients were female (54.1%) and white (68.0%) and had diagnoses of type 2 diabetes mellitus (95.9%), hypertension (86.9%), and hyperlipidemia (87.7%).

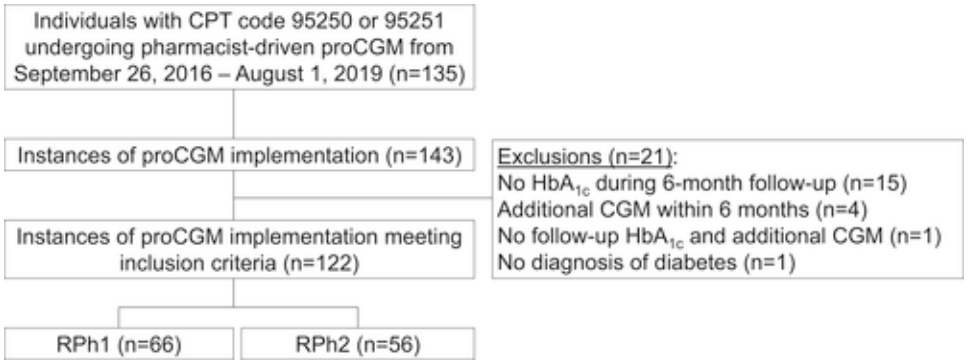

Figure 1. Inclusion flowchart. CPT, current procedural code; HbA$_{1c}$, hemoglobin A$_{1c}$; proCGM, professional continuous glucose monitoring

There were 66 cases of pharmacist-driven proCGM in the RPh1 group and 56 RPh2. Baseline characteristics for each group are presented in Table 1. Demographics were similar between groups, except RPh1 patients tended to be younger (63.7 vs 69.6 years old, $P = .003$), have a higher body mass index (34.1 vs 30.5 kg/m^2, $P = .008$), and use less bolus insulin (6.0 vs 16.0 units, $P = .002$). Lastly, the percentage of patients with documented hypoglycemia at baseline was 16.7% for RPh1 patients and 25.0% for RPh2 patients ($P = .001$).

Table 1. Baseline Characteristics (n = 122)

	RPh1 (n = 66)	RPh2 (n = 56)	*P*-value
Age (years) [a]	63.7 (11.9)	69.6 (9.0)	0.003 *
Male sex [b]	30 (45.5)	26 (46.4)	0.98
Race [b]			
Am. Indian & Alaska Nat	1 (1.5)	0 (0.0)	
African American	18 (27.3)	13 (23.2)	0.61
White	45 (68.2)	38 (67.9)	0.97
Hispanic	1 (1.5)	0 (0.0)	
Other	0 (0.0)	5 (8.9)	
Unknown	0 (0.0)	0 (0.0)	
Ethnicity [b]			
Hispanic or Latino	1 (1.5)	1 (1.8)	
Not Hispanic or Latino	65 (98.5)	53 (94.6)	0.30
Unknown	0 (0.0)	2 (3.6)	
Hemoglobin A1c (%)[a]	8.2 (1.5)	8.3 (1.6)	0.62
Body mass index (kg/m^2)	34.1 (6.8)	30.5 (7.5)	0.008*

[a]

Medical conditions [b]			
Type 1 diabetes mellitus	2 (3.1)	2 (3.6)	
Type 2 diabetes mellitus	64 (97.0)	53 (94.6)	0.52
Unspecified diabetes	0 (0.0)	1 (1.8)	
Hypertension	59 (89.4)	47 (83.9)	0.37
Hyperlipidemia	59 (89.4)	45 (85.7)	0.54
Coronary artery disease	14 (21.2)	17 (30.4)	0.25
Myocardial infraction	6 (9.1)	8 (14.3)	0.37
Cerebrovascular accident	3 (4,5)	4 (7.1)	0.54
Neuropathy	8 (12.1)	14 (25.0)	0.07
Nephropathy	20 (30.3)	19 (33.9)	0.67
Retinopathy	1 (1.5)	3 (5.4)	
Medications [b]			
Metformin	38 (57.6)	30 (53.6)	0.66
Sulfonylurea	17 (25.8)	14 (25.0)	0.92
SGLT2 inhibitor	11 (16.7)	9 (16.1)	0.93
DPP-IV inhibitor	14 (21.2)	7 (12.5)	0.20
Thiazolidinedione	3 (4.5)	5 (8.9)	0.33
GLP-1 receptor agonist	14 (212)	11 (19.6)	0.83
Long-acting insulin	28 (42.4)	32 (57.1)	0.11
Immediate-acting insulin	1 (1.5)	0 (0.0)	
Short-acting insulin	0 (0.0)	0 (0.0)	
Rapid-acting insulin	12 (18.2)	18 (32.1)	0.07
Mixed insulin	3 (4.5)	3 (5.4)	0.84
Insulin pump	0 (0.0)	2 (3.6)	
Daily dose of basal insulin (units) [a]	22.4 (39.5)	30.8 (30.4)	0.20
Daily dose of bolus insulin (units) [a]	6.0 (14.6)	16.0 (24.1)	0.002*
Total daily insulin dose (units)[a]	28.0 (48.1)	45.5 (49.7)	0.06
Documented hypoglycemia [b]	11 (16.7)	14 (25)	0.001 *

Abbreviations: DPP-IV, dipeptidyl peptidase 4; GLP-1, glucagon-like peptide-1; RPh1, one pharmacist-driven encounter; RPh2, two pharmacist-driven encounters; SGLT2, sodium-glucose cotransporter-2.

* Statistically significant difference between groups with $P < .05$.

[a] Data expressed as mean (SD)

[b] Data expressed as *n* (%)

2.2 Change in A1c

Baseline A1c was 8.2% and 8.3% with a mean reduction from baseline to 6 months of 0.75% and 0.87% for RPh1 and RPh2, respectively, with both groups achieving a mean follow-up A1c of 7.4%. Significant improvement in A1c was seen in each group compared with baseline ($P < .001$), but there was no significant difference between groups ($P = .655$) (Table **2**). When stratified by baseline A1c above vs below 8%, there were no statistically significant differences between groups; however, when grouped according to baseline A1c, there were trends favoring RPh2 for a baseline A1c >8% and favoring RPh1 for a baseline A1c <8%. The higher the baseline A1c, the greater the A1c reduction that was seen between the RPh2 compared with the RPh1 group, although no value reached statistical significance (Table **3**). Differences between groups in age, body mass index, baseline bolus insulin usage, and baseline hypoglycemia did not affect results when included in statistical modeling. Mean time from baseline to the follow-up A1c measurement used for analysis was 114 ± 44 days for RPh1 and 89 ± 40 days for RPh2.

Table 2. Mean decrease in post-implementation hemoglobin A1c (%)

	Baseline A1c mean (SD)	**Post-implementation A1c, mean (SD)**	**Mean decrease in A1c (95% CI)**	***t*-statistic (df)**	***P*-value**
Baseline comparison					
RPh1 (n= 66)	8.16 (1.52)	7.40 (1.27)	0.75 (0.43,1.08)	4.59 (65)	<.001
RPh2 (n= 56)	8.30 (1.56)	7.43 (1.09)	0.87 (0.49,1.24)	4.59 (55)	<.001
Group difference					
RPh2-RPh1			0.11 (-0.38, 0.60)	0.45 (1.20)	.655

Abbreviations: df, degrees of freedom; RPh1, one pharmacist-driven encounter; RPh2, two pharmacist-driven encounters.

Table 3. Comparison of mean follow-up A1c difference between groups according to baseline A1c levels

Baseline A1c (%)	**Mean A1c difference as RPh2-RPh1 (%)**	**95% confidence interval**	***P*-value**
5	.40	-0.46, 1.25	.37
6	.26	-0.39, 0.92	.42
7	.13	-0.34, 0.61	.58
8	.00	-0.37, 0.38	.99
9	-.13	-0.54,0.28	.54
10	-.26	-0.82,0.30	.36
11	-.39	-1.15,0.37	.31
12	-.52	-1.50,0.46	.29

Abbreviations: RPh1, one pharmacist-driven encounter; RPh2, two pharmacist-driven encounters.

2.3. Clinical interventions

The number of pharmacological interventions made during proCGM interpretation encounters was 1.23 for RPh1 participants, 1.38 for RPh2 participants at the first encounter, and 1.13 for

RPh2 participants at the second encounter (Figure **2**). The percentage of participants experiencing any intervention (pharmacological or nonpharmacological) was 90.9% for RPh1, 94.6% for RPh2 at the first encounter, and 87.5% for RPh2 at the second encounter. The percentage of patients with pharmacological interventions was 71.2% for RPh1, 83.9% for RPh2 at the first encounter, and 66.1% for RPh2 at the second encounter. The percentage of participants experiencing medication decreases was 31.8% for RPh1 and 57.1% for RPh2, which was statistically significant between groups ($P = .01$). Long-acting insulin was the medication type most commonly changed, diet was the most common lifestyle intervention, and hypoglycemia counseling was the most common patient education provided; this was consistent for the RPh1 encounter and both RPh2 encounters.

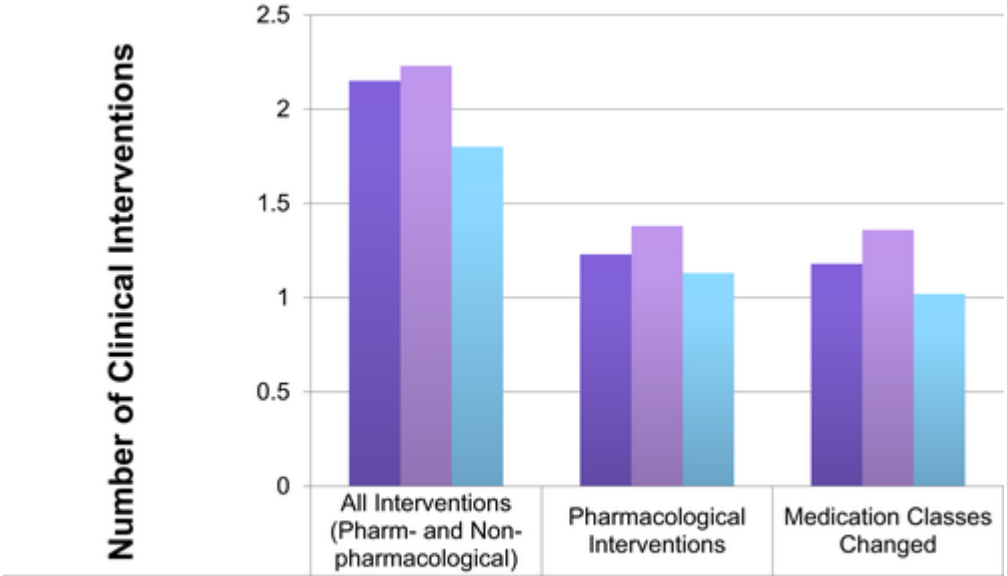

Figure 2. Mean number of overall interventions, pharmacological interventions, and medication classes changed, analyzed for individual encounters

2.4. Continuous glucose monitoring report data

CGM report data metrics were compared from the first to the second encounter for RPh2 participants, revealing a statistically significant decrease in average interstitial glucose and time above range defined as glucose greater than 140 mg/dL ($P < .001$ for both), a statistically significant increase in time in range defined as glucose 80-140 mg/dL ($P < .001$), and no significant change in time below range defined as glucose less than 80 mg/dL ($P = .34$) (Table **4**).

Table 4. CGM report data for RPh2 patients with data available in the electronic medical record (n = 50)

	Measurement at first encounter, mean (SD)	**Measurement at second encounter, mean (SD)**	**Difference mean (95% margin of error)**	***P*-value**
Average interstitial glucose (mg/dL)	173.5 (58.2)	157.6 (53.3)	-15.9 ± 6.9	<.001 [a]

Time in range (80-140 mg/dL) (%)	40.0 (26.3)	47.0 (25.2)	7.0 ± 3.0	<.001 [a]
Time above range (>140 mg/dL) (%)	53.0 (29.8)	44.7 (27.8)	-8.2 ± 3.7	<.001 [a]
Time below range (>80md/dL) (%)	7.0 (10.3)	8.3 (10.7)	1.3 ± 2.7	.34

Abbreviations: CGM, continuous glucose monitoring; RPh2, two pharmacist-driven encounters
[a] Statistical significance

3 Discussion

Results of this study advocate that pharmacist-driven proCGM implementation can significantly improve glycemic control, and both implementation types appear to be similarly effective at lowering A1c during a six-month follow-up period. As these results failed to show a statistically significant difference in A1c change between groups, this study may suggest that clinical services could be streamlined to reduce unnecessary follow-up visits by following the RPh1 protocol rather than RPh2. On the other hand, due to the differences between groups in baseline characteristics (namely age, body mass index, bolus insulin use, and baseline hypoglycemia), the data could be applied to clinical practice by prioritizing which patients receive two follow-up visits in alignment with RPh2 patient demographics. For example, patients who are older, taking higher doses of bolus insulin, and/or have a history of hypoglycemia could be purposefully scheduled to follow the two-step process. Additionally, patterns in the data suggest that patients with baseline A1c >8% may see greater benefit from the RPh2 procedures.

With regard to differences between groups in baseline characteristics, it is important to discuss the implications of these differences and how they may have affected results. As RPh2 participants were statistically significantly older than those in the RPh1 group, it is possible that RPh2 participants had lower A1c targets than their younger counterparts and received more conservative interventions, possibly masking a true difference between implementation methods due to lower glycemic targets in one group vs the other. This could be further exacerbated by the higher rate of baseline hypoglycemia in the RPh2 group. The higher bolus insulin requirement in the RPh2 group could also indicate more long-standing disease that might be more difficult to treat.

Slightly more interventions were made at the first RPh2 encounter than at the single encounter for RPh1 participants, while fewer interventions were made at the second visit for RPh2 participants than at the other visits. Similar trends were seen when reporting the percentage of participants with interventions, except that there was a higher percentage of patients with a decrease in medication usage at the second RPh2 encounter than at the RPh1 encounter, which was statistically significant between groups. As RPh2 participants were older than RPh1 participants and had more baseline hypoglycemia, it is possible that these characteristics contributed to less intensive medication adjustments and/or more de-prescribing during RPh2 encounters compared with the RPh1 encounter, as mentioned above.

Although a difference between groups in follow-up A1c was not found, pharmacists were able to increase time in range, decrease average glucose, and decrease time in hyperglycemia without significantly increasing hypoglycemia for participants in the RPh2 group. With the plethora of data that can be collected as a result of CGM technology, there is increasing support for the use of the ambulatory glucose profile in monitoring a patient's diabetes control. It has long been recognized that there are various limitations to the interpretation of A1c values.

Certain conditions such as anemia, pregnancy, and changes in the rate of erythrocyte turnover may lead to A1c values that do not represent the true level of glucose control. Additionally, A1c is not able to capture fluctuations in blood glucose throughout the day, nor the occurrence of hypoglycemia.[17] Furthermore, the 2021 American Diabetes Association guidelines have identified the time in range (defined as the percentage of readings and time the glucose level is 70-180 mg/dL) as being associated with the risk of microvascular complications, and the time outside of range as a useful parameter for reevaluating a patient's treatment regimen.[18] Literature supports the notion that acute excursions of glucose around a mean value, including hyper- and hypoglycemia, are significant risk factors for neuropathy and retinopathy. These excursions may help to explain why patients with the same A1c value may experience differences in the presentation of microvascular complications.[19, 20] Although CGM reports used in this study defined time in range as glucose values between 80 mg/dL and 140 mg/dL, it would be expected that if the definition was expanded to include values 70-180 mg/dL, then the amount of time spent in range would see an even greater increase during the second RPh2 encounter.

While the majority of participants were utilizing proCGM due to hyperglycemia, it is important to note that 16.7% of patients in the RPh1 group and 25.0% of patients in the RPh2 group had documented hypoglycemia at baseline. Unsurprisingly, participants in the RPh2 group did experience a significantly greater amount of de-prescribing compared with the RPh1 group. This may also have been related to the slight increase in time below range at the second encounter for RPh2 participants. This, again, highlights the importance of the information gleamed from the more comprehensive evaluation of a patient's glycemic control available through CGM use that may not be captured by measuring A1c and/or fingerstick glucose values alone, and the trade-off of a less dramatic decrease in A1c to reduce the risk of hypoglycemia.

This study builds upon previously published literature by increasing the sample size, expanding the population, and adding CGM report data. Compared with the study by Sherrill and colleagues, the current study found a more modest, although still statistically significant difference in A1c reduction from baseline, with the previous literature showing a decrease of 1.0% and 1.3% in the RPh1 and RPh2 groups, respectively.[11] The difference in A1c reduction between the two studies may be a result of differences in inclusion criteria, as the previous study excluded patients with an A1c less than 7% and did not consider efforts of de-prescribing. The expanded inclusion criteria in the current study demonstrates that even patients with a lower baseline A1c experienced clinical interventions at a similar rate as those with higher baseline A1c values with approximately 93% experiencing any intervention in this study compared with approximately 96% in the previous study. Likewise, the total number of interventions made per patient in this study was similar with 2.15, 2.23, and 1.80 in the RPh1, first RPh2 encounter, and second RPh2 encounter, respectively, compared with 2.34, 2.31, and 1.80 based on previous data.[11] The number of pharmacologic interventions and medication classes changed were also similar.[11] Lastly, this study adds CGM report data, which further emphasizes the positive effects of these types of interventions and is in line with new guidance from the American Diabetes Association to utilize time in range as an important measure of glycemic control, as mentioned above.[18]

Similar to previous findings, the difference between the two groups did not achieve statistical significance despite the expanded sample size.[11] However, this research may provide valuable insight to clinicians regarding which patients may achieve greater benefit from more intensive utilization of CGM technology. As previous literature did find a difference between a two-step in-office pharmacist-driven CGM implementation compared with a one-step telephonic

physician intervention, this may further emphasize the difference in A1c seen between the pharmacist and physician group as being attributed more to the method of communication (ie, relaying CGM data in person vs telephone) rather than the number of CGM visits.

4. Limitations

The main limitations of this study include the retrospective design and potential selection bias. Several factors may have affected whether participants had one vs two visits, and, unfortunately, these were not controlled in the study due to its retrospective design. The retrospective design and relatively small number of proCGM occurrences also prohibited the ability to directly match patients between the two groups. It is noted, however, that attempts were made to compare baseline characteristics and discuss differences between groups, as well as to include additional covariates in the statistical analysis to account for differences between groups. An additional limitation of this study was that time in range was defined differently than the currently accepted standard of 70-180 mg/dL, which hinders a direct comparison to other studies.

5. Conclusions

In summary, this study shows that while pharmacist-driven proCGM implementation is associated with improved glycemic control, a two-step intervention did not result in a significantly lower A1c compared with a one-step intervention. This suggests that a one-step intervention may be sufficient for many patients, and these data can be used to help maximize pharmacist workflow related to CGM devices. Additional prospective studies may be beneficial to better understand the nature of differences between the two groups.

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