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# Factors associated with attendance at a pharmacist-led group diabetes self-management education class and impact on health outcomes

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## ABSTRACT

**Background:** Group education has demonstrated benefits among people with diabetes, including reduced A1C and improved self-monitoring practices. Despite this, attendance rates are low for a variety of reasons, including lack of understanding of potential benefits among patients.

**Objectives:** The pharmacist-led diabetes self-management education program at a community hospital has low attendance. This project assesses characteristics associated with attendance and compares outcomes among attendees and non-attendees.

**Methods:** Retrospective data was collected between July 2022 and December 2023. Variables included: age, sex, class attendance, pre- and  $\geq 90$ -day post-class A1C, pre- and post-class BMI, attending pharmacist-led clinic prior to scheduled class, social determinants of health screening survey responses, and diagnosis of depression or anxiety.

**Results:** 103 patients were identified. 53 % attended at least one class out of a series of four. Attendance at the pharmacist-led diabetes clinic (70 % among attendees versus 30 % among non-attendees,  $p < 0.001$ ) was associated with attendance. Age, gender, concurrent mental health diagnoses (depression and anxiety), and SDOH related needs were not associated with attendance. Baseline A1C was similar for attendees and non-attendees (9.6 vs. 9.7 %, respectively). Post-class A1C was 7.4 % for attendees of at least one class and 8 % for non-attendees. Patients who attended all four classes achieved a mean A1C  $< 7$  %.

**Discussion:** There are many factors that lead to lack of engagement with group education for diabetes. Referral to group education by a pharmacist who has established rapport with the patient and can speak to specific details about benefits of the classes may improve attendance at diabetes group education.

## 1. Introduction

An estimated 38 million Americans have diabetes; approximately 90–95 % of these people are diagnosed with type 2 diabetes.<sup>1</sup> Diabetes is the eighth most common cause of death in the United States and is a major contributing factor for cardiovascular disease, retinopathy, neuropathy, ulceration or lower limb amputation, and nephropathy.<sup>1</sup> The direct and indirect costs of diabetes are estimated at over \$400 billion annually.<sup>2</sup> Adequate glycemic control requires patients to actively participate in the self-management of diabetes and comply with medication regimens. Effective patient education is a key factor in diabetes treatment to reduce long-term adverse health outcomes and downstream healthcare costs associated with poor diabetes control. Benefits of diabetes self-management education (DSME) are well known,

but despite this, a low percentage of individuals with diabetes participate.<sup>3</sup>

The positive health benefits of group-based DSME have previously been explored extensively, and include significant reduction in A1C,<sup>4–9</sup> blood pressure,<sup>8</sup> and weight.<sup>9</sup> A study examining the impact of DSME found increased uptake of recommended diabetes management practices such as monitoring blood glucose daily, getting regular physical activity, and avoidance of smoking. Patients also had better adherence to standards of care, such as vaccination against pneumonia and annual eye and foot exams.<sup>10</sup> One cohort study found patients participating in group DSME compared to individual counseling sessions were less likely to have emergency room visits or hospitalizations for hypoglycemia or hyperglycemia.<sup>11</sup> Significant improvements in adherence to diabetes medication have also been demonstrated through group DSME.<sup>12</sup> A

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meta-analysis concluded that group-based education has similar efficacy compared to individual education on improving patients' A1C.<sup>13</sup>

Despite the apparent benefits of group DSME, Mendez et al. reported that among over 60,000 patients, only 52 % reported ever receiving self-management education.<sup>10</sup> Demographic factors have been associated with non-attendance, such as people identifying as Hispanic/ Latinx or male gender.<sup>14</sup> Rurality and advanced age are other influential factors.<sup>15</sup> Education is also a pertinent factor, as patients with a high school education or less were less likely to engage with DSME. Patients with a lower socioeconomic status, as indicated by annual income, or lacking health insurance, were also less likely to attend DSME.<sup>15</sup> Other patient-reported factors for non-attendance include scheduling barriers, lack of transportation, time constraints due to work or other obligations, and lack of perceived need for services.<sup>16,17</sup> Additionally, a report from the Maine Department of Health and Human Services noted that providers may lack information about what DSME entails, making it difficult to describe benefits to patients when making referrals.<sup>18</sup>

Specific to pharmacist interventions, previous studies have found pharmacist driven DSME classes reduce diabetes distress,<sup>19</sup> facilitate training for student pharmacists,<sup>20</sup> and improve diabetes control.<sup>21</sup> However, it remains unclear if interactions between pharmacists and patients can enhance engagement in DSME classes relative to peer, non-pharmacist clinicians within the same healthcare system. Given the identified barriers in the literature, the authors hypothesized that patient participation in a pharmacist-led medication management clinic prior to referral to the health system's pharmacist-led group DSME classes would significantly increase participation.

## 2. Materials and methods

### 2.1. Study design

This was a retrospective cohort study at a single regional medical center. The study was approved by the medical center's institutional review board. The requirement for informed consent was waived due to the retrospective and observational nature of the study, which posed minimal risk to participants. Patients referred to a pharmacist-led group DSME class were evaluated in this study.

The ambulatory care pharmacy department provides free group DSME classes for patients of the organization's physician network. Classes are led by an ambulatory care pharmacist or a first-year resident pharmacist with supervision. The group DSME series consists of one, two-hour session per week for four weeks. Each session focuses on one of the following topics: medications and general knowledge, meal planning, movement and mindset, and monitoring and health outcomes (Appendix 1). The curriculum utilizes active learning strategies to engage and empower patients.<sup>22</sup> Classes are offered in the afternoon and evening, in person and virtually, to allow flexibility and accessibility for patient scheduling. Patients receive a reminder phone call the day before the class from the clinic staff. It is permitted to miss a class and attend the missed class during the subsequent series.

### 2.2. Study participants and setting:

Patients included for analysis were referred to group DSME classes by their primary care physician within the health system's physician network. Alternatively, the clinical pharmacist could initiate the referral if the patient was first referred by the primary care physician to be seen in the pharmacist-led medication management clinic for diabetes. Patients who participated in the pharmacist-led clinics were educated on the content and purpose of the classes and persuaded to attend through motivational interviewing and discussion of benefits specific to the individual patient's needs. All patients were at least 18 years of age and diagnosed with either Type 1 or Type 2 diabetes. Patients who self-identified as preferring Spanish for their primary language were excluded, and instead referred to culturally tailored group DSME classes,

which are also offered within the health system. Patients who were referred to group DSME but never scheduled were excluded from this analysis. There could be various reasons for not scheduling, including inability to contact the patient to schedule, patient unavailability to attend in person or virtually at the offered times, or patient refusal for other reasons. Those factors could not be assessed individually. Only first-time attendances or planned attendances were included in this analysis; patients' subsequent attendances, if present, were excluded.

### 2.3. Data sources

An electronic medical record (EMR) report was used to generate a list of patients who were referred to and scheduled for group DSME classes between July 1, 2022 and December 31, 2023. The timeline for data collection was decided based on the health system changing to a new EMR, thus making it difficult to identify patients who were scheduled for classes, but did not attend, before this timeframe. Manual chart review was used for data collection.

### 2.4. Variables collected

The following variables were collected for this analysis: age (years), gender (as reported by patient in the EMR), pre-class insurance type, number of classes out of the total series of four attended, number of diabetes medications before and at least 90 days after projected class completion, total number of pre-class chronic medications, A1C before and at least 90 days after projected class completion, attendance at pharmacist-led medication management clinic prior to projected completion of classes, social determinants of health (SDOH) screening results, concurrent diagnoses of depression and anxiety (using International Classification of Diseases [ICD] codes from the EMR), and body mass index (BMI) before and at least 90 days after projected class completion. Follow-up data on diabetes medication use was assessed with post-class A1C to capture any changes to a patient's diabetes regimen resulting from the updated A1C.

Attendance at pharmacist-led medication management clinic indicates that a patient's primary care physician made a referral to the ambulatory pharmacy team for diabetes medication management. This involves participation in a collaborative practice agreement for diabetes that allows the clinical pharmacist to initiate or discontinue medications or monitoring devices, change doses of medications, and order laboratory monitoring or perform point-of-care testing as indicated, in addition to providing diabetes-related education.

Screening results for SDOH were recorded from the EMR and included questions about access to food, financial ability to pay for utilities and other essential bills, housing and transportation stability, social isolation, and an acute needs assessment for priority referral to community health worker. This survey was created by the health system through consideration of validated screening tools for SDOH.<sup>23</sup> It is assessed annually (depending on frequency of contact with the health system) and more frequently if needs are identified.

### 2.5. Statistical analysis

The Chi-square test of independence was used to assess differences between attendees and non-attendees for categorical variables. Unpaired *t*-tests were used to assess differences between attendees and non-attendees for continuous variables. Repeated measures mixed analysis of variance (ANOVA) was used to assess within-group change in A1C pre- and post- referral to diabetes group education. The alpha level of significance was set to 0.05 for this study.

## 3. Results

A total of 103 patients were included in this analysis; 55 patients (53 %) attended at least one diabetes education class. Among factors

evaluated for participation in the pharmacist-led group DSME classes, demographic information such as age, gender, concurrent mental health diagnoses (depression and anxiety), and SDOH related needs were not significantly associated with attendance at group DSME classes in this analysis. However, attendance at the pharmacist-led medication management clinic for diabetes (70 % among attendees versus 30 % among non-attendees,  $p < 0.001$ ) was a statistically significant factor associated with attendance to at least one session of the group DSME classes.

The average age of the overall cohort was 53 years (SD = 13 years) and did not differ significantly between attendees and non-attendees (Table 1). There were 3 patients diagnosed with Type 1 diabetes (1 was a non-attende), while 100 patients (97 %) were diagnosed with Type 2 diabetes. Patients were mostly female (53 %); differences in gender were not identified regarding attendance. Of the overall cohort of patients, 48 (47 %) did not attend any diabetes education sessions. Nine patients (9 %) attended one class, 12 patients (12 %) attended two classes, 10 patients (10 %) attended three classes, and 24 patients (23 %) attended all four classes.

The mean baseline A1C was 9.62 % (SD = 2.42 %), and mean follow-

up A1C was 7.64 % (SD = 2.05 %) for the overall cohort. Baseline A1C was comparable between the attendees and non-attendees: approximately 9.7 % among non-attendees and 9.6 % among attendees ( $p = 0.78$ ). Mean follow-up A1C was 7.97 % (SD = 2.09 %) among non-attendees compared to 7.37 % (SD = 1.99 %) among attendees ( $p = 0.17$ ). Patients attending all four classes started out with a lower baseline A1C of approximately 9 % and achieved the American Diabetes Association recommended A1C goal<sup>24</sup> of  $<7$  % with a mean post-class A1C of 6.9 %. Baseline BMI was higher among non-attendees at approximately 37.68 kg/m<sup>2</sup> (SD = 10.36) compared to 35.66 kg/m<sup>2</sup> (SD = 8.62) among attendees, although this was not a significant difference. Post-referral BMI decreased to 34.55 kg/m<sup>2</sup> (SD = 8.30) among attendees but remained close to baseline at 37.55 kg/m<sup>2</sup> (SD = 10.52) among non-attendees ( $p = 0.13$ ).

The repeated measures mixed ANOVA showed there was a statistically significant difference in mean A1C across the whole cohort between the first A1C and follow up A1C ( $F(1,90) = 64.13, P < 0.001$ ). However, a significant difference was not detected between the attendee and non-attende group ( $F(1,90) = 0.42, p = 0.52$ , partial eta squared = 0.005) (Fig. 1). Authors noted a trend of decreasing A1C with an increasing number of classes attended (Table 2). However, the cohort of patients attending three classes broke from this trend.

**Table 1**

Demographic characteristics.

	Total, N = 103  N ± SD	Non- attende, n = 48  N ± SD	Attendance at one or more classes, n = 55  N ± SD	P value
Age, years	53 ± 13	52 ± 13	53 ± 14	0.79
Gender, N (%)				
Male	48(47)	23(48)	25(45)	0.80
Female	55(53)	25(52)	30(55)	
Mental health diagnoses, N (%)				
Depression	22(21)	12(25)	10(18)	0.40
Anxiety	21(20)	7(15)	14(26)	0.17
Specific SDOH needs (pre-class, identified by patient self-report), N (%)				
Finance	38(37)	16(33)	22(40)	0.76
Transportation	10(10)	4(8)	6(11)	0.81
Food	28(27)	13(27)	15(27)	0.64
Housing	6(6)	2(4)	4(7)	0.60
Health literacy	11(11)	7(15)	4(7)	0.13
Social isolation	22(21)	12(25)	10(18)	0.17
Access to healthcare	6(6)	1(2)	5(9)	0.16
Any SDOH need	53(52)	23(48)	30(55)	0.84
Health Insurance Type, N (%)				
Medicare	19(18)	7(15)	12(22)	0.50
Medicaid	27(26)	14(29)	13(24)	
Medicare/Medicaid dual	14(14)	9(19)	5(9)	
Commercial/ marketplace	37(36)	16(33)	21(38)	
Unknown/uninsured	6(6)	2(4)	4(7)	
Pharmacist clinic attendance, N (%)				
Pre-class	53(52)	16(30)	37(70)	<0.001
Health outcomes, mean ± SD				
Pre-class A1C	9.62 ± 2.42	9.69 ± 2.46	9.55 ± 2.41	0.78
Post-class A1C	7.64 ± 2.05	7.97 ± 2.09	7.37 ± 1.99	0.17
Pre-class BMI	36.60 ± 9.48	37.68 ± 10.36	35.66 ± 8.62	0.28
Post-class BMI	35.86 ± 9.40	37.55 ± 10.52	34.55 ± 8.30	0.13
Medication use, mean ± SD				
Mean number of diabetes medications, pre-class	2 ± 1	2 ± 1	2 ± 1	0.47
Mean number of diabetes medications, post-class	2 ± 1	2 ± 1	2 ± 1	0.21
Mean number of total medications, pre-class	9 ± 5	9 ± 6	9 ± 5	0.80

Describes demographic characteristics and health outcomes by cohort (total cohort, attendees, non-attendees).

#### 4. Discussion

Key factors associated with diabetes control include adherence to medication management and following recommended lifestyle changes. Patient participation in targeted DSME classes that provide rigorous and structured education on how to manage diabetes and enhance quality of life has been proven to significantly decrease A1C levels, improve adherence to recommended lifestyle changes, and increase uptake of recommended standards of care.<sup>4-9,25</sup> However, despite known benefits, exposure remains low as it has been estimated approximately half of patients participate in DSME.<sup>10</sup> This study found that targeted education about group DSME classes by a pharmacist was significantly associated with patient participation when compared to patients who were referred to the classes without exposure to the pharmacist education.

A small survey of patients who had received DSME found that healthcare provider-related factors affected patients' willingness to ask questions about improving control of diabetes. For example, several patients stated that their primary care physician or pharmacist was too busy to spend time providing additional disease-related education.<sup>26</sup> This perceived lack of willingness to provide education may also be a barrier to patient uptake of DSME. In the pharmacist-led medication management clinic, ample time is spent identifying a patient's knowledge deficits, perceived areas of need, and self-identified health-related goals. In this setting, where pharmacists are focused on provision of clinical services, patients may perceive greater accessibility and willingness to provide education, which could facilitate attendance at the pharmacist-led group DSME classes.

The findings from this study highlight the importance of providing patients with specific details about goals and benefits of DSME, and explanation of what can be expected during each class, a previously identified barrier to participation.<sup>17,18</sup> Further study is needed to determine if provider education can assist with establishing rapport and identifying patient-specific goals in order to increase patient-perceived benefits of the class, thus leading to greater participation.<sup>17,18,27</sup> Monetary incentivizing strategies have proven to be useful for increasing attendance at medical appointments, and may be applicable for DSME.<sup>28</sup> Utilizing a motivational interviewing approach, which prioritizes the patient's self-identified needs and goals before offering education, may be more effective for patients with knowledge-based barriers or lack of perceived need for DSME.<sup>29</sup>

It is important to note this study was not powered to evaluate clinical outcomes despite statistical testing to identify if any changes or trends could be identified. It is noteworthy, there was a 0.6 % difference in

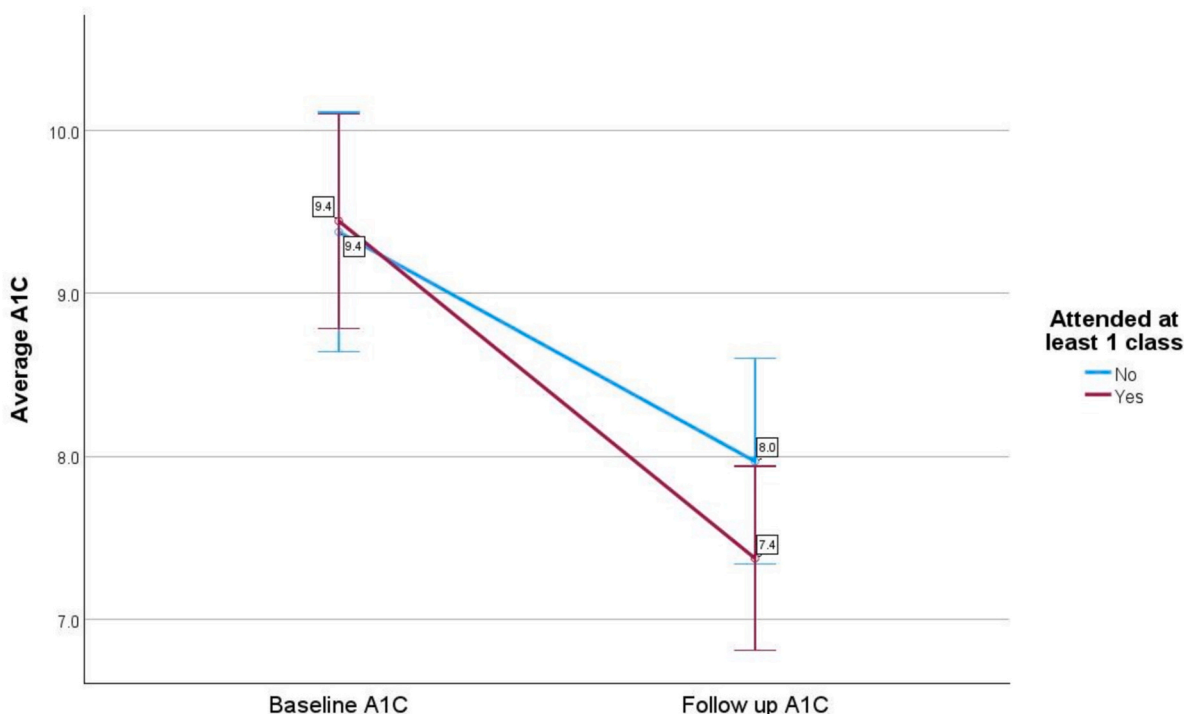


Fig. 1. Average A1C pre- and post-referral to group diabetes self-management education class.

Pre-class A1C measurement as close to referral as available in electronic medical record. Post-class A1C measured at 90 days or more post-referral. Error bars represent 95 % confidence intervals.

Table 2

Change in A1C by number of classes attended.

Number of classes attended	Baseline A1C (%) ± SD	After class A1C (%) ± SD
0 (n = 48)	9.63 ± 2.47	7.93 ± 2.08
1 (n = 9)	11.18 ± 2.09	7.83 ± 3.41
2 (n = 12)	9.07 ± 2.07	7.55 ± 1.35
3 (n = 10)	10.38 ± 2.81	8.02 ± 2.59
4 (n = 24)	9.01 ± 2.28	6.90 ± 1.51

Describes differences in mean pre- and post-A1C based on number of classes attended out of the series of four weekly sessions.

post-referral A1C between attendees of at least one class and non-attendees, with attendees having a lower overall post-class A1C at approximately 7.4 %. A change in A1C of 0.3 % has previously been described as clinically meaningful for prevention of long-term diabetes-related outcomes.<sup>30</sup> Although dose changes for medications could not be assessed, the mean number of diabetes medications did not change post-class attendance.

When stratified by number of classes attended, there was a trend towards lower A1C with each additional class attended; patients attending all four classes achieved a post-class A1C that meets the ADA recommended target of <7 %.<sup>24</sup> The group of patients attending three classes deviated from this trend. Patients attending three classes had a higher baseline mean A1C of approximately 10.4 %; multiple participants in this cohort had baseline A1C readings that were > 12 %. The baseline A1C of patients in this cohort may have contributed to the deviation from the trend of decreasing A1C with each additional class attended that was observed for patients attending one, two, and four classes.

The health benefits of DSME are well-defined in the literature; additional studies with longitudinal follow-up could be useful for determining if benefits of DSME are sustained over time, as previous studies with longitudinal follow-up have had conflicting results.<sup>5,7</sup> Randomized controlled trials enrolling large numbers of patients are

needed to determine causal factors impacting attendance at group DSME. Furthermore, a larger sample may be needed to evaluate the effect of confounders in this study given SDOH related needs were not significant in our cohort, which contrasts with studies conducted by Lee and Adjei Boakye, et al.<sup>14,15</sup> Reasons for incongruity with previous research with respect to SDOH could be related to offering classes virtually and at no cost, thus eliminating transportation and socioeconomic barriers. To assess additional relevant outcomes, patients' diabetes knowledge could be assessed with a pre- and post-class Diabetes Knowledge Questionnaire (DKQ) to determine if there is an improvement in patient self-management knowledge after attending classes.<sup>31</sup> Patient satisfaction and feedback surveys could also be utilized to ascertain patient perspectives on potential improvements to the program.

4.1. Limitations

This was a retrospective, observational study, which prevents determination of causality for findings. Additionally, this study was conducted at a single medical center, limiting extrapolation to other patient populations. Assessing specific medication changes during the pre- and post-class interval could have improved understanding of results, to determine if patients in both groups received guideline-directed medication treatment at appropriately titrated doses. With the current scheduling process, it is not possible to determine if a class was held in person or virtually; thus, the type of class attended was not recorded, although this may have impacted attendance. Additionally, the class is taught by various instructors depending on which resident is currently assigned to teach and which preceptor is supervising. Patients may prefer one teaching style over another, which could impact attendance. It is possible that greater participation in the classes is reflective of self-selection bias – these patients may be more intrinsically motivated to manage their diabetes and consequently demonstrate greater participation.<sup>32</sup> Self-report bias, including recall error, withheld information, or misunderstanding of the way a question is posed may also impact data

that is reported by patients.<sup>33</sup>

## 5. Conclusion

This study found that attendance at a pharmacist-led medication management clinic where patients were exposed to targeted education about group DSME was associated with increased attendance to pharmacist-led group DSME classes. Future research aimed at increasing attendance and retention in the group DSME program should consider referring provider and patient education about DSME, incentivizing strategies, assessment of additional health outcomes, and a longer duration of data analysis.

## CRedit authorship contribution statement

**Olivia Ramey:** Writing – review & editing, Writing – original draft, Software, Resources, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Christopher Gildea:** Writing – review & editing, Validation, Supervision, Resources, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization.

## Declaration of competing interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests:

At the time of authorship and data collection, authors OR and CG were both employed by the health system at which the work was completed.

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## Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.rcsop.2024.100526>.

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