A New Look at Barriers to Clinical Care Among Appalachian Residents Living With Diabetes

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In the United States, diabetes is the seventh leading cause of death and continues to rise in prevalence, with type 2 diabetes accounting for 90–95% of all cases. Rates of diabetes in Kentucky, and, in particular, the Appalachian region, are among the highest in the nation and are increasing faster than the national average. Despite this disproportionate burden, barriers to clinical appointment attendance have not been fully explored in this population. This article examines the association among perceived barriers to clinical attendance, glycemic control, and diabetes self-care as part of an ongoing study. We used a 25-item checklist developed using the Chronic Care Model to assess participants' barriers to clinic attendance. Glycemic control was assessed via A1C measurement. Diabetes self-care was assessed using the Summary of Diabetes Self-Care Activities measure. At the time of analysis, 123 of the 356 participants (34.6%) did not report any barriers to clinic attendance. For the remainder, the major reported barriers included forgetting appointments, inability to afford medicines or other treatment, and placing faith above medical care. The average A1C was 7.7%, and the average diabetes self-care summary score was 17.1 out of 35 points (with higher values indicating better self-care). Missing clinic appointments is associated with lower health outcomes, especially in vulnerable populations. This study can help educate clinic staff on perceived barriers to type 2 diabetes management among people with diabetes in Appalachia.

In the United States, 10.5% of the population has diagnosed or undiagnosed diabetes (1). Diabetes is the seventh leading cause of death and continues to rise in prevalence, with >34 million Americans—more than one in 10—suffering from the disease (1,2). The rate of diabetes is largely influenced by the growing incidence of type 2 diabetes, which accounts for 90–95% of all cases of diabetes (2).

Rates of diabetes in Kentucky are among the highest in the nation (13.3%) and, within Kentucky, the Appalachian region is disproportionately affected (3). In many counties of Appalachian Kentucky, the prevalence of diabetes exceeds 20% of the adult population, and the prevalence in parts of the region has been increasing faster than the national average (4,5).

Regular clinic attendance and diabetes self-care are key components of successful type 2 diabetes management. Prior studies have established a consistent association between clinic nonattendance and poor glycemic control (6). Regular clinic attendance allows for more frequent A1C testing and adjustment of medications and enables identification of diabetes-related complications. Attending clinical appointments regularly provides opportunities for routine medical care focused on individualized treatment plans and ongoing support to reduce the risk of diabetes-related complications (7).

Despite consistent evidence supporting the importance of clinic attendance, various barriers to attendance have been identified, including limited transportation, geographical distance to the clinic, scheduling difficulties, low perceived risks of type 2 diabetes, low perceived value from clinic visits, and economic limitations such as inability to afford adequate health care (5,8–11). Multiple challenges exist in the complex management of type 2 diabetes that undermine optimal treatment and outcomes. Inadequate health systems and communication platforms, emotional

difficulties of coping with diabetes, and the challenges of implementing diabetes self-management within social roles have been identified as common barriers to diabetes self-management (12). These barriers may differ across regions and populations based on social determinants of health, especially in low-resourced and geographically isolated communities. Despite disproportionate rates of type 2 diabetes among Appalachian residents, barriers to attending clinical appointments in the region have not been fully explored. The purpose of this article is to determine whether the barriers to clinical care for people with type 2 diabetes in a sample of adults from Appalachian Kentucky are consistent with those found in existing literature.

Research Design and Methods

This article reports on baseline cross-sectional data collected as part of the ongoing Community to Clinic Navigation to Improve Diabetes Outcomes study (National Institutes of Health grant R01 DK112136, principal investigator N.E.S.). The study used the Chronic Care Model (CCM) (13,14) to better understand and address barriers to the major determinants of diabetes outcomes, optimal self-management, and clinic attendance. The baseline data collection included a diverse array of outcomes and domains consistent with the CCM (13). All baseline data collection occurred upon determination of eligibility and completion of written informed consent. Participants received a $35 honorarium for completing the baseline assessment. All research protocols were approved by the institutional review board at the University of Kentucky (#14-0314-P6H).

Study Setting

The project was carried out in six counties in Appalachian Kentucky. These counties are extremely rural, with Rural-Urban Continuum Codes ranging from 7 to 9 (13). All of the counties are considered by the Appalachian Regional Commission to be economically distressed, with high rates of unemployment, poverty, and low income (15).

Recruitment Strategy

Participants were recruited through community sites, including churches and senior centers. Project staff—all local and trained residents—contacted community organizations and leaders to gauge community members' interest in participating. Information sessions were held for interested community members.

Study Population

Individuals were considered eligible to participate if they were Appalachian residents ≥18 years of age, had no plans to relocate out of the area within the next 18 months, and had been diagnosed with type 2 diabetes and/or had an A1C ≥6.5%. Individuals were screened to determine their eligibility, including sociodemographic questionnaires and point-of-care A1C testing. The latter was used to allow for inclusion of individuals who had yet to be diagnosed by a clinician but who met the A1C eligibility criterion. With the high prevalence of undetected type 2 diabetes in Appalachian communities, interested individuals at elevated risk of type 2 diabetes (as determined by a score ≥2 on the American Diabetes Association's Diabetes Risk Test [16]) who had not received a type 2 diabetes diagnosis were offered A1C screening. More than one person per household were allowed to participate given the high prevalence of type 2 diabetes among family members.

Measures

Barriers to Clinic Attendance Checklist

A 25-item checklist was developed using the CCM (13,14) and was based on prior studies of clinic nonattendance (14,17,18). To apply the overall barriers categories to the Appalachian population, we conducted a pilot study that verified the salience and completeness of these barriers (19). For each of the 25 potential barriers, participants assigned a number between 1 and 5 to indicate the degree to which that barrier made it difficult for them to attend clinic appointments (1 = never, 2 = rarely, 3 = some of the time, 4 = most of the time, and 5 = always). Responses were then used to create a summary score as the average of all 25 barrier scores.

Glycemic Control

Glycemic control was assessed via A1C measurement at baseline for all enrolled study participants.

Diabetes Self-Care

Diabetes self-care was assessed using the Summary of Diabetes Self-Care Activities measure (20). Participants were asked to indicate how many days in the past 7 days they had performed various self-management tasks. Responses for each item ranged from 0 to 7. Five composite measures were created by averaging corresponding items related to general diet, specific diet, exercise, blood glucose testing, and foot care.

Data Collection

Interviews were conducted in participants' homes, at a local project office, or at another community location. To

mitigate concerns about health literacy, interviewers read all questions to participants. All data were entered into a REDCap secure database and checked for completeness by the project data manager.

Statistical Analysis

Descriptive statistics were used to summarize sample characteristics, A1C values, and responses to the Barriers to Clinic Attendance Checklist and the Summary of Diabetes Self-Care Activities measure. Next, multilevel linear mixed-effect models were used to examine the association between the potential barriers to clinic attendance and a summary measure of diabetes self-care and A1C. We fit an unadjusted model and models adjusting for age, sex, marital status, education, employment, insurance, financial status, health conditions, and smoking status for each potential barrier and adjusted each model for demographic variables. To determine the most significant barriers to clinic attendance, we fit a model that simultaneously included all potential barriers identified from the adjusted models with a $P < 0.20$ after adjustment of P values for multiple comparisons based on the false discovery rate (21). We then used backward elimination at the $P < 0.05$ significance level to arrive at final models for A1C and type 2 diabetes self-care that each included all significant barriers to clinic attendance. Within all mixed models, random site effects and random household effects within sites were used to account for the possibility of multiple levels of clustering resulting from the study design. Outcomes were centered and standardized for interpretation. All tests were two-sided, and statistical significance was defined as $P < 0.05$. Analyses were conducted in SAS, v. 9.4, statistical software (SAS Institute, Cary, NC).

Results

At the time of analysis, a total of 356 participants from 26 community sites had completed baseline assessments. Table 1 presents baseline characteristics of the sample. The average age of participants was 64.2 years (SD 10.6 years). Consistent with local demographics, the majority of the sample was White ($n = 349$, 98%). Nearly two-thirds were women ($n = 230$, 64.6%). Educational attainment varied, with one-third of participants reporting a high school degree or general education diploma (GED) ($n = 115$, 32.3%) and another one-third reporting a graduate or professional degree ($n = 113$, 31.7%). A little over half of participants were married ($n = 208$, 58.4%), and nearly half were retired ($n = 150$, 42.1%). Nearly all participants reported having some form of health insurance ($n = 349$, 98%), with more than half reporting Medicare insurance ($n = 197$, 55.3%). Participants had an average

TABLE 1 Baseline Characteristics of Study Participants ($N = 356$)

Characteristic	Value
Age, years	64.2 ± 10.6
Female sex	230 (64.6)
Race	
White	349 (98.0)
African American	7 (2.0)
Education	
High school/GED	115 (32.3)
Associate's degree	43 (12.1)
Some college	61 (17.1)
Bachelor's degree	24 (6.7)
Graduate/professional degree	113 (31.7)
Marital status	
Married	208 (58.4)
Divorced	55 (15.4)
Never married	21 (5.9)
Widowed	68 (19.1)
Employment	
Full-time	63 (17.7)
Part-time	12 (3.4)
Disability	73 (20.5)
Homemaker	49 (13.8)
Retired	150 (42.1)
Unemployed	9 (2.5)
Financial status	
More than you need to live well	91 (25.6)
Just about enough to get by	154 (43.3)
Sometimes struggle to makes end meet	103 (28.9)
Any health insurance	349 (98.0)
Medicaid insurance	65 (18.3)
Medicare insurance	197 (55.3)
Current smoker	37 (10.4)
Number of health conditions	2.09 ± 1.07
A1C, %	7.7 ± 1.7
Diabetes self-care summary score	17.1 ± 6.3
General diet	3.12 ± 2.42
Special diet	3.35 ± 1.58
Exercise	2.02 ± 2.26
Blood glucose testing	3.94 ± 2.74
Foot care	4.70 ± 1.39
Average time since last clinic visit, months	2.1 ± 1.7
0–3 months	202 (81.5)
≥4 months	46 (18.6)

Data are mean ± SD or n (%).

of 2.09 health conditions (SD 1.07), the majority had seen their health care provider within the past 3 months ($n = 202$, 81.5%), and the mean A1C was 7.7% (SD 1.7%). The average diabetes self-care summary score was 17.1 (SD 6.3) out of a possible total of 35 points, with higher scores indicating more optimal self-care practices; participants reported the highest levels of self-care for foot care, followed by glucose testing and healthy diet, and the lowest levels of self-care for being active.

Table 2 presents the distribution of responses to each of the 25 items on the Barriers to Clinic Attendance Checklist. Overall, 123 participants (37.4%) did not report any barriers to clinic attendance (i.e., responded "never" to all 25 items). For those reporting barriers, the three most frequently cited barriers included "It is hard for me to attend clinic appointments because I sometimes forget," "It is hard for me to attend clinic appointments because I can't afford the medicines or other treatment they tell me to get," and "It is hard for me to attend clinic appointments because I know that God will take care of me better than any doctor."

We used multilevel linear mixed-effect models to examine the association between barriers to clinic attendance and a summary measure of diabetes self-care and A1C (Table 3). After adjusting for sex, marital status, education, employment, insurance, financial status, and smoking status, the association with the barrier "It is hard for me to attend clinic appointments because I am not particularly worried about my diabetes" was significant (β −0.31, SE −0.10, P = 0.0017). In models adjusted for the same covariates, no barriers were significantly associated with A1C.

Table 4 presents results from our final regression models, including one for diabetes self-care and one for A1C. In the adjusted model, only one item was significantly associated with diabetes self-care: "It is hard for me to attend clinic appointments because I am not particularly worried about my diabetes" (β −0.31, SE −0.10, P = 0.0017). In the final regression model for A1C, four barriers were significantly associated with A1C: "It is hard for me to attend clinic appointments because I don't have reliable transportation" (β −0.17, SE −0.07, P = 0.0185), "It is hard for me to attend clinic appointments because I know that God will take care of me better than any doctor" (β −0.14, SE −0.05, P = 0.0085), "It is hard for me to attend clinic appointments because I can't afford the co-pay" (β 0.17, SE −0.08, P = 0.0306), and "It is hard for me to attend clinic appointments because I really don't think anything I do will help my diabetes" (β 0.35, SE −0.11, P = 0.0021).

Discussion

This study provides an updated and culturally situated understanding of the barriers to clinic attendance for Appalachian residents living with type 2 diabetes. Missing clinic appointments undermines efficiency in the medical system and disrupts the continuity of care (22). More importantly, missing appointments has been associated with poor health outcomes, particularly in low-income or otherwise vulnerable populations (23). Our study shows that, among rural underserved residents with type 2 diabetes, the most frequently mentioned barriers to clinic attendance included forgetting appointments, medication expenses, and placing faith above medical care, which is consistent with the literature (24). However, it should also be noted that almost 80% of study participants reported attending a clinic visit within the past 3 months and that our study participants may not be the most vulnerable group within this low-resourced community.

Given the challenges of obtaining routine care in rural areas, particularly those with well-documented scarcity such as Appalachia, we found it surprising that nearly 40% of participants indicated minimal or no barriers to clinical care. This perspective may reflect the expansion of health insurance coverage via Medicaid through the Affordable Care Act. Participants in this study also belong to an older age-group (mean age 64.2 years [SD 10.6 years]), so individuals may be dually enrolled in Medicare and Medicaid. Alternatively, the lack of a perceived barrier to clinical care may reflect access to federally qualified health centers and other community health clinics. This finding seems a bright spot in communities that oftentimes have challenges with access to care.

Cognitive or emotional factors were more salient to attending clinical visits than other factors, including tangible, informational, or logistical factors. Specifically, the most frequently cited reasons for missing appointments included forgetting the appointment and believing that God will take care of them. Forgetting appointments is a well-documented reason patients miss clinic appointments, with many studies indicating that approximately one-third of all missed appointments are the result of a forgotten appointment (23,25,26). Other research suggests that, although forgetting an appointment may be stated as a main reason patients do not obtain clinical care, additional and intersecting challenges may be the true source of the problem. For example, in one study, patients who missed appointments because they forgot also endorsed having competing priorities (23). Determining the relative contribution of these barriers requires additional in-depth queries.

Researchers have used numerous approaches to address forgetting appointments, including tailored systems providing telephone and text reminders (27), patient portal messages, and interactive messaging that allows for rescheduling or canceling (28). Although some evidence exists on the success of telephone and text reminders in increasing appointment attendance, results vary because of additional and intersecting challenges, particularly among underserved populations (29). One promising approach to improve clinic attendance involves tailoring reminder systems to maintain

TABLE 2 Responses to the 25 items in the Barriers to Clinic Attendance Checklist					
Barrier	Never	Rarely	Some of the Time	Most of the Time	Always
It is hard for me to attend clinic appointments because I'm worried about making/arranging the appointment.	305 (85.9)	27 (7.6)	16 (4.5)	4 (1.1)	3 (0.9)
It is hard for me to attend clinic appointments because I don't have reliable transportation.	322 (90.5)	15 (4.2)	8 (2.30)	8 (2.3)	3 (0.9)
It is hard for me to attend clinic appointments because it takes too much time to get to and from the clinic.	321 (90.4)	15 (4.2)	13 (3.7)	3 (0.9)	3 (0.9)
It is hard for me to attend clinic appointments because I have too many child care or elder care responsibilities.	318 (89.6)	17 (4.8)	11 (3.1)	3 (0.9)	6 (1.7)
It is hard for me to attend clinic appointments because I have too many work or school responsibilities.	311 (87.9)	19 (5.4)	18 (5.1)	3 (0.9)	3 (0.9)
It is hard for me to attend clinic appointments because the staff at the clinic is rude to me.	344 (97.7)	5 (1.4)	3 (0.9)	0 (0.0)	0 (0.0)
It is hard for me to attend clinic appointments because I have to wait too long to see the health care provider.	292 (82.0)	38 (10.7)	17 (4.8)	4 (1.1)	5 (1.4)
It is hard for me to attend clinic appointments because the clinic has inconvenient hours.	339 (95.5)	10 (2.8)	5 (1.4)	1 (0.3)	0 (0.0)
It is hard for me to attend clinic appointments because I sometimes forget.	238 (66.9)	67 (18.8)	44 (12.4)	5 (1.4)	5 (0.6)
It is hard for me to attend clinic appointments because I am too worried about what they'll tell me.	308 (86.5)	24 (6.7)	16 (4.5)	4 (1.1)	4 (1.1)
It is hard for me to attend clinic appointments because I don't have insurance.	333 (93.8)	9 (2.5)	8 (2.3)	1 (0.3)	4 (1.1)
It is hard for me to attend clinic appointments because I can't afford the copay.	303 (85.1)	23 (6.5)	20 (5.6)	6 (1.7)	4 (1.1)
It is hard for me to attend clinic appointments because I don't have a regular doctor or provider.	346 (97.2)	8 (2.30)	2 (0.6)	0 (0.0)	0 (0.0)
It is hard for me to attend clinic appointments because I can't afford the medicines or other treatment they tell me to get.	286 (81.0)	33 (9.4)	24 (6.8)	9 (2.6)	1 (0.3)
It is hard for me to attend clinic appointments because I know that God will take care of me better than any doctor.	314 (89.0)	9 (2.6)	8 (2.3)	3 (0.9)	15 (4.3)
It is hard for me to attend clinic appointments because I don't understand the diabetes treatment procedures recommended by my provider.	305 (86.4)	29 (8.2)	12 (3.4)	5 (1.4)	2 (0.6)
It is hard for me to attend clinic appointments because I am worried that the provider or office staff will make me feel bad about not following their treatment advice.	323 (91.5)	21 (6.0)	7 (2.0)	1 (0.3)	1 (0.3)
It is hard for me to attend clinic appointments because my doctor's office changes or cancels my diabetes appointment fairly often.	330 (93.0)	22 (6.2)	2 (0.6)	1 (0.3)	0 (0.0)
It is hard for me to attend clinic appointments because it's not that important to actually have a doctor's appointment for my diabetes.	338 (95.20)	12 (3.4)	4 (1.1)	1 (0.3)	0 (0.0)
It is hard for me to attend clinic appointments because I am not particularly worried about my diabetes.	314 (89.0)	26 (7.4)	9 (2.6)	1 (0.3)	3 (0.9)
It is hard for me to attend clinic appointments because I am worried that they'll tell me to change my lifestyle to take care of my diabetes.	300 (85.7)	31 (8.9)	14 (4.0)	3 (0.9)	2 (0.6)

TABLE 2 Responses to the 25 items in the Barriers to Clinic Attendance Checklist

Barrier	Never	Rarely	Some of the Time	Most of the Time	Always
It is hard for me to attend clinic appointments because I don't think it's that important to stick to the treatment plan (e.g., come to all scheduled treatment appointments and not skip any appointments).	324 (91.5)	20 (5.7)	8 (2.3)	2 (0.6)	0 (0.0)
It is hard for me to attend clinic appointments because my family doesn't push me or support me to get treatment for my diabetes.	320 (90.4)	17 (4.8)	11 (3.1)	4 (1.1)	2 (0.6)
It is hard for me to attend clinic appointments because I really don't think anything I do will help my diabetes.	327 (92.4)	13 (3.7)	11 (3.1)	1 (0.3)	2 (0.6)
It is hard for me to attend clinic appointments because most people like me really don't have control over their diabetes.	314 (89.2)	24 (6.9)	9 (2.6)	3 (0.9)	2 (0.6)

Data are n (%).

personalized patient care by ensuring preferred communication approaches, modality of reminders, and frequency of reminders (30).

Our results reveal a second major factor implicated in nonattendance: the perspective that God will take care of a chronic disease such as type 2 diabetes, and, thus, a clinic visit may not be necessary. Akin to the barriers of forgetting an appointment, this perspective should be understood as a complex response to a challenging and oftentimes undesirable activity. A more complex understanding of this barrier is warranted.

Researchers often stop short of fully comprehending why participants express this perspective, attributing such an

TABLE 3 Linear Regression Models Examining the Association Between Barriers to Clinic Attendance and Diabetes Self-Care and A1C

Barrier	Diabetes Self-Care				A1C			
	Unadjusted		Adjusted*		Unadjusted		Adjusted*	
	B (SE)	P	B (SE)	P	B (SE)	P	B (SE)	P
It is hard for me to attend clinic appointments because I sometimes forget.	−0.20 (−0.06)	0.0017	−0.16 (−0.07)	0.03	0.07 (−0.08)	0.39	0.04 (−0.11)	0.6969
It is hard for me to attend clinic appointments because I can't afford the medicines or other treatment they tell me to get.	−0.16 (−0.72)	0.03	−0.08 (−0.09)	0.37	0.26 (−0.08)	0.0017	0.17 (−0.09)	0.0443
It is hard for me to attend clinic appointments because I am not particularly worried about my diabetes.	−0.25 (−0.09)	0.0085	−0.31 (−0.10)	0.0017	0.03 (−0.10)	0.76	0.09 (−0.11)	0.4205
It is hard for me to attend clinic appointments because I am worried that they'll tell me to change my lifestyle to take care of my diabetes.	−0.25 (−0.09)	0.0037	−0.23 (−0.10)	0.02	0.09 (−0.10)	0.36	−0.01 (−0.09)	0.9512
It is hard for me to attend clinic appointments because my family doesn't push me or support me to get treatment for my diabetes.	−0.31 (−0.09)	0.0007	−0.28 (−0.10)	0.01	0.14 (−0.10)	0.14	0.08 (−0.06)	0.2029
All 25 barriers, mean score	−0.65 (−0.19)	0.0010	−0.52 (−0.22)	0.02	0.52 (−0.31)	0.09	0.26 (−0.23)	0.2609

Statistical significance is after adjustments based on the false discovery rate; only statistically significant associations have been included in this table. *Adjusted for sex, marital status, education, employment, insurance, financial, and smoking status.

TABLE 4 Final Regression Models Identified via Backward Elimination

Barrier	Diabetes Self-Care		A1C	
	Estimate (SE)	P	Estimate (SE)	P
It is hard for me to attend clinic appointments because I am not particularly worried about my diabetes.	−0.31 (−0.10)	0.00	−	−
It is hard for me to attend clinic appointments because I don't have reliable transportation.	−	−	−0.17 (−0.07)	0.0185
It is hard for me to attend clinic appointments because I can't afford the copay.	−	−	0.17 (−0.08)	0.0306
It is hard for me to attend clinic appointments because I know that God will take care of me better than any doctor.	−	−	−0.14 (−0.05)	0.0085
It is hard for me to attend clinic appointments because I really don't think anything I do will help my diabetes.	−	−	0.35 (−0.11)	0.0021

endorsement to fatalism, ignorance, or lack of willingness that could be targeted for intervention. Individuals from lower-income environments, including rural and minoritized communities, often experience circumstances that lead them toward the belief that God can alleviate fear and discourage activities to promote overall health (31). However, it is essential to understand that such groups often experience constrained choices, socially derived information, and suboptimal care, if clinical services are offered at all. Given impeded access to health care services, in combination with competing demands of housing, transportation, and food, a logical response is for patients to de-prioritize clinic attendance or the use of other health care services (32).

This finding resonates with our prior work; ethnographic investigations into health decision-making among this same population suggest that numerous and complex factors—particularly inadequate access to health services, a legacy of self-reliance, and religiosity, combined with a culturally acceptable idiom of fatalism—foster the use of, but not necessarily a rigid conviction in, the notion of fatalism (33).

The exception to these more cognitive barriers is a logistical barrier: the inability to afford recommended treatment and, especially, medications. This barrier merits attention because it was cited frequently as a barrier to clinical attendance in our study. Although type 2 diabetes treatment involves far more than simply medication, patients with diabetes often are motivated to attend clinics to receive their insulin or other medications (19). Skipping appointments makes sense if patients are unable to fill prescriptions, which may be viewed as the main (or sole) reason to attend a clinic appointment. Taking medication is also often viewed as a more effective and feasible type 2 diabetes self-care activity, as opposed to more difficult lifestyle change, particularly for residents of rural and other traditionally underserved areas (34).

Limitations

This study had several limitations. First, the sample size consisted of a relatively homogenous population, including underrepresentation of all non-White populations and less vulnerability than the region overall. Second, individual responses to the survey may have reflected particular resources and services accessible to this region and thereby potentially limit generalizability to other areas of rural Appalachia. Third, selection bias may have resulted in nearly half the participants stating that few barriers exist, indicating that we enrolled individuals who were healthy enough to attend clinic appointments and willing to volunteer. Similarly, the sample population reported higher levels of education and insurance coverage than what would have been expected. Despite these limitations, our study suggests that diabetes clinical care is multifactorial and requires the development of patient-centered interventions to improve adherence to clinic appointments.

Conclusion

This study focused on identifying perceived barriers to clinic attendance among adults with type 2 diabetes in a rural Appalachian setting. Its results can help to educate clinic staff and providers about their patients' perceived barriers to diabetes management in order to address potential barriers.

Future research should be aimed at investigating how these recognized barriers to clinic attendance correlate to actual attendance. For example, there may be recall bias when self-reporting clinic attendance. Therefore, cross-referencing

self-reports with medical records or solely using medical records may allow a more complete understanding of the relationship between the barriers studied and clinic attendance. Additionally, the financial aspect of type 2 diabetes treatment continues to be a major burden for patients and is seen as a contributing barrier to clinic attendance in rural Appalachia. Inadequate financial status may be addressed through cost-effective strategies and medication management. Finally, our results suggest that adults with type 2 diabetes and their families in this rural community can benefit from interventions that assess emotional/psychosocial factors, religion, and cost as they relate to clinic attendance and the subsequent development of type 2 diabetes complications.

DUALITY OF INTEREST

No potential conflicts of interest relevant to this article were reported.

AUTHOR CONTRIBUTIONS

B.L.S., M.E.L., and N.E.S. contributed to the development, review, and editing of each section of the manuscript. A.A. and N.B. contributed to the discussion. L.H. and T.N. contributed to the introduction. S.W. and N.E.S. took part in data collection and management. P.M.W. and T.A. conducted data analysis, wrote the results, and contributed to the methods. N.E.S. is the guarantor of this work and, as such, had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

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