

Characteristics and Delivery of Diabetes Shared Medical Appointments in North Carolina

Connor Drake, Julienne K. Kirk, John B. Buse, David Edelman, Christopher M. Shea, Susan Spratt, Laura A. Young, Anna R. Kahkoska

BACKGROUND Successful diabetes care requires patient engagement and health self-management. Diabetes shared medical appointments (SMAs) are an evidence-based approach that enables peer support, diabetes group education, and medication management to improve outcomes. The purpose of this study is to learn how diabetes SMAs are being delivered in North Carolina, including the characteristics of diabetes SMAs across the state.

METHOD Twelve health systems in the state of North Carolina were contacted to explore clinical workflow and intervention characteristics with a member of the SMA care delivery team. Surveys were used to assess intervention characteristics and delivery.

RESULTS Diabetes SMAs were offered in 10 clinics in 5 of the 12 health systems contacted with considerable heterogeneity across sites. The majority of SMAs were open cohorts (80%), offered monthly (60%) for 1.5 hours (60%). SMAs included a mean of 7.5 ± 3.4 patients with a maximum of 11.2 ± 2.7 patients. Survey data revealed barriers (cost-sharing and provider buy-in) to, and facilitators (leadership support and clinical champions) of, clinical adoption and sustained implementation.

LIMITATIONS External validity is limited due to the small sample size and geographic clustering.

CONCLUSION There is significant heterogeneity in the delivery and characteristics of diabetes SMAs in North Carolina with only modest uptake across the health systems. Further research to determine best practices and effectiveness in diverse, real-world clinical settings is required to inform implementation and dissemination efforts.

Although diabetes is common across the nation, the prevalence of prediabetes and type 2 diabetes is greatest in the southern and Appalachian regions of the United States [1]. At the core of diabetes prevention and treatment is patient self-management to achieve and maintain glucose levels at individualized target values and control cardiovascular risk factors with a healthy lifestyle program, weight management, and medication adherence [2]. Despite massive health care expenditures in the care of patients with diabetes, a minority of patients achieve good control across domains and many suffer from excess risk of poor health outcomes [3]. Research indicates that enabling self-management [4-5], patient activation [6], peer support [7-8], and care coordination [9-10] can improve health outcomes and quality of life. Providing this level of patient engagement, diabetes group education, and self-management support in routine outpatient clinical encounters poses distinct challenges in primary care.

Primary care clinic staff and clinicians must balance the goal of improving quality and value within the financial constraints of a fee-for-service reimbursement model. Shared medical appointments (SMAs) are an evidence-based care model that brings together patients with a mutual chronic condition for longer billable visits in a group setting and has been shown to be effective for the management of type 2 diabetes [11]. SMAs provide support to patients who require a more intensive approach that synergizes group discussion, peer support, diabetes group education, and medi-

cal care. A meta-analysis of 17 randomized controlled trial studies that compared diabetes SMAs with usual care shows an association between participation in a diabetes SMA and an improvement in hemoglobin A1C levels (mean -0.55 percentage points) and lower systolic blood pressure (mean -5.22 percentage points) [12-13]. Furthermore, there is preliminary evidence that this approach is cost-effective for health systems [14]. The primary aim of this study is to investigate the core elements and characteristics of diabetes SMA structures and workflows across clinical sites in North Carolina to identify barriers and facilitators for implementation at the clinic level.

Methods

Identification of Diabetes SMAs in North Carolina

We administered an in-person survey with closed- and open-ended items to representatives from the clinics offering diabetes SMAs within health systems in the state of North Carolina. We queried 12 health systems to determine whether diabetes SMAs were being offered in primary care or endocrinology clinics. The study sample was a thorough

Electronically published April 5, 2019.

Address correspondence to Connor Drake, 135 Dauer Drive, 1101 McGavran-Greenberg Hall, CB #7411, Chapel Hill, NC 27599-7411 (cddrake@live.unc.edu).

N C Med J. 2019;80(5):261-268. ©2019 by the North Carolina Institute of Medicine and The Duke Endowment. All rights reserved. 0029-2559/2019/80501

convenience sample selected for practical considerations of survey feasibility and given the large proportion of North Carolinians served by these health systems. Diabetes SMA settings were identified by contacting endocrinology and primary care leads at the health systems. Endocrinology and primary care leads were identified through health system website directories based on administrative leadership role at the clinic level and/or at the department level (eg, medical director, department chair, or other management/coordinating positions). If a diabetes SMA was confirmed to be offered at a clinic within a health system, clinical champions of each SMA were identified by asking the leads who had significant responsibility for their implementation and management at the clinic. If multiple clinics offered diabetes SMAs within the same health system, survey data was collected from clinical champion representatives from each clinic to describe delivery and SMA characteristics that were specific to their respective clinics.

In-person surveys were conducted only with clinical champions who were intimately involved with the delivery of the diabetes SMAs at their respective clinics. The survey included both closed-ended and open-ended items. Closed-ended items focused on characteristics of SMAs for which the research team could identify response categories (eg, duration and frequency of SMA sessions). Open-ended items focused on aspects of how SMAs were being delivered, for which the range of responses was unknown and required a qualitative description. The Institutional Review Board from Duke University approved the protocol for the survey as exempt from reviewed research.

Quantitative Data Collection and Analysis

The survey questions were designed to help users understand the recruitment process, clinical workflow, intervention characteristics, perceived advantage of this approach, and other factors associated with diabetes SMA implementation. Multiple choice survey responses were combined across groups and analyzed in terms of frequency and proportion or mean and standard deviation of responses. All clinical champion respondents answered the same survey administered between August and November 2017.

Qualitative Data Collection and Analysis

Identified clinical champions answered open-ended survey questions administered by a member of the study team during a 45- to 90-minute session. Survey items were based on the Consolidated Framework for Implementation Research (CFIR) [15]. CFIR is a consolidation of 20 published sources from 13 disciplines reporting on factors associated with effective implementation of interventions. CFIR has 5 main domains and associated nested constructs (Intervention Characteristics, Outer Setting, Inner Setting, Characteristics of Individuals, and Process) that are used to systematically guide and analyze implementation efforts [15].

The standards for reporting qualitative research (SRQR)

were used to organize and report qualitative data from the open-ended survey questions [16]. Detailed notes were analyzed using a conventional content analysis approach [15] wherein codes, or short phrases or descriptors of an attribute found in the analyzed text, were not established *a priori*, but rather emerged from the data [17]. Two coders (C.D., A.K.) identified codes in the notes from the open-ended survey questions. Codes were identified independently by the coders and then reconciled to create a codebook. The 2 members of the study team coded transcripts individually and then reviewed together periodically to come to consensus on the consistent application of codes and refinement of the codebook. All notes were re-analyzed using the final codebook and differences were reconciled. In the final stage of analysis, members of the study team evaluated responses for major themes, such as sources of heterogeneity (ie, aspects of SMAs that were markedly different or varied across sites) and major sources of saturation (ie, aspects of SMAs that were consistent across different sites).

Results

Of the 12 health systems contacted, 10 responded for an 83% response rate. Eight of the health systems that responded were private and not for profit, 3 were academic medical centers, and 1 was operated by the Veterans Health Administration. Diabetes SMAs were offered in 5 of the 10 health systems that responded. In these 5 health systems, 10 clinics offered SMAs to patients with diabetes (see Supplemental Table). There was a 100% response rate on surveys administered to the clinical champions at the identified clinics that offered SMAs. Quantitative analyses were conducted on survey responses of the identified clinical champion from each participating clinic. Of the 10 clinics offering SMAs, 20% were free clinics, 10% were community health centers, 10% were Veterans Health Administration community-based outpatient clinics, 50% were family medicine clinics, and 10% were endocrinology clinics.

Quantitative Analysis

Table 1 describes the logistics and operations characteristics of SMAs across North Carolina. Half of the sites have been offering SMAs for more than 5 years. The majority of SMAs were open cohorts (80%) offered monthly (60%) for 1.5 hours (60%). SMAs included a mean of 7.5 ± 3.4 patients with a maximum mean of 11.2 ± 2.7 patients.

The SMA care teams were varied with the highest proportion of sites including nurses (90.0%) and pharmacists (70.0%), followed by physicians, facilitators/health coaches/certified diabetes educators, and nutritionists (50%). There was heterogeneity across clinical sites in usage of eligibility criteria and recruitment strategies. Practice patterns for recruitment included electronic health record (EHR) query followed up by phone call, EHR query followed up by primary care provider (PCP) screening, or

TABLE 1.
Logistics and Operations of Diabetes Shared Medical Appointment (SMA) Models Across North Carolina (N = 10)

Type of Clinic (N, %)		Recruitment Strategies (n, %) ^b	
	Free Clinic	2	(20.0)
	Community Health Center	1	(10.0)
	Veterans Association	1	(10.0)
	Community-based/Family Medicine	5	(50.0)
	Specialty Clinic (endocrinology)	1	(10.0)
Duration of SMA Intervention (N, %)		Frequency of SMA (N, %)	
	=< 1 year	1	(10.0)
	>1-4 (44.4) years	4	(40.0)
	>=5 (55.6) years	5	(50.0)
		Weekly	2 (20.0)
		Bi-weekly	1 (10.0)
		Monthly	6 (60.0)
		Other (eg, 3x a month)	1 (10.0)
SMA Care Team Composition (N, %)		Length of SMA (N, %)	
	Physician	5	(50.0)
	Pharmacist	7	(70.0)
	Facilitator/Health Coach/CDE	5	(50.0)
	Nurse	9	(90.0)
	Advanced Practice Provider (NP, PA)	3	(30.0)
	Behavioral Health Practitioner	4	(40.0)
	Nutritionist	5	(50.0)
	Medical Assistant	4	(40.0)
	Residents/Fellows	2	(20.0)
	Medical Students	2	(20.0)
	Pre-medical Students	1	(10.0)
	Nursing Students	2	(20.0)
	Pharmacy Students	4	(40.0)
		1 hour	1 (10.0)
		1.5 hours	6 (60.0)
		2 hours	3 (30.0)
Eligibility Criteria (N, %) ^a		Number of SMA offered (N, %)	
	Diabetes diagnosis code in EHR	1	(10.0)
	A1C threshold	2	(20.0)
	Disease stage (ie, prediabetes, diabetes, advanced complications)	1	(10.0)
	None (ie, patient interest)	5	(50.0)
	Other	1	(10.0)
		Single SMA (stand-alone)	4 (40.0)
		2-8	4 (40.0)
		Continuously offered for drop-ins	3 (30.0)
Cohort Type (N, %)		Average Patients per SMA, mean (SD)	
	Open	8	(80.0)
	Closed	2	(20.0)
		Maximum Patients per SMA, mean (SD)	
		11.2 (2.7)	
		Number of Patients Served Regularly through SMA (N, %)	
		<40 patients	2 (20.0)
		40-60 patients	2 (20.0)
		60-80 patients	4 (40.0)
		>80 patients	2 (20.0)
		Copay Required (N, %)	
		4 (40.0)	
		EHR Documentation (N, %)	
		6 (60.0)	
		EHR or Chart Documentation Unique to SMA (N, %)	
		7 (70.0)	
		Data Collected for Research Use (N, %)	
		2 (20.0)	

Note. SMA, Shared Medical Appointment; EHR, Electronic Health Record; NP, Nurse Practitioner; PA, Physician Assistant

^aFocus on sicker patients (A1C 9-10%), versus above 7%; 2 clinics describe mixing prediabetes and type 2 diabetes, 2 clinics describe mixing type 1 and type 2 (22.2) diabetes. One clinic targeted low-income patients from free clinics.

^bConsiderable overlap and multiple approaches used by single clinics. Patterns: EHR followed up by phone call (1), EHR followed up by PCP screening (2), a PCP-driven process; assisted them with the recruitment and also gave them little cards with a description for the physician to explain the groups and a brochure for patients.

a PCP-driven process. The majority of SMAs use EHR for documentation (60%) and a few collect data for research or quality improvement (20%).

Table 2 describes the intervention characteristics of SMAs across North Carolina. All SMAs included diabetes group education based on American Diabetes Association self-management priority areas, with a high proportion of SMAs including other clinical measures and ordering of labs. Diabetes group education was structured in 60% of the sites. All sites reported diabetes group education that included medications, medication adherence, and nutrition, with another 80% of sites reporting diabetes pathology, understanding laboratory values, and exercise. Ninety

percent of sites provided educational materials to accompany SMA programming. Goal-setting and use of incentives, including drinks, snacks, free supplies, or foods, varied across sites (40%). PCP referral was the most common form of recruitment (50%) and SMAs were most frequently being offered on a monthly basis. Ninety percent of the clinics that participated in the study had groups that lasted between 90 and 120 minutes, with only one clinic holding 60-minute SMAs. Half of the clinics created educational materials in-house and 40% had an unstructured, patient-directed curriculum. An emphasis on goal-setting was not a common feature of the SMAs at the clinics, with only 40% reporting that this was a major focus.

Qualitative Analysis

Open-ended items in the survey completed by the clinical champion at each of the 10 clinics provide additional context and description of SMA characteristics and delivery. The following codes emerged from the survey responses to open-ended questions: Clinician Satisfaction, Perceived Advantage, Self-Management Support, Peer Support, Access, Efficiency, Leadership Support, Team-based Care, Recruitment, Patient Population, SMA Delivery or Characteristics, and Workforce Development. These primary codes for analyzing the qualitative data and have been defined in Table 3. Codes were further distilled into the following themes.

Theme 1: SMAs have been adopted based on Perceived Advantages for both patients and clinicians. Perceived Advantage of the SMA spanned across several domains from both the patient and clinician perspective, including the perception of a better patient experience, comprehensive diabetes management leading to better outcomes, and more time with patients. Sub-elements of the Perceived Advantage code include: Self-Management Support, Peer Support, Efficiency, and Access. Peer Support was described where SMA are "... a good way to connect patients to support each other." Self-Management Support was described by a medical student, who said that "a lot of patients are struggling with basic diabetes education and self-management; [SMA] would be a good way to address this." Self-Management Support and Peer Support were described as being enabled by group discussion and interactive activities. Similarly, Efficiency and Access were interrelated, with SMAs providing "economies of scale" and "flexibility" for patients, with one nurse identifying this as a strength of a "drop-in" model for the SMAs, commenting that "...if [patients] can't come this week, they can come next week."

Clinician Satisfaction was identified as both an advantage of the approach over usual care and a rationale for implementing the approach to address provider burnout. One family medicine doctor stated, "The theory is that it could help take complicated patients from providers who were frustrated." A pharmacist described similar rationale: "...[We] saw it as another way to see a lot of patients and prevent provider burnout, particularly in primary care and family medicine, where the model is seeing a patient every 15 minutes, to move away from that model."

Theme 2: Sufficient organizational capacity is a predictor of successful implementation. Organizational capacity was referenced as a facilitator of implementation of SMAs and included the following codes: Workforce Development, Team-based Care, and Leadership Support. Workforce Development was described by one pharmacist who reported that "facilitation training is key... you need to do a good job engaging the group." Multiple clinical champions suggested that a co-facilitator be present with one medical student, stating, "The facilitator role is very impor-

tant, but it's also very good to have a person as a backup." Team-based Care was described as a foundational element of diabetes SMAs across all participating clinics. A certified diabetes educator indicated that the diabetes SMAs were even used to train physicians to participate in Team-based Care, "We decided to implement [diabetes SMAs]

TABLE 2.
Intervention Characteristics of Shared Medical Appointment (SMA) Models Across North Carolina (N = 10)

Recurring Components of SMAs (N, %)	
Weight Measurement	6 (60.0)
A1C Measurement	9 (90.0)
Blood Pressure Measurement	8 (80.0)
Medication Reconciliation	6 (60.0)
Physical Exam with Provider	5 (50.0)
Foot Exam	5 (50.0)
Other Labs Ordered and Filled	9 (90.0)
Diabetes Education	10 (100.0)
Group Discussion	10 (100.0)
Review of Log Book	7 (70.0)
Exercise Activity	2 (20.0)
Goal-setting	3 (30.0)
Mindfulness Activity	3 (30.0)
Other (eg, vaccines as due)	3 (30.0)
Structure of Patient Education	
Facilitators follow a script and each session has a specific educational topic	6 (60.0)
Educational content covered but it depends on what patients want to discuss	4 (40.0)
Content of Patient Education (N, %)	
Diabetes Pathology	8 (80.0)
Understanding Laboratory Values	8 (80.0)
Medications	10 (100.0)
Medication Adherence	10 (100.0)
Nutrition	10 (100.0)
Exercise	8 (80.0)
Mind-body Connection	5 (50.0)
Goal-setting	5 (50.0)
Stress Management	4 (40.0)
Spirituality	2 (20.0)
Navigating the Health Care System	4 (40.0)
Community Resources	5 (50.0)
Personal Development	2 (20.0)
Personal Relationships/Social Support	4 (40.0)
Other (eg, cooking tips, meal preparation, management of complications)	3 (30.0)
Educational Materials	
Educational materials are provided	9 (90.0)
Educational materials are made in house	5 (50.0)
Goal-setting (N, %)	
Goal-setting and goal achievement are major focuses	4 (40.0)
Sometimes patients set their own goals	3 (30.0)
Patients do not set goals	2 (20.0)
Missing	1 (10.0)
Incentives Provided (N, %)	
(includes drinks, snacks, free supplies, food pantry)	4 (40.0)

Note. SMA, Shared Medical Appointment.

to help train our physicians better on diabetes and function as an interdisciplinary team." Leadership Support was also identified as an element of organizational capacity for implementation. One pharmacist indicated, "Our leadership is very supportive. Our medical director has even sat in to observe." A certified diabetes educator expressed a similar sentiment: "We work for a very forward-thinking organization, so they support this type of work." Some of the clinical champions explicitly linked leadership support back to Efficiency and Access. For example, a pharmacist stated, "Leadership really is encouraging teams to use groups as a tool to improve access."

Theme 3: Characteristics of SMA interventions and delivery are often tailored to Patient Population and clinic attributes. Heterogeneity in SMA approaches appears to, in part, stem from differences in Patient Population served by the clinic. As a result, there are implications for delivery characteristics such as Recruitment and SMA Delivery or Characteristics. Clinics targeted different patient populations for participation in the diabetes SMAs. For example, one clinic offered SMAs that were open access for all patients with a diabetes diagnosis to participate in the groups with an accompanying family member or friend. One pharmacist indicated that, for a longitudinal series of SMAs, the most important criteria is that the patients are "the people that are going to come back. A big part of this is the continuity of relationships with providers or other patients because they are more likely to set goals with each other." Most clinics targeted specific patients, usually those with HbA1C levels that were above target, to justify this more intensive approach. However, many respondents indicated that this approach may be better suited to those who are newly diagnosed or closer to goal. A pharmacist described this rationale: "The closer people are to overall goal (A1C), we can move those people, because they're so close. The further from the goal, the less likely they are to benefit from this approach since it's focused on lifestyle and behavior." A different pharmacist stated that "... recently diagnosed can benefit the most because they're overwhelmed and may not know what questions to ask."

Recruitment was described in a variety of ways, including flyers, announcements, and clinic meetings, or scripted calls from a medical assistant based on an electronic medical record query. PCP referrals were the most common strategy for filling groups. PCPs were engaged in different ways. For example, a list of patients from a medical record query could be provided for PCP approval to be contacted to participate in SMAs. Different strategies were employed to boost recruitment and retention, including small incentives like healthy snacks, and dedicated staff to do personal reminder calls in addition to "robo-calls." One pharmacist stated: "We have found that reminder calls can make or break a group."

The SMA Delivery or Characteristics code captured a common order of activities that consisted of check-in, intake, and a dedication of 45-70 minutes to diabetes group

education and discussion while patients were pulled out for one-on-one visits with the provider. However, there was significant variation across clinics for how this one-on-one time was used to both bill for the visit and efficiently address individual concerns or medical needs. For example, most sites removed patients from the group to meet with a provider in a separate examination room or behind a privacy partition. However, one site conducted individual encounters in front of other group participants with each patient's consent. Providers often indicated that a comprehensive history and physical exam was not conducted, but rather an abbreviated clinical evaluation pertinent to a diabetes diagnosis was performed. This could include a foot exam, medication list review, review of blood glucose logs, and ordering preventive screenings or labs that were due. Provider roles varied across sites, ranging from being narrowly involved with a brief physical evaluation to a more expanded role of participating in the group. Pharmacists were successfully integrated into many clinics' delivery of diabetes SMAs. Their role varied by site but included participating in engaging patients as a group to improve medication adherence, medication reconciliation, and adjustments based on individual consultation. Billing logistics were coded under this theme and ranged based on clinic. Free and Veterans Health Administration clinics did not bill and had zero or minimal copayments. Other clinics billed "just like a regular office visit" or at an appropriate level based on the diagnosis code, while one physician indicated that we are "financially viable with 4 or more patients."

Discussion

To our knowledge, this is the first study to examine diabetes SMA characteristics, delivery, and prevalence across real-world clinical settings. Our findings reveal that dissemination of SMAs for patients with diabetes has been limited, despite evidence of their effectiveness. Only 5 of the health systems contacted offered diabetes SMAs. Within these 5 health systems, 10 clinics offered SMAs, which suggests that uptake has been modest even within the health systems in North Carolina that offer SMAs. In a survey of these 10 clinics, we found that several aspects of SMA delivery were largely consistent across all sites, including the SMA duration and patient cohort. We also found evidence of notable heterogeneity in other features of SMAs.

TABLE 3.
Qualitative Codes, Definitions, and Illustrative Quotes
About Diabetes Shared Medical Appointments in North
Carolina

This table is available in its entirety in the
online edition of the NCMJ.

Note. SMA, Shared Medical Appointment; CDE, Certified Diabetes Educator; HEDIS, Healthcare Effectiveness Data and Information Set; PACT, Patient Aligned Care Team; RN, Registered Nurse; RD, Registered Dietician

There was relative consistency across sites with regard to the frequency and duration of SMAs. All sites, except one, reported a frequency of monthly or more and 1.5 hours or more. Based on the majority of responses, SMA “dose” may be optimized in real life as monthly occurrences that last approximately 1.5 hours. This is a lower frequency than in clinical trials that test the efficacy of weekly or biweekly meetings [14].

There is also consistency across sites regarding the nature and size of the patient cohort. Most SMAs in North Carolina are open cohorts with approximately 8 patients per session, with a maximum of approximately 15 patients per session. We hypothesize that the popularity of the open cohort reflects the real-life challenges of patient recruitment, attendance, and scheduling logistics surrounding SMAs and their care teams. The size of 8 patients is consistent with other reports in the literature, where groups of 6 to 8 patients are commonly used [14].

Three key takeaways or themes emerged from the identified codes found in the qualitative data. The first is that adoption of SMAs into clinical practice is based on perceived advantages for both patients and clinicians. Second, leadership support and team-based care emerged as key facilitators of SMA implementation. Nurses and pharmacists were heavily involved in all diabetes SMAs across all sites, suggesting that these members of the care team may be regarded by organizations as essential to the delivery of SMAs. Pharmacists may be uniquely situated to facilitate diabetes SMAs due to the emphasis on medical adherence and titration that underlies a large portion of type 2 diabetes self-management strategies [14]. In addition, the majority of sites surveyed reported involvement from trainees in medicine, nursing, and pharmacy. SMAs may offer an educational opportunity for trainees across different programs to learn more about a multidisciplinary approach to diabetes care [18]. Third, there was significant variation in eligibility criteria and recruitment strategies. This may reflect a lack of consensus on which patient populations are best served by SMAs. For example, clinical champions had differing perspectives on whether SMAs were best for patients with persistently poorly controlled diabetes or for newly diagnosed patients. Our data suggest that these aspects of SMAs need to be tailored to individual sites to maximize the efficiency of both recruitment and retention.

All SMAs included discussion and diabetes group education. Interestingly, 60% of sites surveyed used scripts and focused session topics and 50% of clinics were creating educational materials in-house. This may reflect challenges of the open cohort, where each session may include a mix of old and new patients. It also signals the lack of a structured and available curriculum or programming based on best practices that can be delivered during SMAs. Despite the inconsistency in the structure of diabetes group education, there was high saturation with regard to the themes of patient education. For example, all sites emphasized medications, medi-

cation adherence, and nutrition, which reflects the current standards of care and self-management priority areas [19]. Additional research is required to explore best practices for structuring one-on-one patient encounters with providers as part of an SMA to maximize their clinical benefit and coordinate care with a patient's primary care provider.

SMAs have had only modest uptake [4-5]. However, their clinical efficacy and ability to serve as vehicles for comprehensive diabetes care, patient engagement, and health self-management education make them uniquely suited to improve population health management and provide patient-centered care. Taken together, our data suggest that a refined and standardized intervention that synthesizes these best practices is critically needed to amplify the positive impact of SMAs in real-world clinical settings. Such a model would be adaptable and transposable but integrate core components into the approach. Toward this end, we integrated our data into a schematic (see Figure 1) based on features that were both heavily saturated and highly variable across sites and that have been described in randomized trials of diabetes SMA interventions. We suggest that the core aspects of SMAs, including leadership support, viable finances, and sustainable frequency, are critical to SMA implementation. With these basic capacities, we propose that staffing, patient populations, access/structure of SMAs, and documentation/incentives can be increasingly modified to meet the individual needs of each clinic.

This study has limitations. As a pilot study, there are small sample sizes. There may be additional SMA sites among the major health systems contacted that were missed. Our data may have limited generalizability to small or privately operated health clinics. We were unable to assess the efficacy of SMAs in terms of patient outcomes. We urge that there is a need for streamlined collection of data for outcomes research in the future. For example, a single EHR code to indicate SMAs would allow for easier, large-scale analyses in the future and would leverage joined EHR systems across the state and region.

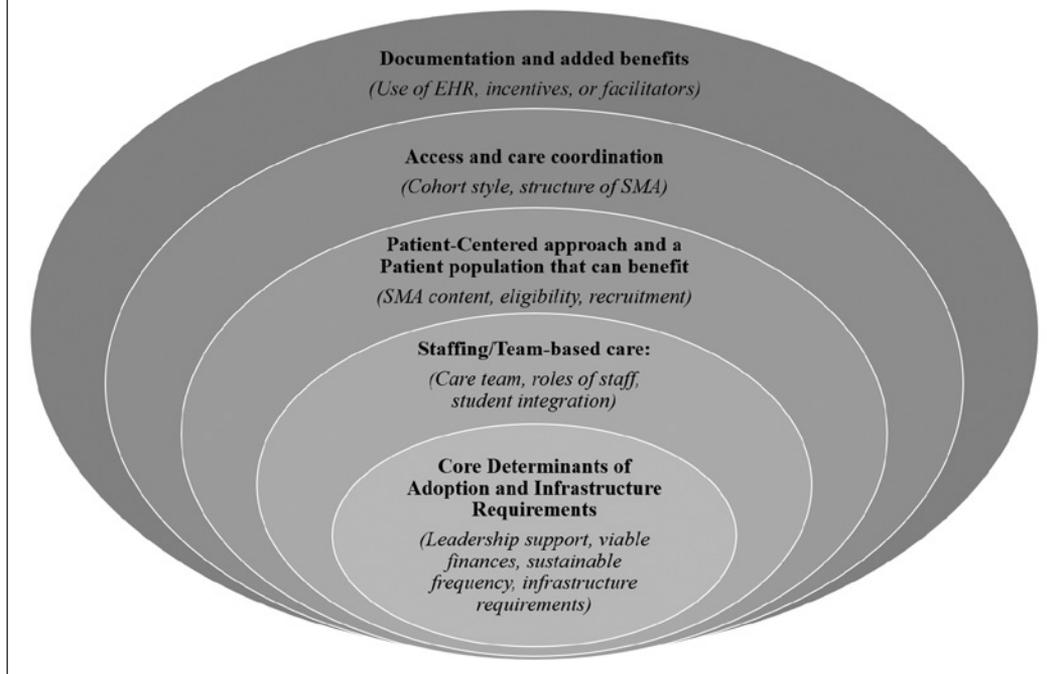
Conclusions

The data from our structured survey indicate that SMAs are a model being used to impact the complex management of diabetes through group provider and patient engagement. We found evidence of significant heterogeneity in the delivery and characteristics of diabetes SMAs in North Carolina with only modest uptake across the health systems included in this study. Further research to identify best practices may enable implementation and dissemination efforts for SMAs into diverse real-world clinical settings. **NCMJ**

Connor Drake, MPA research program director, Duke Center for Personalized Health Care, Duke University School of Medicine, Durham, North Carolina; PhD candidate, Department of Health Policy and Management Gillings School of Global Public Health, University of North Carolina at Chapel Hill, Chapel Hill, North Carolina.

Julienne K. Kirk, PharmD professor, Department of Family and Community Medicine, Wake Forest University, Department of Family and

FIGURE 1.
Best Practices for Diabetes SMA Delivery and Implementation



Community Medicine, Wake Forest School of medicine, Winston-Salem, North Carolina; certified diabetes educator, Diabetes and Endocrinology Center, Wake Forest Baptist Health, Winston-Salem, North Carolina.

John B. Buse, MD, PhD Verne S. Caviness distinguished professor, Division of Endocrinology & Metabolism, Department of Medicine, University of North Carolina School of Medicine, Chapel Hill, North Carolina.

David Edelman, MD professor, Division of General Internal Medicine, Department of Medicine, Duke University School of Medicine, Durham, North Carolina; research associate, Center for Innovation, Durham VA Health Care System, Durham, North Carolina.

Christopher M. Shea, PhD associate professor, Department of Health Policy and Management, Gillings School of Global Public Health, University of North Carolina at Chapel Hill, Chapel Hill, North Carolina.

Susan Spratt, MD associate professor, Division of Endocrinology, Department of Medicine, Metabolism, and Nutrition, Duke University School of Medicine, Durham, North Carolina.

Laura A. Young, MD assistant professor, Division of Endocrinology & Metabolism, Department of Medicine, University of North Carolina School of Medicine, Chapel Hill, North Carolina.

Anna R. Kahkoska, PhD MD/PhD candidate, Department of Nutrition, Gillings School of Global Public Health, University of North Carolina at Chapel Hill, Chapel Hill, North Carolina.

Acknowledgments

We would like to thank all clinical sites for their time and participation in this project. We also gratefully acknowledge the support and mentorship from the team at the Duke Center for Personalized Health Care.

J.B.B. and C.M.S. are funded by a grant from the National Institutes of Health's National Center for Advancing Translational Science, UL1TR002489. A.R.K. is supported by funding from the National Institute of Diabetes and Digestive and Kidney Disease of the National Institutes of Health under Award Number F30DK113728.

Potential conflicts of interest. The authors have no relevant conflicts of interest.

All authors conceptualized the project. C.D. and A.R.K. collected and analyzed the data and wrote the manuscript. C.M.S. provided oversight of the qualitative analysis. J.K., J.B.B., D.E., L.Y. reviewed and edited the manuscript.

References

- Centers for Disease Control and Prevention. National Diabetes Statistics Report, 2017. Atlanta, GA: Centers for Disease Control and Prevention, US Department of Health and Human Services; 2017.
- American Diabetes Association. Standards of medical care in diabetes—2018 abridged for primary care providers. *Clinical Diabetes*. 2018;36(1):14-37.
- Vazquez-Benitez G, Desai JR, Xu S, et al. Preventable major cardiovascular events associated with uncontrolled glucose, blood pressure, and lipids and active smoking in adults with diabetes with and without cardiovascular disease: a contemporary analysis. *Diabetes Care*. 2015;38(5):905-912.
- Wagner EH, Austin BT, Davis C, Hindmarsh M, Schaefer J, Bonomi A. Improving chronic illness care: translating evidence into action. *Health Affairs*. 2001;20(6):64-78.
- Wagner EH, Austin BT, Von Korff M. Organizing care for patients with chronic illness. *The Milbank Quarterly*. 1996;74(4):511-544.
- Lorig KR, Holman H. Self-management education: history, definition, outcomes, and mechanisms. *Ann Behav Med*. 2003;26(1):1-7.
- Hibbard JH, Greene J. What the evidence shows about patient activation: better health outcomes and care experiences; fewer data on costs. *Health Affairs*. 2013;32(2):207-214.
- Hibbard JH, Stockard J, Mahoney ER, Tusler M. Development of the patient activation measure (PAM): conceptualizing and measuring activation in patients and consumers. *Health Services Research*. 2004;39(4p1):1005-1026.
- Fisher EB, Earp JA, Maman S, Zolotor A. Cross-cultural and inter-national adaptation of peer support for diabetes management. *Fam Pract*. 2010;27(suppl 1):i6-16.
- Peers for Progress. What is Peer Support? Peers for Progress website. <http://peersforprogress.org/learn-about-peer-support/what-is-peer-support/>. Accessed March 8, 2017.
- American Diabetes Association. Standards of medical care in diabetes-2018. *Diabetes Care*. 2018;41(suppl 1):S1-S159.
- Housden LM, Wong ST. Using group medical visits with those who have diabetes: examining the evidence. *Current Diabetes Reports*. 2016;16(12):134.
- Edelman D, Gierisch JM, McDuffie JR, Oddone E, Williams Jr. JW. Shared medical appointments for patients with diabetes mellitus: a systematic review. *J Gen Intern Med*. 2015;30(1):99-106.

14. Edelman D, Gierisch JM, McDuffie JR, Oddone E, Williams JW. Shared medical appointments for patients with diabetes mellitus: a systematic review. *J Gen Intern Med.* 2015;30(1):99-106.
15. Damschroder LJ, Aron DC, Keith RE, Kirsh SR, Alexander JA, Lowery JC. Fostering implementation of health services research findings into practice: a consolidated framework for advancing implementation science. *Implementation Science.* 2009;4(1):50.
16. O'Brien BC, Harris IB, Beckman TJ, Reed DA, Cook DA. Standards for reporting qualitative research: a synthesis of recommendations. *Acad Med.* 2014;89(9):1245-1251.
17. Hsieh H-F, Shannon SE. Three approaches to qualitative content analysis. *Qual Health Res.* 2005;15(9):1277-1288.
18. Cohen LB, Taveira TH, Khatana SAM, Dooley AG, Pirraglia PA, Wu W-C. Pharmacist-led shared medical appointments for multiple cardiovascular risk reduction in patients with type 2 diabetes. *The Diabetes Educator.* 2011;37(6):801-812.
19. Kirsh SR, Schaub K, Aron DC. Shared medical appointments: a potential venue for education in interprofessional care. *Qual Manag Health Care.* 2009;18(3):217-224.

SUPPLEMENTAL TABLE.

Identification of Diabetes Shared Medical Appointments and their Clinical Champions Across the 13 Health Care Systems in North Carolina

Clinic/Health System	Description	SMA Offered	Clinical Champion*
Cape Fear	Private not-for-profit health system based in Fayetteville, NC.	No	-
Atrium Health (formerly Carolinas HealthCare Systems)	Private not-for-profit health system in Charlotte, NC and surrounding area.	No	-
Cone Health	Private not-for-profit health system based in Greensboro, NC.	No Response	-
Duke/Durham	Private not-for-profit academic medical center and health system based in Durham, NC.	Yes	-
<i>Duke Outpatient Clinic</i>	-	Yes	Clinical Pharmacist
<i>Duke Family Medicine</i>	-	Yes	Medical Doctor - Family Medicine
<i>CARE Community Center</i>	-	Yes	Medical Doctor - Endocrinology
Piedmont Health Services	Community health center with clinics across the Piedmont region.	Yes	Medical Student
Durham VA Health Care System	Public health system operated under the US Department of Veterans Affairs (VA).	Yes	-
<i>Durham VA Medical Center</i>	-	Yes	Medical Doctor - Internal Medicine
<i>Hillandale CBOC 1</i>	-	Yes	Clinical Pharmacist
<i>Raleigh III CBOC</i>	-	Yes	Clinical Pharmacist
FirstHealth of the Carolinas	Private not-for-profit health system based in Pinehurst, NC.	Yes	-
<i>Bariatric Clinic</i>	-	-	Registered Dietician
Mission Health	Private not-for-profit independent community hospital system based in Asheville, NC.	No	-
Novant Health	Private not-for-profit health system based in Winston-Salem, NC.	No Response	-
UNC Health Care	Public not-for-profit academic medical center and health system based in Chapel Hill, NC.	Yes	-
<i>Open Door Clinic of Alamance County</i>	-	Yes	Medical Student
<i>UNC School of Medicine Student Health Action Coalition (SHAC)</i>	-	No	-
Vidant Health	Private not-for-profit health system based in Greenville, NC.	No	-
WakeMed	Private not-for-profit health system based in Raleigh, NC.	No	-
Wake Forest Baptist Health	Private not-for-profit academic medical center and health system based in Winston-Salem, NC.	Yes	-
<i>Family and Community Medicine Outpatient Clinic</i>	-	Yes	Clinical Pharmacist

*Clinical champions were identified where SMAs were offered only.

TABLE 3.
Qualitative Codes, Definitions, and Illustrative Quotes About Diabetes Shared Medical Appointments in North Carolina

Qualitative Code	Definition	Illustrative Quote
Satisfaction	Clinicians prefer SMAs to usual care and derive greater satisfaction from SMA care redesign. This includes SMAs reducing provider burnout.	<p>"[We] saw it as another way to see a lot of patients and prevent provider burnout, particularly in primary care and family medicine, where the model is seeing a patient every 15 minutes."</p> <p>"The theory is that it could help take complicated patients from providers who were frustrated. We were not able to scale it up enough to test the third theory about provider satisfaction."</p>
Perceived Advantage	SMAs have perceived advantages for chronic care delivery to support self-management, more time with patients, improved outcomes, improved access, or other positive characteristics that make SMAs preferable to usual care for improving outcomes.	<p>"Our goal is: enable people to take care of their diabetes themselves. Some people find it easier if they have a weekly meeting to remind them of all of the diabetes habits and skills that are necessary. It's a little bit like Weight Watchers in that way. A lot of what we do is lifestyle coaching, reminding people of the importance of setting goals."</p> <p>"They like having the extra time with the health care team."</p>
Self-management Support	SMAs are described as a strategy for improving health behaviors and patient education related to health self-management such as diet, exercise, medication adherence, and stress reduction.	"I think it's those guys who [are] just told that they are diabetic or that they are prediabetic and need to make change. Targeting those with a new diagnosis or [who] want to prevent the development of diabetes. This is about [a] more general education resource."
Peer Support	SMAs enable social or peer support to improve outcomes and accountability.	<p>"[SMAs are a] good way to connect patients to support each other."</p> <p>"We don't know what types of personalities are drawn to this; anecdotally we found that people that are more drawn to peer support and engaged tended to participate. We don't have any data to support this."</p>
Access	SMAs have greater capacity and therefore increase patient access to treatment and care.	<p>"I was part of the team that recognized the need. The main need we saw was that patients didn't have access to healthy food and there was a lot of food insecurity"</p> <p>"Efficiency as well; no-show rates were high in the low-income population we were trying to reach and serve. Patients were being shuttled to nutrition one day, provider another day, so this was an attempt to integrate those services all into one visit. This could also help us offset the expense of a no-show rate; more efficient for provider, educator, and patient."</p>
Leadership Support	When the respondent indicates leadership support for delivering SMAs from the health system or clinic level.	"Our leadership is very supportive of SMAs. Our medical director has even sat in to observe. When we've needed additional administrative support, she's been a good advocate. And scheduling the assigned resident can be a bit of a nightmare, and the leadership has continued to view SMAs as a priority. We also have dedicated staff to do personal reminder calls...We have found that reminder calls can make or break a group!"
Team-based Care	SMAs are associated with team-based care.	<p>"On the diabetes side we decided to implement them to help train our physicians better on diabetes and function as an interdisciplinary team."</p> <p>"Julienne is a CDE and pharmacist. Med students are allowed to sit in but not part of care team. Behavioral health specialist (psychologist) does the mind-body spiritual session. RD for nutrition session."</p>
Efficiency	SMAs are associated with efficiency and improving access or patient volume.	"We felt the clinic was inefficient and diabetes outcomes weren't great. We cared about the efficiency and also there is so much really basic education going on, so we felt it would save some redundancy. Gain some economy of scale as doing it as a group. A lot of patients struggling with basic diabetes education and self-management and this would be a good way to address this."
Recruitment	Describes processes, workflows, or strategies for recruiting and referring patients into SMAs.	<p>"It's been discussed at the monthly clinic-wide meetings. Once the schedule is built, I let all the providers know how to refer, who to refer. An e-mail is sent to all of the providers. Each pharmacist meets with their PACT team every week—it's always encouraged for us to tell providers to refer to groups to meet HEDIS measures. The RN case managers have done a great job at taking the lead at finding patients to come to the group. We have a flyer (not put up yet)."</p> <p>"We've had them going on for so long they're pretty established. Reiterate them at staff meetings."</p>

TABLE 3. continued

Qualitative Code	Definition	Illustrative Quote
Patient Population	When the patient population of interest for receiving an SMA intervention is described. This could include patient characteristics, knowledge, skills, and abilities of patients that participate or of patients that derive the greatest benefit.	<p>“We tend to target sicker patients to justify an intensive approach like this —patients at very high risk of complications—so for example A1C over 8, high blood pressure, also patients that would do well in a group.”</p> <p>“There really isn’t any [eligibility criteria]. They could be diabetes, prediabetic, or advanced diabetes.”</p> <p>“Anyone who walks in. We have a surprising number of type 1 diabetics. Anyone who is interested in learning more about diabetes. Some people come in with spouses or family members, some of them don’t have diabetes.”</p> <p>“Those who are closest to goal ... the self-management things we focus on tend to help them achieve that goal. I can move somebody that’s not so far off, as opposed to someone who is far off and there are all kind of barriers. The closer people are to the overall A1C goal, we can move those people, because they’re so close. The further from the goal, less likely to benefit from this approach since it’s focused on lifestyle and behavior.”</p> <p>“I’ve found that it’s been helpful for veterans who were diagnosed a long time ago and their sugars are creeping up—so it can be helpful for the people that have fallen off the bandwagon.”</p> <p>“I definitely think the recently diagnosed can benefit the most because they’re overwhelmed and may not know what questions to ask. They don’t have time to ask questions like, “What is diabetes?” Those patients benefit a lot because they learn about what diabetes is and goals. There’s also a lot of time dedicated to nutrition, which is really helpful for them.”</p> <p>“It is the people that are prediabetic that have an [A1C test] over 6.5% within three years of their initial diagnosis. They should either be managing with diet and lifestyle or oral medication only. For people on injectable drugs, it’s harder to move the needle. Why? People still have hope. People are motivated nearer to the diagnosis. Less time for complications. Less naive about drug/treatment options, so we have choices that we haven’t tried already.”</p> <p>“[We] believe this is beneficial for a wide array of patients. Especially newly diagnosed or for patients experienc[ing] complications. Even can be good for patients who have lived with diabetes for a long time and sugars are way out of control. Would not consider this type of program appropriate for patients with a cognitive impairment or severe persistent mental illness.”</p> <p>“A big part of this is the continuity of relationship (with both providers and other patients) because they are more likely to set goals with each other. Women seem a little bit more comfortable with this format and connecting with strangers and engaging with other people. I think people who are struggling are the ones who benefit the most because they come with things they want to talk about. Newly diagnosed is helpful too. The people that are newly diagnosed and not worr[ie]d about it are probably not going to come. The important moderator here is personality, how invested people are in it. Female-female relationships seem to form the fastest.”</p> <p>“SMAs benefit men in particular; we saw when multiple men were in a group they really thrived the most.”</p>

TABLE 3. continued

Qualitative Code	Definition	Illustrative Quote
SMA Delivery or Characteristics	Intervention characteristics and delivery such as educational content, activities, clinical activities, or group discussion that occur during the SMA visit.	<p>“Presentation of educational content, group discussion on educational content, and goal-setting along with the intake and elements of the medical visit. The goal-setting discussion is done during the one-one-one visit with the provider, so that people aren’t just sitting there. People take their own weight and they write down their weight on their sheet. We make them responsible for their numbers. Group time happens after all of the intake and goal-setting, then group discussion and educational portion begins.”</p> <p>“We have a ‘dialogue sheet.’ It’s each person’s most recent A1C, cholesterol, blood pressure—and then the definition of ‘goal’ ranges for those values. I will look up patients to see meds and [Hemoglobin A1C test results], we make sure to order them if the labs are past due. Have they had a recent eye test? All of those HEDIS measures. And then the nurse calls everyone back, then I come in and introduce myself and the visit. I start off by asking what the participants’ concerns are related to diabetes. I try to identify some of those common concerns that people have—we put those up on the board to make sure we address them. A quick review of what causes diabetes. We go through a very simple description of pancreas, muscles, etc. Then I go into the uncontrolled diabetes and the consequences. Then we talk about blood sugar goals, when to check, what numbers should you see. We talk about hypoglycemia and appropriate ways to treat a low blood sugar. Here’s your Hemoglobin A1C value and then how does it relate to your blood sugar levels that you’re measuring each day.”</p>
Workforce Development	The extent to which additional skills, knowledge, and ability of staff and clinicians is required to deliver SMAs.	<p>“Facilitation training is key. I received that through CenteringPregnancy training. If you do not understand how to be a facilitator and quiet down the person talking too much or invite quiet people to join the group, or you as a facilitator are talking too much, you need to do a good job engaging the group.”</p>

Note. SMA, Shared Medical Appointment; CDE, Certified Diabetes Educator; HEDIS, Healthcare Effectiveness Data and Information Set; PACT, Patient Aligned Care Team; RN, Registered Nurse; RD, Registered Dietician