



# Diabetes Management for Community Paramedics: Development and Implementation of a Novel Curriculum

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More than one in seven American adults are living with diabetes (1), making the disease a leading cause of morbidity, disability, impaired quality of life, and high health care costs in the United States (1–7). Despite advances in the science of diabetes management, rates of diabetes complications remain unacceptably high, particularly among racial/ethnic minorities, low-income individuals, and residents of rural areas (1,8–10), who often have limited access to comprehensive diabetes care. Such care includes diabetes self-management education and support (DSMES), which improves diabetes knowledge, self-care behaviors, glycemic control, and quality of life, as well as reduces mortality and health care costs (11). DSMES also supports timely and effective treatment modification to achieve glycemic control, improvement of hypoglycemia awareness, and prevention of severe dysglycemia (11).

Most often, DSMES is delivered by nurses, dietitians, and pharmacists who pursue additional certification as diabetes care and education specialists (CDCESs) (12). Unfortunately, many people who need DSMES have no or limited access to CDCESs, spurring efforts to expand DSMES availability by engaging community health workers (13,14) and even peers (15,16). Recognizing the continued need for adaptive person-centered solutions to gaps in DSMES availability, diabetes care quality, and health outcomes, our team has engaged community paramedics (CPs) to deliver DSMES to adults living with diabetes.

CPs are well positioned to care for individuals with both medical and socioeconomic complexities with the goals of improving access to care and health outcomes and reducing costs (17–19). CPs are experienced paramedics with advanced training in both emergency medical services (EMS) and the management of low-acuity and chronic

health conditions, primary and preventive care, and social determinants of health (SDOH). CPs practice under the supervision of a physician medical director to provide a wide range of services tailored to each patient's medical, educational, and social needs. These services include preventive interventions, chronic disease management, wound care, and post-hospitalization care transitions (17,18,20–30). This scope contrasts with the traditional role of EMS providers, which is focused on episodic high-acuity care for emergent conditions and transport to a higher level of care when appropriate.

However, there is wide variability in EMS and CP education about diabetes and its management, hindering these professionals from delivering more formalized DSMES. Thus, additional training may be needed to equip CPs to deliver DSMES, support comprehensive diabetes care, and tailor their services to address both psychosocial and medical barriers to optimal diabetes care. With such training, CPs can be valuable members of the diabetes health care team, engaging people living with diabetes and their caregivers in the home setting to identify barriers to optimal diabetes care, helping to communicate these barriers to individuals' health care providers, delivering focused DSMES in response to identified barriers, and connecting individuals to clinical and community resources they need to live well with diabetes.

To meet this need, we developed and implemented a focused diabetes training curriculum designed specifically for CPs. The content of this curriculum builds on education provided during initial EMS paramedic and subsequent CP training programs and seeks to provide CPs with deeper knowledge of the pathophysiology and management of diabetes and its

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complications, pharmacology, diabetes technologies, self-management skills, mental health, nutrition and wellness, SDOH, and adult education theory. Although developed and implemented within a single ambulance agency, this curriculum can be adapted to the local resources and needs of individual EMS agencies and health care institutions to improve the care for people living with diabetes.

### Research Design and Methods

#### *Setting*

Mayo Clinic Ambulance is an advanced life support provider and the primary response, treatment, and transport service for 14 locations throughout eastern and central Minnesota and western Wisconsin, covering 6,894 square miles of urban, suburban, and rural areas. Mayo Clinic Ambulance first established a CP service in rural northwest Wisconsin in late 2015 and has maintained 1.0 CP full-time equivalent (FTE) in that role since that time. In 2020, an additional 2.1 FTE CPs (four CPs) were hired in the southeast Minnesota region, further increasing to 3.0 FTE CPs (six CPs) in 2021. The diabetes curriculum described herein was delivered to these seven CPs (four women and three men) with a wide range of years of experience in EMS (median 12 years, range 5–31 years) when counting their cumulative experience in military medic, emergency medical technician (EMT), paramedic, and CP positions at the time the diabetes training was completed. One CP had been practicing as a CP for 2 years, whereas all of the others were new to community paramedicine at the time of the training. All CPs in the program were included in the training and in subsequent evaluations and analyses.

#### *Needs Assessment and Foundational Diabetes Training*

The enhanced diabetes curriculum developed and evaluated here was designed to complement and build on existing EMS paramedic and CP training. The foundational paramedic and CP education is overseen by the Mayo Clinic School of Health Sciences. Briefly, the paramedic program curriculum for diabetes focuses on the epidemiology and pathophysiology of diabetes-related emergencies. Clinical scenarios and practical simulations are used to demonstrate and practice the implementation of relevant patient care guidelines. The CP specialization program follows the American Academy of Orthopedic Surgeons' community paramedicine textbook (31) and covers additional diabetes and diabetes-related content. This added content covers the anatomy and physiology of the endocrine system and provides a deeper understanding of the pathophysiology and clinical presentation of diabetes across the spectrum of disease acuity and severity.

Coursework focuses on the diagnostic criteria of diabetes, common comorbidities, required laboratory monitoring, complications of diabetes, medications used to treat diabetes, basic principles of lifestyle therapy, and relevant SDOH. Formal didactics are coupled with practical simulations that connect the classroom environment to the practical environment in which the CPs will be working. The simulations include specific medical scenarios that are commonly encountered by CPs. A total of 25 simulations focus on diabetes, including 8 longitudinal experiences that span the 10-week duration of the course and 17 single scenarios. For example, one longitudinal simulation focuses on an individual with newly diagnosed type 2 diabetes and symptomatic hyperglycemia who needs education about diabetes and its complications, monitoring, metformin, and lifestyle management. Another simulation focuses on a person with a longer duration of diabetes who recently experienced deterioration of glycemic control; the goal of this simulation is to work with the individual to identify barriers to optimal diabetes care and provide support to improve glycemic control.

After each simulation, students are provided with constructive actionable feedback through group discussion among the student, peers, and instructors. This standard diabetes education from the CP specialization program served as the foundation for the subsequent enhanced Community Paramedic Diabetes Education Program delivered to the Mayo Clinic Ambulance CP team after the CPs were hired and before they started caring for people living with diabetes.

#### *Enhanced Community Paramedic Diabetes Education Program*

The objective of the focused Community Paramedic Diabetes Education Program that is described herein was to build on the existing training and provide CPs with deeper practical knowledge of diabetes management to allow them to deliver DSMES to people living with diabetes. Given the CPs' unique ability to care for people living with diabetes in their personal environments, the educational content was designed to maximize this powerful dynamic. A secondary goal was to train and empower CPs to share their knowledge and experience with other EMS providers in the ambulance service. The expectation was that they would become local subject matter experts in diabetes, diabetes management, and resources to support people living with diabetes.

The educational subject matter, not including guest speaker content, was based on the American Diabetes Association's (ADA's) current *Standards of Medical Care in Diabetes* (11,32–36) and Mayo Clinic patient education resources used by Mayo

Clinic CDCESs throughout the institution. It was designed to reflect the most up-to-date, evidence-based recommendations on person-centered care. The lived experience with diabetes was central to all included elements, and this content was designed to prepare CPs with both the functional and soft skills to empower and support people with diabetes and their caregivers. These functional skills included specific instruction on teaching patients about meter use techniques, insulin pen use, site rotation, insulin pump infusion site disconnection, hypoglycemia treatment, etc. The complementary soft skills were related to navigating the emotional and psychological considerations that CPs could encounter during their patient interactions, as well as a deeper understanding of the psychological and socioeconomic considerations that affect the outcomes of diabetes self-care. Thus, each subject area was taught as three complementary components: presentation of the clinical content, how to teach this content to people living with diabetes (including reference to formal patient education materials used at Mayo Clinic), and what clinical and community resources can be leveraged to access additional or specialized support in these areas. Themes covered in the curriculum are detailed in Table 1.

Feedback on course content was sought from two people living with diabetes to ensure person-centeredness, with content iteratively refined to meet the needs and expectations expressed by people living with diabetes, paramedic and CP programs' educators (J.L.S. and D.M.), CP program leadership (L.A.M., P.N.C., C.P.L., and M.B.J.) and medical direction (R.G.M.), and a diabetes education subject matter expert (A.L.K.).

Lecture content for the 2-day course was developed and delivered jointly by A.L.K. (a registered nurse and CDCES), R.F.J. (a patient care and education specialist), and R.G.M. (an endocrinologist, primary care physician, and medical director of the CP service), with guest lectures by an educator in cultural competency within health care settings, diversity, equity, and inclusion; a registered dietitian; and a psychiatrist. These guests developed and delivered their own content. Guest speakers were provided with guidance on which subject areas and objectives to cover in their lectures, and their lecture content was reviewed in advance to ensure that these objectives were met. In the event of gaps, R.G.M. and A.L.K. provided additional content during other didactic segments.

Additionally, for continuing education and the just-in-time trainings, we developed standalone modules that covered the same content as the original program but could be delivered independently for continuing education and for onboarding new staff. These modules were delivered approximately 1 year after the original 2-day course to train a new team of CPs who

had just joined the program in a Diabetes Bootcamp program, as well as in continuing education CP conferences.

### *Program Evaluation*

Pre- and post-program exams were completed by all five participants in the original 2-day Community Paramedic Diabetes Education Program. A pass rate of 80% was required for program completion. One year after the program was delivered, during which the participating CPs had the opportunity to care for people living with diabetes, the five CPs who completed the initial course were surveyed to assess their satisfaction with the training, usefulness of the training and its components, and any residual gaps they identified in the course of their practice. Two CPs who joined the practice in the spring of 2021 were also surveyed, but they received only the just-in-time training in modular form (Diabetes Bootcamp). Survey questions can be viewed in Supplementary Appendix S1. The survey was administered using a de-identified REDCap electronic survey with up to three reminders sent via e-mail to nonresponders. Survey results were analyzed descriptively, with results presented as numbers and percentages. No formal statistical analysis was conducted because of the small sample size. The survey was exempt from institutional review board review because it evaluated an educational program/tool. The survey instrument informed respondents that their feedback would be anonymous and that the summary results may be shared for education research purposes.

### **Results**

The initial 2-day Community Paramedic Diabetes Education Program was delivered live in a classroom setting to a small group of CPs. A live video feed was set up to stream content to other locations and be viewable on personal computers and devices for all other interested Mayo Clinic Ambulance staff. Training included hands-on practice with glucose meters, insulin pens and syringes/vials, glucagon devices, digitally connected insulin pens, insulin pumps, and continuous glucose monitoring (CGM) systems. Each participant received a binder with lecture slides and patient education materials relevant to the topics covered. The purpose of these materials was to facilitate instruction on how to teach this content to people living with diabetes and their caregivers. All content was subsequently saved online in a SharePoint folder accessible to all Mayo Clinic Ambulance staff.

**TABLE 1** Community Paramedic Diabetes Education Program Content

Class/Module	Content
<i>Day 1, morning</i>	
Cultural competency (1 hour)	<ul style="list-style-type: none"> <li>• Cultural competence in the health care setting</li> <li>• Culture and developing cultural agility</li> <li>• Examining individual and system bias</li> <li>• Intercultural development</li> </ul>
Diabetes overview (45 minutes)	<ul style="list-style-type: none"> <li>• Epidemiology of diabetes in the United States</li> <li>• Pathogenesis of prediabetes and diabetes</li> <li>• Introduction to acute and chronic complications of diabetes*</li> <li>• Diabetes classification and diagnosis*</li> <li>• Comprehensive diabetes care*</li> <li>• Immunization recommendations</li> <li>• Recommended targets for glucose, A1C, blood pressure, LDL cholesterol, and weight management in diabetes*</li> </ul>
BGM (15 minutes)	<ul style="list-style-type: none"> <li>• Basics of glucose meters and BGM*</li> <li>• Logbook overview*</li> <li>• Sharps management and disposal*</li> </ul>
Hypoglycemia (30 minutes)	<ul style="list-style-type: none"> <li>• Classification and symptoms of hypoglycemia*</li> <li>• Causes of hypoglycemia*</li> <li>• Educating individuals on hypoglycemia self-management and prevention*</li> <li>• Glucagon*</li> </ul>
Hyperglycemia (30 minutes)	<ul style="list-style-type: none"> <li>• Classification and symptoms of hyperglycemia*</li> <li>• Causes of hyperglycemia*</li> <li>• DKA vs. HHS: diagnosis, causes, prevention, and treatment*</li> <li>• Sick-day management*</li> </ul>
<i>Day 1, afternoon</i>	
COVID-19 (15 minutes)	<ul style="list-style-type: none"> <li>• Overview of COVID-19</li> <li>• Risk and severity of COVID-19 in people living with diabetes</li> <li>• Risk of new/worsening diabetes because of COVID-19</li> <li>• Diabetes management in the setting of quarantine and social isolation</li> </ul>
Insulin (1 hour, 15 minutes)	<ul style="list-style-type: none"> <li>• Insulin types, preparations, action times*</li> <li>• Insulin administration*</li> <li>• Insulin storage*</li> <li>• Insulin dosing principles, correction scales, and dose adjustments*</li> <li>• Logbooks for individuals treated with intensive insulin therapy*</li> <li>• Life while on insulin therapy</li> </ul>
Noninsulin medications (1 hour)	<ul style="list-style-type: none"> <li>• Overview of different classes of noninsulin diabetes medications: mechanisms of action, administration principles, side effects, and cost considerations*</li> <li>• Treatment initiation and intensification principles*</li> </ul>
Medical nutrition therapy (1 hour)	<ul style="list-style-type: none"> <li>• Addressing common myths about nutrition and diabetes*</li> <li>• Healthy eating in people living with diabetes*</li> <li>• Recognizing disordered eating in diabetes*</li> <li>• Nutrition therapy in the setting of intensive insulin therapy*</li> </ul>
<i>Day 2, morning</i>	
Psychological and emotional elements of diabetes (1 hour)	<ul style="list-style-type: none"> <li>• Diabetes distress*</li> <li>• Common mental health problems in people living with diabetes: depression, anxiety, and serious mental illness*</li> <li>• Resources for individuals with mental health concerns*</li> </ul>
Teaching the adult learner (1 hour)	<ul style="list-style-type: none"> <li>• Adult learning theory</li> <li>• Teach back</li> </ul>
Socioeconomic barriers and resources (30 minutes)	<ul style="list-style-type: none"> <li>• Costs associated with insulin and noninsulin medications, administration supplies, and monitoring supplies*</li> <li>• Resources to help individuals afford their medications and equipment*</li> <li>• Free or low-cost diabetes clinics</li> <li>• Local support networks and resources</li> </ul>

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**TABLE 1** Community Paramedic Diabetes Education Program Content (Continued)

Class/Module	Content
Health literacy (1 hour)	<ul style="list-style-type: none"> <li>Assessing health literacy and numeracy*</li> <li>Communication and education strategies for all health literacy levels</li> </ul>
<i>Day 2, afternoon</i>	
Diabetes technology (30 minutes)	<ul style="list-style-type: none"> <li>Insulin pumps*</li> <li>CGM systems (isCGM and rtCGM)*</li> <li>Insulin pump/CGM combinations and hybrid closed-loop systems*</li> <li>Safety considerations*</li> <li>Troubleshooting and patient education*</li> </ul>
Chronic complications of diabetes and common comorbidities (30 minutes)	<ul style="list-style-type: none"> <li>Cardiovascular disease</li> <li>Cancer</li> <li>Lung disease (asthma, COPD, sleep apnea, and smoking)</li> <li>Kidney disease</li> <li>Neuropathy</li> <li>Obesity</li> </ul>
Personal experience panel (1 hour)	Conversations with individuals living with type 1 and type 2 diabetes

\*Adapted to individual didactic sessions that were delivered as a subsequent Diabetes Bootcamp program and other modules. BGM, blood glucose monitoring; DKA, diabetic ketoacidosis; HHS, hyperglycemic hyperosmolar state; isCGM, intermittently scanned CGM; rtCGM, real-time CGM.

Individual modules were later delivered virtually as part of the Mayo Clinic Ambulance Continuing Education Conference and in a hybrid format during an intensive, 1-day Diabetes Bootcamp program designed for newly hired CPs who did not receive the initial training.

### Evaluation

Five currently practicing CPs attended the 2-day program in June 2020; four attended in person and one (from northwest Wisconsin) attended via live telecast. Also in attendance in person were two CPs who were part of the CP program at the time but then transitioned to other roles, course instructors and organizers, and the Mayo Clinic Ambulance medical director. Pre- and post-program exams were completed by the six CPs attending in person (four who continued to practice as part of the CP program and two who resigned their positions and did not practice). The pass rate of  $\geq 80\%$  was achieved by one CP on the pre-program test and by all six CPs on the post-program test.

The evaluation survey was completed 1 year after the initial diabetes education program by five of the seven initial program recipients. Survey responses are detailed in Tables 2 and 3. These five respondents included three of five original-hire CPs who had attended the initial 2-day program and the refresher Diabetes Bootcamp and the two subsequent hires who only attended the Diabetes Bootcamp. The two nonresponders were from the original CP group who would have attended both the original 2-day course and the Diabetes Bootcamp. Both courses were rated as “excellent” by each responder (Table 2).

All CPs reported that their knowledge and comfort level in all topic areas improved because of the education program (Table 2). Knowledge improved most in the areas of using CGM, managing and preventing hyperglycemia, insulin therapy, insulin pump therapy, comorbidities prevalent among people living with diabetes, and personal perspective on the experience of living with diabetes.

Respondents had an opportunity to provide open-ended comments in the survey as well, with all content reproduced in Table 3. CPs noted that in-person training is the most effective way to deliver education. Education about diabetes medications and insulin regimens was deemed to be the most useful in practice, and additional content was requested on dietary considerations, comorbidity management, understanding health insurance and benefit design, and technology (i.e., insulin pump and CGM system) use.

### Discussion

The ADA strongly recommends that “all people with diabetes should participate in diabetes self-management education and receive the support needed to facilitate the knowledge, decision-making, and skills mastery necessary for diabetes self-care” (11). Unfortunately, people living with diabetes experience many barriers to receiving DSMES, including gaps in CDCES availability and inadequate insurance coverage for DSMES services beyond the first year of diabetes diagnosis (37,38). To address the urgent need for broader access to DSMES, particularly in underserved areas and populations, we developed an enhanced diabetes curriculum for CPs with the goal of allowing them to deliver more

comprehensive DSMES than was previously possible. The enhanced curriculum dives deeper into the pharmacology of diabetes management, technology use, medical nutrition therapy, mental health aspects of diabetes, and diversity and inclusion issues. Additionally, DSMES facilitated by CPs is designed to be delivered in an individual's home, where caregivers can be readily engaged and barriers to and facilitators of optimal diabetes care may be more apparent and more amenable to targeted intervention.

There are many barriers to optimal diabetes care and health outcomes, including gaps in access to medical care, diabetes distress, cost-related barriers, and socioeconomic challenges such as food and/or housing insecurity. These barriers cannot be addressed solely by clinicians and may not be entirely known to them if not disclosed and readily apparent during medical appointments. Nurse, pharmacist, and dietitian CDCESs are integral members of the diabetes care team, but their availability is often limited and they do not care for individuals in their home environments, where these barriers can be observed and more informed teaching can be delivered. CPs are therefore uniquely positioned to support person-centered diabetes care by directly observing the challenges people living with diabetes face in managing their diabetes and making sure that the care and education that are delivered are aligned with individuals' capacity for self-management and their goals and preferences for care.

The developed curriculum was well received by the CPs and, when evaluated in the context of caring for people living with diabetes and reflecting on the training received when first getting started, was deemed to be adequate to prepare them for practice. CPs reported feeling comfortable with and much improved in the more specialized DSMES skills that were new to them in their CP roles, including knowledge of noninsulin and insulin medications, diabetes technologies (i.e., insulin pumps and CGM systems), managing hyperglycemia, psychological elements of living with diabetes, and financial barriers to care. They also expressed the desire to continue learning more about these topics, particularly diabetes technologies and medical nutrition therapy, which spurred ongoing efforts to continue enhancing and building out the longitudinal curriculum for continued education. The feedback we received regarding preferred learning styles and settings led to the introduction of "Fireside Chats with Medical Direction," a biweekly hour-long case conference focused on case-based learning and discussion.

Our objective was to ensure that the curriculum not only covers the clinical aspects of diabetes management, but also prepares CPs for working with diverse individuals and populations. The first session in the curriculum focused

on SDOH, diversity, equity, and inclusion to contextualize all future discussions in the day-to-day realities of the people CPs care for. Diabetes is more prevalent among racial/ethnic minorities, low-income individuals, and rural residents, and these populations have higher rates of diabetes complications (1,8–10). These populations also experience inadequate access to medical care and DSMES, reinforcing the need for CPs to deliver diabetes-focused education and care to disadvantaged and underserved populations. As such, it was imperative to familiarize the CPs with these disparities and the multiplicity of reasons for them, increase awareness of cultural dimensions of living with diabetes, and provide CPs with a foundation for equitable person-centered care.

We used the evaluation feedback provided by participating CPs to enhance and refine the curriculum. Specifically, we hold biannual CP conferences to deliver continuing education on a wide range of topics, including diabetes. Content that has been added since the development of this curriculum includes a deeper examination of diabetes technologies, lower-extremity foot infections, nutrition, and noninsulin medications. We also introduced monthly CP team meetings and biweekly Fireside Chats to provide a forum for peer-to-peer discussions, case review, and focused education, and case-specific conversations on counseling, team-based care, and financial aspects of care. These were all areas with opportunities for improvement identified by CP feedback, and we plan to reassess their knowledge and confidence in these areas in the future.

Although this curriculum can serve as a framework for diabetes education in other settings, it will need to be adapted to local needs, populations, practices, and resources. Our program is also nascent, and the quality and retention of education received will need to be reexamined over time. Because of the small number of CPs who completed only the Diabetes Bootcamp format, we were unable to assess whether educational quality was compromised by the condensed time frame. Nevertheless, overall feedback on the two versions of the curriculum was uniformly positive. It will also be important to evaluate the effectiveness of CP-delivered DSMES and examine how this education was received by people living with diabetes. CPs in our program are currently engaged in the delivery of DSMES and diabetes-focused care to individuals with uncontrolled diabetes, specifically those with elevated A1C and those who experience severe hypoglycemia. We plan to rigorously evaluate the impact of CP-delivered DSMES on self-management skills, diabetes distress, and glycemic control once those studies are concluded.

Because there is no standardized CP curriculum, diabetes-related knowledge gaps may differ across ambulance

**TABLE 2** Program Evaluation

Survey Item	Responses
Sessions attended	
Initial 2-day course	3/5
Refresher bootcamp	5/5
Diabetes medications continuing education module	5/5
Self-rated comfort level with the following content areas. <i>Rated on a 5-point Likert scale of very comfortable, somewhat comfortable, neutral, somewhat uncomfortable, not at all comfortable; N/A or do not know</i>	
Cultural competency	Very comfortable (4/5) Neutral (1/5)
Chronic diabetes complications	Very comfortable (3/5) Somewhat comfortable (2/5)
BGM using a glucose meter	Very comfortable (5/5)
Glucose monitoring using a CGM system	Very comfortable (2/5) Somewhat comfortable (3/5)
Managing and preventing hypoglycemia	Very comfortable (5/5)
Managing and preventing hyperglycemia	Very comfortable (3/5) Somewhat comfortable (2/5)
Insulin therapy	Very comfortable (2/5) Somewhat comfortable (2/5) Neutral (1/5)
Insulin pump therapy	Very comfortable (1/5) Somewhat comfortable (3/5) Neutral (1/5)
Noninsulin diabetes medications	Very comfortable (1/5) Somewhat comfortable (4/5)
Diet and nutrition considerations in diabetes	Very comfortable (2/5) Somewhat comfortable (2/5) Neutral (1/5)
Psychological elements of diabetes	Somewhat comfortable (5/5)
Adult learning theory and teaching adults	Very comfortable (2/5) Somewhat comfortable (3/5)
Financial barriers to care	Very comfortable (2/5) Somewhat comfortable (3/5)
Multidisciplinary team care and working with patients' other health care providers	Very comfortable (3/5) Somewhat comfortable (1/5) Neutral (1/5)
Common comorbidities in people living with diabetes	Very comfortable (4/5) Somewhat comfortable (1/5)
The experience of living with diabetes (individual perspectives)	Very comfortable (1/5) Somewhat comfortable (3/5) Neutral (1/5)
How much has your knowledge in the following areas improved as a result of the training you attended? <i>Rated on a 3-point Likert scale of very much, somewhat, not at all; N/A or do not know</i>	
Cultural competency	Very (4/5) Somewhat (1/5)
Chronic diabetes complications	Very (4/5) Somewhat (1/5)
Blood glucose monitoring using a glucometer	Very (4/5) Somewhat (1/5)
Blood glucose monitoring using a CGM	Very (5/5)
Managing and preventing hypoglycemia	Very (4/5) Somewhat (1/5)
Managing and preventing hyperglycemia	Very (5/5)
Insulin therapy	Very (5/5)
Insulin pump therapy	Very (5/5)

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**TABLE 2** Program Evaluation (Continued)

Survey Item	Responses
Noninsulin diabetes medications	Very (4/5) Somewhat (1/5)
Diet and nutrition considerations in diabetes	Very (3/5) Somewhat (2/5)
Psychological elements of diabetes	Very (4/5) Somewhat (1/5)
Adult learning theory and teaching adults	Very (3/5) Somewhat (2/5)
Financial barriers to care	Very (4/5) Somewhat (1/5)
Multidisciplinary team care and working with the patient's other health care providers	Very (4/5) Somewhat (1/5)
Common comorbidities in people living with diabetes	Very (5/5)
The experience of living with diabetes (individual perspectives)	Very (5/5)
Overall evaluation of program components. <i>Rated on a 5-point Likert scale of excellent, good, neutral, fair, poor; N/A or do not know</i>	
Initial 2-day CP course (June 2020)	Excellent (3/5) N/A or don't know (2/5)
Diabetes Bootcamp (April 2021)	Excellent (5/5)
Diabetes medication talk at CP conference (April 2021)	Excellent (4/5) Good (1/5)
Conversations with CP medical director about specific patient cases	Excellent (4/5) Good (1/5)
Conversations with CP medical director about diabetes in general	Excellent (5/5)
Conversations with peers (other CPs) about specific patients	Excellent (2/5) Good (3/5)
Conversations with peers (other CPs) about diabetes in general	Excellent (2/5) Good (3/5)
Independent learning about diabetes	Excellent (5/5)
Conversations with the patients' other health care providers	Excellent (3/5) Good (1/5) N/A or don't know (1/5)
Overall program	Excellent (3/5) Good (1/5) Neutral (1/5)

The survey was anonymous. Seven CPs were surveyed, and five responded (71.4% response rate). Data are summary statistics for respondent answers, where the numerator is the number of participants who responded as indicated and the denominator is the total number of respondents (i.e., 5). N/A, not applicable.

agencies and CP training programs. Nevertheless, we believe that the course outline included in this article can serve as a foundation for adaptation, dissemination, and implementation efforts for any CP program in the United States or worldwide.

Despite being able to deliver DSMES, CPs cannot currently earn the CDCES credential because they are not licensed in the disciplines recognized by the Certification Board for Diabetes Care and Education. Specifically, recognized providers include dietitians, clinical psychologists, occupational therapists, optometrists, pharmacists, physical therapists, physicians, podiatrists, registered nurses, nurse practitioners, clinical nurse

specialists, physician assistants, exercise physiologists, master-certified health education specialists, and master's level social workers (39). The field would benefit from considering CPs eligible for advanced education and credentialing as CDCESs, since this would expand the reach and scope of DSMES services available to the people who need it most. CPs can engage individuals in their homes and help to bridge the gaps among people living with diabetes, the health care system, and the community. We believe that the comprehensive diabetes management curriculum described here can serve as a framework for other EMS agencies and practices seeking to leverage the unique skillset of CPs to engage with and care for people living with diabetes.



**TABLE 3** General Feedback

What other subject areas would you like to see covered?	More options regarding dietary needs for diabetic patients.   Common comorbidities and complications of diabetes.   Maybe how to set up a FreeStyle Libre or Dexcom system. Mental health issues specific to diabetic patients.   Chronic disease management for other diseases besides diabetes.   Pumps and pump management.   I think it would be beneficial to walk through insurance and payers to help better understand the patients' perspective, especially for those on Medicare/Medicaid.   Diabetes and other health problems such as cardiac and respiratory implications that trigger diabetic issues or infections that cause issues like sepsis.
What would be the most effective way of delivering this content?	In-person training.   Hands on or online.   Flowchart and brief overview of what is important for a provider to know.   Lecture
What is the most effective way to support continuing education?	To provide it and to pay for our attendance.   Recorded lectures.   Outside resources to utilize on our own.   Rounding and case reviews with medical direction.   Assigned education can help as well.   Yearly.
What topics have been the most useful when taking care of patients with diabetes?	Basic knowledge of common diabetes medications.   Medications.   Understanding their process and "way of thinking/functioning with diabetes."   Understanding insulin regimens and other diabetes medications.   Continual with the dialogue on what we have been working with.
What content was not useful and could have been eliminated from this program?	Continuing on with patients who are not engaged for continued visits and working with them for free care when they have no [way] . . . to continue to move forward on their own with the [program]. The patient should have been eliminated in the [program] earlier on.
Other comments	[Medical director] is a great educator. She does a great job of keeping us informed on diabetes issues that concern our patients.   [Medical director] is an excellent mentor and care provider. She goes above and beyond the call of the medical director.

Responses to open-ended questions posed to CPs in the anonymous electronic survey. Seven community paramedics were surveyed, and five responded (71.4% response rate).

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## DUALITY OF INTEREST

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## AUTHOR CONTRIBUTIONS

A.L.K. co-developed the curriculum and reviewed/edited the manuscript. L.A.M., P.N.C., and J.L.S. contributed to curriculum

development and reviewed/edited the manuscript. R.F.J. co-developed the curriculum and reviewed/edited the manuscript. D.M. contributed to the discussion and reviewed/edited the manuscript. C.P.L. contributed to curriculum development, provided resources, and reviewed/edited the manuscript. M.B.J. researched data and reviewed/edited the manuscript. R.G.M. co-developed the curriculum, researched the data, and wrote the manuscript. R.G.M. 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 analysis.

## REFERENCES

- Centers for Disease Control and Prevention. Diagnosed diabetes. Available from <https://gis.cdc.gov/grasp/diabetes/DiabetesAtlas.html>. Accessed 28 January 2022
- Trikkalinou A, Papazafiropoulou AK, Melidonis A. Type 2 diabetes and quality of life. *World J Diabetes* 2017;8:120–129
- Agency for Healthcare Research and Quality. 2019 National Healthcare Quality and Disparities Report (Pub. No. 20[21]-0045-EF). Rockville, MD, Agency for Healthcare Research and Quality, 2020
- Huang ES, Brown SES, Ewigman BG, Foley EC, Meltzer DO. Patient perceptions of quality of life with diabetes-related complications and treatments. *Diabetes Care* 2007;30:2478–2483
- American Diabetes Association. Economic costs of diabetes in the U.S. in 2017. *Diabetes Care* 2018;41:917–928

6. Nicolucci A, Kovacs Burns K, Holt RI, et al.; DAWN2 Study Group. Diabetes Attitudes, Wishes and Needs second study (DAWN2™): cross-national benchmarking of diabetes-related psychosocial outcomes for people with diabetes. *Diabet Med* 2013;30:767–777
7. Jing X, Chen J, Dong Y, et al. Related factors of quality of life of type 2 diabetes patients: a systematic review and meta-analysis. *Health Qual Life Outcomes* 2018;16:189
8. Purnell TS, Calhoun EA, Golden SH, et al. Achieving health equity: closing the gaps in health care disparities, interventions, and research. *Health Aff (Millwood)* 2016;35:1410–1415
9. Hill-Briggs F, Adler NE, Berkowitz SA, et al. Social determinants of health and diabetes: a scientific review. *Diabetes Care* 2020;44:258–279
10. Golden SH, Joseph JJ, Hill-Briggs F. Casting a health equity lens on endocrinology and diabetes. *J Clin Endocrinol Metab* 2021;106:e1909–e1916
11. American Diabetes Association. 5. Facilitating behavior change and well-being to improve health outcomes: *Standards of Medical Care in Diabetes—2021*. *Diabetes Care* 2021;44(Suppl. 1):S53–S72
12. Beck J, Greenwood DA, Blanton L, et al.; 2017 Standards Revision Task Force. 2017 National Standards for Diabetes Self-Management Education and Support. *Diabetes Educ* 2017;43:449–464
13. Spencer MS, Kieffer EC, Sinco B, et al. Outcomes at 18 months from a community health worker and peer leader diabetes self-management program for Latino adults. *Diabetes Care* 2018;41:1414–1422
14. Trump LJ, Mendenhall TJ. Community health workers in diabetes care: a systematic review of randomized controlled trials. *Fam Syst Health* 2017;35:320–340
15. Fisher EB, Boothroyd RI, Elstad EA, et al. Peer support of complex health behaviors in prevention and disease management with special reference to diabetes: systematic reviews. *Clin Diabetes Endocrinol* 2017;3:4
16. Krishnamoorthy Y, Sakthivel M, Sarveswaran G, Eliyas SK. Effectiveness of peer led intervention in improvement of clinical outcomes among diabetes mellitus and hypertension patients: a systematic review and meta-analysis. *Prim Care Diabetes* 2019;13:158–169
17. Patterson DG, Coulthard C, Garberson LA, Wingrove G, Larson EH. What is the potential of community paramedicine to fill rural health care gaps? *J Health Care Poor Underserved* 2016;27:144–158
18. Martin AC, O'Meara P. Perspectives from the frontline of two North American community paramedicine programs: an observational, ethnographic study. *Rural Remote Health* 2019;19:4888
19. Hegwer LR. Community paramedicine saves organization \$6M in 1 year. Available from <https://www.hfma.org/topics/article/63296.html>. Accessed 5 August 2021
20. O'Meara P, Ruest M, Stirling C. Community paramedicine: higher education as an enabling factor. *Australasian Journal of Paramedicine* 2014;11 (doi: <https://doi.org/10.33151/ajp.11.2.22>)
21. Nolan MJ, Nolan KE, Sinha SK. Community paramedicine is growing in impact and potential. *CMAJ* 2018;190:E636–E637
22. Gregg A, Tutek J, Leatherwood MD, et al. Systematic review of community paramedicine and EMS mobile integrated health care interventions in the United States. *Popul Health Manag* 2019;22:213–222
23. Mi R, Hollander MM, Jones CMC, et al. A randomized controlled trial testing the effectiveness of a paramedic-delivered care transitions intervention to reduce emergency department revisits. *BMC Geriatr* 2018;18:104
24. McCarthy P, Brown A, Nystrom P, Ho J. Impact of community paramedic program on health service utilization. *Acad Emerg Med* 2017;24(Suppl. 1):S112
25. Huang Y-H, Ma L, Sabljak LA, Puhala ZA. Development of sustainable community paramedicine programmes: a case study in Pennsylvania. *Emerg Med J* 2018;35:372–378
26. Guo B, Corabian P, Yan C, Tjosvold L. *Community Paramedicine: Program Characteristics and Evaluation*. Edmonton, Alberta, Institute of Health Economics, 2017
27. Bennett KJ, Yuen MW, Merrell MA. Community paramedicine applied in a rural community. *J Rural Health* 2018;34(Suppl. 1):s39–s47
28. Choi BY, Blumberg C, Williams K. Mobile integrated health care and community paramedicine: an emerging emergency medical services concept. *Ann Emerg Med* 2016;67:361–366
29. Dainty KN, Seaton MB, Drennan IR, Morrison LJ. Home visit-based community paramedicine and its potential role in improving patient-centered primary care: a grounded theory study and framework. *Health Serv Res* 2018;53:3455–3470
30. Pearson KB, Shaler G. Community paramedicine pilot programs: lessons from Maine. Symposium on community-based health care. *J Health Hum Serv Adm* 2017;40:141–185
31. American Academy of Orthopaedic Surgeons. *Community Health Paramedicine*. Burlington, MA, Jones & Bartlett Learning, 2017
32. American Diabetes Association. 11. Microvascular complications and foot care: *Standards of Medical Care in Diabetes—2021*. *Diabetes Care* 2021;44(Suppl. 1):S151–S167
33. American Diabetes Association. 10. Cardiovascular disease and risk management: *Standards of Medical Care in Diabetes—2021*. *Diabetes Care* 2021;44(Suppl. 1):S125–S150
34. American Diabetes Association. 9. Pharmacologic approaches to glycemic treatment: *Standards of Medical Care in Diabetes—2021*. *Diabetes Care* 2021;44(Suppl. 1):S111–S124
35. American Diabetes Association. 7. Diabetes technology: *Standards of Medical Care in Diabetes—2021*. *Diabetes Care* 2021;44(Suppl. 1):S85–S99
36. American Diabetes Association. 4. Comprehensive medical evaluation and assessment of comorbidities: *Standards of Medical Care in Diabetes—2021*. *Diabetes Care* 2021;44(Suppl. 1):S40–S52
37. Horigan G, Davies M, Findlay-White F, Chaney D, Coates V. Reasons why patients referred to diabetes education programmes choose not to attend: a systematic review. *Diabet Med* 2017;34:14–26
38. Strawbridge LM, Lloyd JT, Meadow A, Riley GF, Howell BL. Use of Medicare's diabetes self-management training benefit. *Health Educ Behav* 2015;42:530–538
39. Certification Board for Diabetes Care and Education. Discipline requirements. Available from <https://www.cbdce.org/discipline-requirement>. Accessed 28 October 2021