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ORIGINAL RESEARCH

A MULTIDISCIPLINARY TEAM IN AMBULATORY MANAGEMENT OF DIABETES MELLITUS USING TELEHEALTH AMONG A SAMPLE OF MEDICAID PATIENTS

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Abstract

***Objectives*:** Effective treatment of patients with type 2 diabetes mellitus requires a multidisciplinary approach. Our study provided telemedicine healthcare delivery, using a model of collaborative drug therapy management (CDTM) protocol incorporating medical nutrition therapy (MNT) interventions by Dietitians and Pharmacists.

***Methods*:** We conducted a retrospective chart review of patient data collected between December 2014 and December 2015. We compared five intervention groups of patients (n = 12,370) receiving different levels of treatment from pharmacists, registered dietitian/nutritionist and/or the call center, using telemedicine consultation techniques over a 1-year period. The control group received their supplies through the mail without any contact with the call center, pharmacists or dietitians. The cross-sectional data collected for hemoglobin A1c (A1c) were analyzed using ANOVA to assess for within-group differences in A1c reduction among groups with different risk factors.

***Results*:** Roughly, 18% of study participants were identified as high risk, with a serum A1c level greater than 10%. Lower A1c and low-density lipoprotein (LDL) cholesterol levels were reported for patients who received at least four prescription refills over the study period, (–0.113 and –4.931, respectively). Results reveal that average A1c levels for the intervention groups were lower compared to the control group. Overall, interventions led by dietitians and pharmacists resulted in a higher reduction in A1c levels in the high-risk group of patients with type 2 diabetes.

***Conclusions*:** This study showed that using Telemedicine consultation, led by dietitians and pharmacists, resulted in a more effective intervention for patients with diabetes and resulted in a positive change of lowering plasma A1c levels and LDL cholesterol as a secondary outcome. For future study, using the same multidisciplinary intervention and telehealth format, a longitudinal data collected over a minimum of 6 months would allow for tracking of changes in A1c and LDL cholesterol in individuals with type 2 diabetes.

Keywords: *Diabetes, telemedicine, telehealth, pharmacist and dietitian-led intervention, A1c, LDL cholesterol*

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INTRODUCTION

Diabetes mellitus is a chronic condition that occurs as a result of the body's inability to produce any or a sufficient amount of insulin, resulting in abnormally elevated blood glucose levels (1). It is a common chronic disease in the United States, with an estimate that as many as 34 million Americans of all ages have diabetes with 90–95% as type 2 diabetes (1). According to the 2018 study by the American Diabetes Association, the annual cost of treating people with diabetes in America is $327 billion, which includes $237 billion in direct medical cost. The cost reflects 2.3 times greater heath care cost for treating Americans with diabetes compared to individuals without diabetes. One in every 7 healthcare dollars is spent on treating people with

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diabetes and its complications (2). The Diabetes Control and Complications Trial (DCCT) reported a reduction in early stages for microvascular disease with tight blood glucose control in patients with type 1 diabetes (3). Implications from the DCCT studies indicate that short-term complications from uncontrolled diabetes include hypoglycemia and hyperglycemia. Over time, hyperglycemia causes glycosylation of microvascular and nervous tissues, which are associated with long-term complications such as renal failure due to nephropathy leading to dialysis and kidney transplant, blindness, amputations, neuropathy, which can affect the quality of life for individuals with diabetes (3).

Practice guidelines, such as those provided by the American Diabetes Association, Academy of Nutrition and Dietetics, and the American Association of Clinical Endocrinologists, aim to provide a set of standards upon which to achieve glycemic control for patients with diabetes. However, despite the existence of such guidelines, due to potential barriers, treatment outcomes in patients were lower than expected (4). The provision of high-quality care for patients with diabetes has shown to be a challenging process for healthcare entities. Interdisciplinary team efforts among physicians, nurse practitioners, registered nurses, registered dietitians, and pharmacists have the potential to increase the quality of medical care provided to patients with diabetes mellitus in addition to improving patient outcomes and lower healthcare costs (5, 6). Such practices focused on the implementation of diabetes self-management education (DMSE) and have shown promising results (7). Zgibor et al. (8) explored barriers to diabetes care, which include patient's non-compliance and lack of access, self-care, and socioeconomic factors such as education and income. These researchers and others have reported that patients of lower socioeconomic standing are less likely to receive specialized care or use preventive healthcare services, and they have a lower level of diabetes knowledge (7, 8). The DIABEMPIC (DIAbetes EMPowerment and Improvement of Care) intervention reported a relationship between social determinants of health and improved knowledge and cardiometabolic parameters including a greater reduction in hemoglobin A1c (A1c) (9).

Davidson (10) reported that most patients with diabetes do not meet the recommended goals set by the American Diabetes Association of A1c <7%, LDL cholesterol <100 mg/dl and blood pressure <130/80 mmHg. Choe et al. (11) reported that specially trained nurses or pharmacists showed improved outcomes of diabetes care, where they noted a 2.1% drop in A1c levels compared to the baseline over a 12–24 months period. In a 6-month study, Cohen et al. (12) showed that the pharmacist- and nurse-led telehealth program resulted in a significant medical adherence and a significant difference in plasma A1C in patients with diabetes.

In addition to traditional physician-run medical clinics, registered dietitians are able to implement medical nutrition therapy (MNT) services and provide education on topics such as carbohydrate counting, timing of the meals, effect of carbohydrates on glycemic control and promotion of healthy food choices among other topics (7). Clinical pharmacists are able to provide education on the effective use of medications and outcomes of the disease.

Moreover, clinical pharmacists, working under collaborative drug therapy management (CDTM) protocol in conjunction with physicians, are able to implement medication changes to provide better glycemic control (13, 14). Studies on health literacy did not show that the direct positive and social support associated with intervention is associated with better glycemic control (15, 16) Nigam (17) defined telehealth and telemedicine and reported that these modes of healthcare intervention may provide a way to deal with shortage in healthcare providers and reduce the cost of healthcare without compromise in patient care when used appropriately. Furthermore, pharmacists utilizing telehealth has shown to reach more patients and reduce medication-related problems (18).

Preveon Health, formerly known as WeCare Pharmacy, located in San Bernardino, CA, is a unique setting for diabetes disease management in that it provides opportunities for interventions through clinical pharmacists working under CDTM protocol and MNT interventions provided by Registered Dietitians Nutritionists (RDN). Furthermore, patients who do not receive interventions by a clinical pharmacist or registered dietitian are still provided a minimal level of education on appropriate self-monitored blood glucose testing techniques and blood glucose goals through Preveon's call-center agents, which occurs independently of clinician-performed interventions.

This study aims to examine whether the interventions provided in an ambulatory care setting by Preveon Health's RDN, clinical pharmacists, and call-center agents, under CDTM and nutrition intervention protocol, have the ability to improve direct patient outcomes as measured through plasma hemoglobin A1C (A1c) levels, a measurement of the average blood glucose concentrations for the preceding 2–3 months. Moreover, plasma low-density lipoprotein (LDL) data were measured to assess the risk of cardiovascular diseases in the patients with type 2 diabetes.

METHODS

Study design

We performed a retrospective chart review of patients receiving Preveon Health's services from December 1, 2014 to December 30, 2015. The study population was sorted into five mutually exclusive groups, characterized by the level of

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intervention provided: pharmacist consult, dietitian consult, both pharmacist and dietitian consult, and those who did not receive a clinical consult but received some education through the WeCare call center, and finally, the control group members are those who received their supplies through the mail on a quarterly basis and had no contact with the call center, pharmacists or dietitians. At the time of the study, the "no contact group" had no interaction from the start of their enrollment into obtaining diabetic testing supplies, through to the end of the study period. These patients had their supplies mailed as an "automatic refill process" where the refill was simply processed automatically through the insurance. In the event that a patient did have an inquiry that could have pertained to a clinical issue, call center agents are trained to refer those patients back to their primary-care providers. However, in the event that they changed their mind about speaking to a Preveon clinician, then their encounter would have been captured and thus the patient would not have been counted as part of the "no contact" group. Patients in the pharmacist, dietitian or both the pharmacist/dietitian group received care through telemedicine support (see Figure 1).

All patient information and laboratory data were obtained from Inland Empire Health Plan's (IEHP) online database and Zoho, which is the Preveon Health's customer relationship management (CRM) software

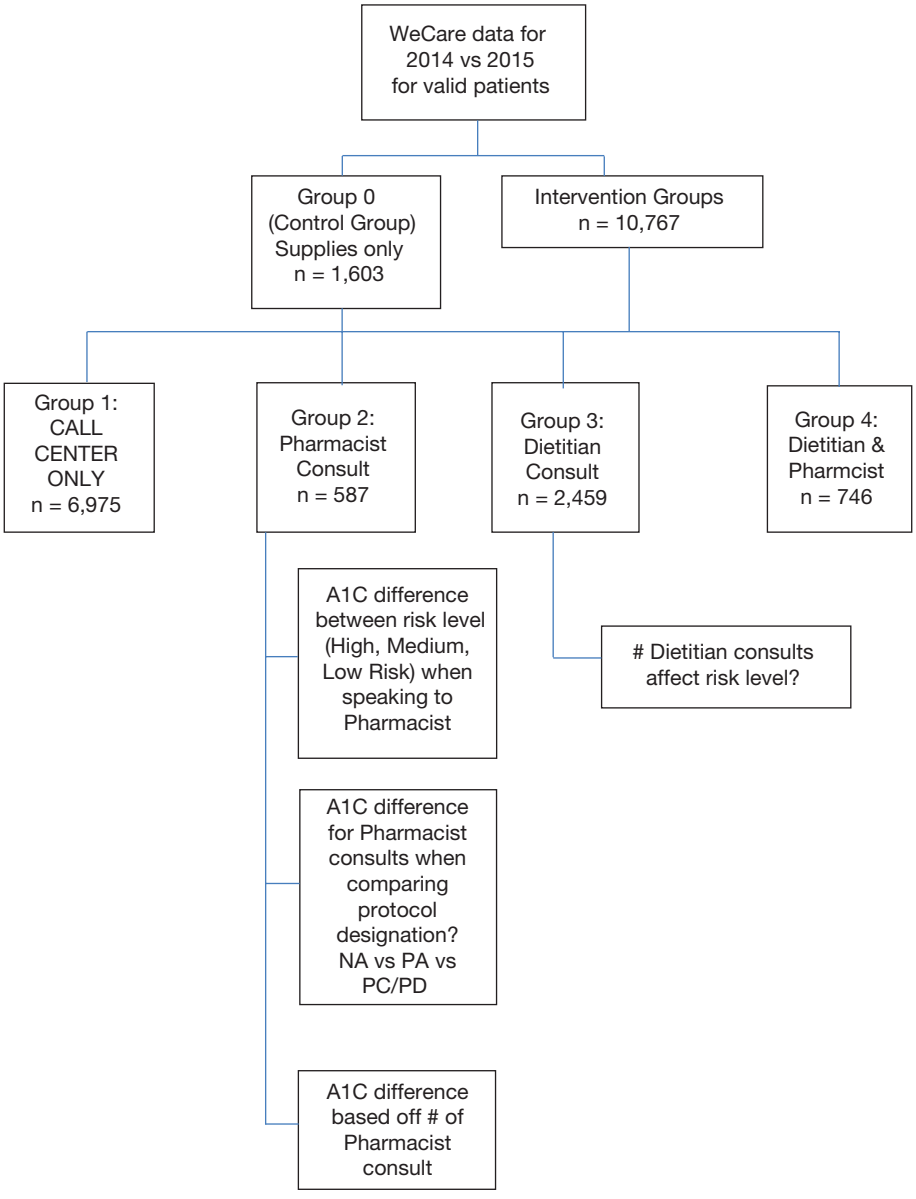

Fig. 1. Flowchart of the patient selection process.

database. Baseline data were defined as the oldest data points available before July 1, 2014. Endpoint data were defined as the most recent data points between July 1, 2014 and December 30, 2015. The study was approved by IRB of CSUSB #15058.

Eligibility

Inclusion criteria included confirmed Preveon Health patients, aged 18 years and older, with a baseline hemoglobin A1c (A1c) lab result and a follow-up A1C performed at least 2 months after their last clinical consult conducted during the timeframe between June 1, 2014 and December 30, 2015. Patients were included in the study and also deemed as compliant if they received at least four testing supplies refills during the course of the study. Patients were excluded from the study if their insurance group, IEHP, was on hold, they were ineligible for insurance during the study period or if they were missing baseline or follow-up data.

Statistical analysis

Intragroup differences in A1C reduction were analyzed through a paired, two-tailed T-test using a 95% confidence interval. To assess for intergroup differences in A1C reduction among the groups with different risk factors, ANOVA analysis was utilized. The Levene test was conducted to assess for homogeneity of variances and corrected with the Welch test if the test of homogeneity was violated. Games Howell post-hoc comparison was utilized to assess for statistically significant pairs when analyzing for intergroup differences. All statistical data analyses were performed using SPSS version 22.0 software.

RESULTS

A total of 39,365 patients were identified for the 1-year period from December 2014 to December 2015. Of the total, 4,254 (10.8%) had at least one session with a pharmacist, and 13,669 (27.1%) had at least one session with a dietitian. Based on the inclusion criteria, a total of 11,798 patients were assigned to one of the five groups depending on the intervention received.

The "control group" received their supplies through mail and had no contact with the call center, dietitians or pharmacists. The "call center" group had limited education provided by non-clinical staff, who were trained to give basic information to the patients. The "dietitian" and "pharmacist" groups interacted with a dietitian or pharmacist, respectively, at least once during the year. The "both" group had interacted with both a dietitian and a pharmacist over the time period. There was no set schedule for remote consultation. Patients met with providers, via telehealth on an as-needed basis. Typically, the length of time between encounters would depend on the types of changes that may have been made or implemented and the stability of the patient's diabetes status. If an insulin change was made, pharmacists would aim to speak to the patient every 2–4 weeks minimum. If only education or a non-insulin medication change (changing tablet medication dose, providing education on optimal administration, diet counseling), the clinician would aim to interact with the patient at 1– to 3-month intervals. If a patient was having extremely low blood sugar events or extremely high blood sugar events, the patient may even be contacted every 1–2 weeks. Table 1 contains the demographic data of the study population sorted by the group assigned.

Table 2 shows the total sample size for all patients' lab results for A1c and LDL. A1c values, with at least four refills over the 1-year period, had a baseline line sample of 8,373 for the paired sample test with an endpoint sample size of 7,994.

Moreover, LDL values, with at least four refills over the 1-year period, had a baseline line and endpoint sample of 12,847 for the paired sample test. After enrolling in the Preveon Health program, on average, patients had a reduction in both A1c and LDL values over the 1-year period, –0.113 and –4.931, respectively. Therefore, the effect of any intervention lowers the blood glucose and LDL levels, possibly due to medications prescribed by their physician. Under CDTM, qualifying patients were also able to have medications initiated or medication dosage adjustments implemented by Preveon Health pharmacists. Clinical pharmacists were also able to enhance diabetes care through encouraging medication compliance, educating on correct medication administration, as well as providing medication refills to aid patient compliance. To assess the effect

Table 1. Demographic information for the intervention groups

Intervention group	N	% of total	Age (years)	SD (age)
0 – Control Group	1,603	12.96	56.87	10.913
1 – Call Center	6,975	56.34	55.55	11.403
2 – Pharmacist	587	4.74	55.78	10.578
3 – Dietitian	2,459	19.88	54.56	10.530
4 – Dietitian and pharmacist	746	6.03	55.43	10.104
Total	12,370	100		

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Table 2. A change in hemoglobin A1c and LDL levels in patients with baseline and endpoint lab results who had at least four prescription refills over the year

Lab	December 2014	December 2015	Difference	T value (*p* value)
Mean A1c % (SD)	8.107 (2.045)	7.994 (1.975)	−0.113	6.335 (<0.001)
	N = 15,577	N = 17,423	(1.634)	
	(N = 8,373)	(N = 7,994)		
Mean LDL mg/dl	101.649 (35.317)	96.718 (34.52)	−4.931	17.489 (<0.001)
(SD)	N = 18,733	N = 20,685	(31.954)	
	(N = 12,847)	(N = 12,847)		

Table 3. A change in the average hemoglobin A1c (A1c) from 2014 to 2015 by groups

Intervention groups	N	December 2014 A1c (%)	December 2015 A1c (%)	Mean difference (*p* value)
0 – Control Group	1,031	7.765	7.671	-0.093
		SD 1.919	SD 1.835	($p = 0.62$)
1 – Call Center	6,975	7.751	7.663	–0.087 *
		SD 1.903	SD 1.810	($p < 0.001$)
2 – Pharmacist	587	8.427	8.133	-0.294 *
		SD 2.046	SD 1.939	($p < 0.001$)
3 – Dietitian	2,459	8.632	8.412	–0.220*
		SD 2.108	SD 1.993	($p < 0.001$)
4 – Dietitian and pharmacist	746	9.479	8.902	–0.578*
		SD 2.147	SD 1.982	($p < 0.001$)

(note these are aggregated cross-sectional data and not a longitudinal data set)

of specific interventions, only patients with baseline and endpoint values were included in the intervention groups.

Table 3 shows the average A1c values were lower in all patients over the 1 year period. More importantly, the drop in A1c values over the year was significant in all groups that had some contact with the staff of Preveon Health, whether the contact was made with a clinician or non-clinician. The average change in A1c is significant in all four groups that had interactions with the staff. The intervention group, with both a dietitian and a pharmacist, had the highest average A1c values at baseline and showed the largest change over the 1-year period (–0.578, $p < 0.000$). Even though the average change in A1c for the call center group was very small, due to a large sample size, the drop in the A1c value was statistically significant (–0.087, $p < 0.000$).

To assess whether the average change in the A1c was affected by different levels of the intervention, the patients were assigned to three risks groups based on the A1c levels: low risk, moderate risk, and high risk. Table 4 includes the number of patients in the three risk factor groups. More than half of the subjects had A1c levels below 7.9% (58.8%), compared to the high-risk group with A1c at 10% or higher (17.8%). The change in A1c was statistically different among the intervention groups.

As seen in Table 5, among the low-risk clients with A1c < 8.0%, the intervention provided by the dietitian and pharmacist resulted in an average reduction in A1c levels of –0.616 (SD = 1.46) over a 1-year period. The intervention provided by the dietitian led to a higher reduction in A1c, on average, compared to clients in the call center (–0.301) and pharmacist groups (–0.271). Moreover, the intervention provided by both the dietitians and pharmacists resulted in a higher reduction, on average, in A1c levels compared to low-risk clients in the pharmacist (–0.271) or the call center (–0.301) groups.

ANOVA was used in Table 6 to demonstrate whether there was a statistical difference in the A1c mean differences between the different intervention groups, over the 1 year period, for the low-risk clients with A1c < 7.9%. There were statistically significant mean differences in A1c levels between the groups at the .05 significance level. The highest reduction in A1c mean differences (–0.3457) was demonstrated between the groups that received intervention from the pharmacist and the dietitian/pharmacist.

Table 4. Risk levels based on A1c level

Group type with A1c levels	N	% of total subjects
Low risk (A1c < 7.9%)	6,940	58.8
Moderate risk (8.0–9.99%)	2,761	23.4
High risk (>10%)	2,097	17.8
Total	11,798	100

Table 5. Average change in A1c levels over the 1-year period by intervention level for low-risk group (A1c < 7.9%)

Intervention group	N	Mean A1c Difference	SD
0 – Control group	697	–0.314	1.164
1 – Call center	4,676	–0.301	1.084
2 – Pharmacist	288	–0.271	1.044
3 – Dietitian	1,085	–0.533	1.330
4 – Dietitian and pharmacist	194	–0.616	1.460

Table 6. Between-group A1c mean differences among the low-risk clients (A1c < 7.9%)

Group 1	Group 2	Mean difference	Significance level
Supplies only (control group)	Dietitian	–0.2189	0.002
Pharmacist	Dietitian	–0.2622	0.004
Pharmacist	Dietitian and pharmacist	–0.3457	0.038
Dietitian	Call center	0.2315	0.000

The mean difference is significant at the 0.05 level

Table 7. Average change in A1c levels over the 1-year period by intervention level for the moderate-risk group (A1c between 8.0 and 9.99%)

Intervention group	N	Mean A1c difference	SD
0 – Control group	184	–0.384	1.483
1 – Call center	1,387	–0.268	1.615
2 – Pharmacist	171	–0.204	1.558
3 – Dietitian	770	–0.139	1,554
4 – Dietitian and pharmacist	249	–0.179	1.662

Table 8. Average change in A1c levels over the 1-year period by intervention level for high-risk group (A1c > 10%)

Intervention group	N	Mean A1c difference	SD
0 – Control group	150	–1.629	2.339
1 – Call center	912	–1.807	2.4006
2 – Pharmacist	128	–1.687	2.450
3 – Dietitian	604	–1.676	2.300
4 – Dietitian and pharmacist	303	–1.670	2.207

Tables 7 and 8 present the average change in A1c over the 1-year period for clients with moderate (8.0–9.99%) and high-risk (≥10%) levels of A1c, receiving different levels of the intervention. In the moderate-risk and high-risk groups, the changes seen were not statistically significant among the two groups ($p = 0.817$ and $p = 0.770$, respectively), possibly due to a smaller number of subjects compared to the low and moderate-risk groups.

DISCUSSION

The study showed that the interventions by dietitians and pharmacists can provide patients with a more effective treatment plan for patients with type 2 diabetes.

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Furthermore, interventions provided to patients with lower A1c levels (low risk), possibly at an earlier onset of diabetes, are more effective than those with high A1c levels (high risk). However, patients with high A1c levels, nevertheless, demonstrated a bigger change in levels over the year, indicating that those with the highest levels of A1c levels can benefit most by interacting with dietitians and pharmacists.

Compared to the control group, which did not receive any contact with the Preveon Health Pharmacy staff, contacts with the call center, dietitian and/or pharmacist resulted in a positive impact on the reduction of mean A1c over a 1-year period. The larger sample size in the low-risk group (A1c < 7.9%) and the intervention by dietary staff resulted in a larger change in mean A1c value over the 1-year period of study. The drop in A1c was larger in the patients who had consultation with both pharmacist staff and dietitian staff. Patient consultation provided by dietitians and pharmacists using Telemed system resulted in a significant reduction in mean values of A1c compared to baseline and 1-year period. Patients in the high-risk group (A1c > 10%) had a larger drop in the mean A1c value over the year; however, possibly due to the smaller sample size of the group, there were no statistical differences among the intervention groups.

A study by Greenwood et al. (19) to assess the effectiveness of DSME using in-person, telephone or secure messages showed that there were no statistically significant differences in A1c values among the groups over a 9-month period (19). Davis et al. (20) reported that DSME provided by a nurse and dietitian using interactive videoconferencing, telephone, fax and telehealth-enabled retinal camera to patients in the underserved rural community resulted in lower A1c over a 1-year period (20). In a recent study, Xu et al. (21) stated that healthcare professionals reported higher usage, satisfaction and future use of telehealth during the COVID-19 pandemic.

Limitations

The limitation of this study includes the comparison of A1c change over the 1-year period using cross-sectional data rather than the longitudinal change in A1c in the individual patients. Furthermore, Preveon Health does not have a set protocol, or schedule, for regular consultations with their patients. Therefore, we are unable to make generalizations to other populations. Moreover, we must recognize these low-income, Medi-Cal patients enrolled in the IEHP health insurance plan have specific needs that may differ from the general population of individuals with diabetes or those enrolled in a private health insurance program.

In spite of the study limitations, it is important to highlight the significance of this study as it demonstrates the effectiveness of a multidisciplinary team approach for the treatment of diabetes and telehealth, providing convenience and accessibility to low-income patients enrolled in the IEHP insurance program, which provides care to mostly Medi-Cal-qualified patients. Most of the primary care offices through IEHP are privately owned and do not have an on-staff pharmacist to assist with adjusting diabetes medications; hence the clinical pharmacists at Preveon were able to provide that role. The same can be said for dietitian interventions as well, and at the time of the study, and even afterwards, IEHP and its affiliated providers readily referred patients to Preveon for diabetes nutrition counseling as it was the most readily accessible access to a dietitian. While telehealth ambulatory care services are common in larger and more established healthcare systems (i.e. Kaiser, VA), such services were not readily available to smaller, privately owned primary practices, and as a result, the majority of those clinics partnered with Preveon. Allowing Preveon to provide unique services to a majority Medi-Cal population that would not have had access otherwise.

Summary

In summary, our study provided telemedicine healthcare delivery, using a model of CDTM protocol incorporating MNT interventions by healthcare professionals. This intervention model of treatment for patients with type 2 diabetes, yields a positive change in plasma A1c, and as secondary outcome, a reduction in plasma LDL cholesterol. Future research needs to address the longitudinal change of A1c in individuals using this intervention model of treatment over a minimum period of 6 months.

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Conflict of interests

The authors declare no potential conflict of interests at this time.

Author contributions

Every author made substantial contributions to all of the work and participated sufficiently in the work to take public responsibility.

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REFERENCES

1. Centers for Disease Control and Prevention. Type 2 diabetes. Available from: https://www.cdc.gov/diabetes/basics/type2.html [cited 29 September 2021].
2. American Diabetes Association. Statistics: the cost of diabetes: the staggering cost of diabetes Internet]. Available from: https://www.diabetes.org/resources/statistics/cost-diabetes [cited 29 September 2021].
3. Nathan DM. The diabetes control and complications trial/epidemiology of diabetes interventions and complications study at 30 years: overview. Diabetes Care 2014; 37(1): 9–16. doi: 10.2337/dc13-2112
4. Campbell L. Diabetes guidelines: easier to preach than to practice? The Med J Australia 2006; 185: 305–9. doi: 10.5694/j.1326-5377.2006.tb00583.x
5. Housden L, Wong ST, Dewes M. Effectiveness of group medical visits for improving diabetes care: a systematic review and meta-analysis. CMAJ 2013; 185: 635–44. doi: 10.1503/cmaj.130053
6. Mundt MP, Agneessens F, Tuan WJ, Zakletskaia LI, Kamnetz SA, Gilchrist VJ. Primary care team communication networks, team climate, quality of care, and medical costs for patients with diabetes: a cross-sectional study. Inter J Nurs Studies 2016; 58: 1–11. doi: 10.1016/j.ijnurstu.2016.01.013
7. Isaksson U, Hajdarevic S, Abramsson M, Stenvall J, Hornsten A. Diabetes empowerment and needs for self-management support among people with type 2 diabetes in a rural inland community in northern Sweden. Scand J Caring Sci 2015; 29: 521–7. doi: 10.1111/scs.12185
8. Zgibor JC, Songer TJ. External barriers to diabetes care: addressing personal and health system issues. Diabetes Spectrum 2001; 14(1): 23–8. doi: 10.2337/diaspect.14.1.23
9. Silva-Tinoco R, Cuatecontzi-Xochitiotzi T, De la Torre-Saldena V, Leon-Garcia E, Serna-Alvarado J, Guzman-Olvera E, et al. Role of social and other determinants of health in the effect of a multicomponent integrated care strategy on type 2 diabetes mellitus. Int J Equity Health 2020; 19: 75. doi: 10.1186/s12939-020-01188-2
10. Davidson MB. How our current medical care system fails people with diabetes: lack of timely, appropriate clinical decision. Diabetes Care 2009; 32(2): 370–2. doi: 10.2337/dc08-2046
11. Choe HM, Mitrovich S, Dubay D, Hayward RA, Krein SL, Vijan S. Proactive case management of high-risk patients with type 2 diabetes by a clinical pharmacist: a randomized controlled trial. Am J Manag Care 2005; 11: 253–60.
12. Cohen LB, Taveira TH, Wu WC, Pirraglia PA. Pharmacist-led telehealth disease management program for patients with diabetes and depression. J Telemed Telecare 2020; 26(5): 294–302. doi: 10.1177/1357633X18822575
13. Daly A, Michael P, Johnson EQ, Harrington CC, Patrick S, Bender T. Diabetes white paper: defining the delivery of nutrition services in Medicare medical nutrition therapy vs Medicare diabetes self-management training programs. J Am Diet Assoc 2009; 109(3): 528–39. doi: 10.1016/j.jada.2008.11.004
14. Campbell, RK. Role of the pharmacist in diabetes management. Am J Health-Syst Pharm 2002; 59(Suppl 9): S18–21. doi: 10.1093/ajhp/59.suppl_9.S18
15. Bains SS, Egede LE. Association between health literacy, diabetes knowledge, self-care behaviors, and glycemic control in a lower income population with type 2 diabetes. Diabetes Tech Therap 2011; 13: 335–41. doi: 10.1089/dia.2010.0160
16. Osborn CY, Baines SS, Egede LE. Health literacy, diabetes self-care, and glycemic control in adults with type 2 diabetes. Diabetes Tech Therap 2010; 12: 913–19. doi: 10.1089/dia.2010.0058
17. Nigam S. Telehealth and telemedicine: using technology to extend the reach and offset the insufficient supply of healthcare professionals. TMT [Internet]. 2018 [cited 2021 September 30];1(1). Available from: https://telehealthandmedicinetoday.com/index.php/journal/article/view/68
18. Taylor AM, Bingham J, Schussel K, Axon D, Dickman DR, Boesen K, et al. Integrating innovative telehealth solutions into an interprofessional team-delivered chronic care management pilot program. J Manag Care Spec Pharm 2018; 24(8): 813–18. doi: 10.18553/jmcp.2018.24.8.813
19. Greenwood DA, Hankins AI, Parise CA, Spier V, Olveda J, Buss KA. A comparison of in-person, telephone, and secure messaging of type 2 diabetes self-management support. Diabetes Educ 2014; 40(4): 516–25. doi: 10.1177/0145721714531337
20. Davis RM, Hitche AD, Salaam MM, Herman WH, Zimmer-Galler IE, Mayer-Davis EJ. Telehealth improves diabetes self-management in an underserved community: diabetes telecare. Diabetes Care 2010; 33(8): 1712–17. doi: 10.2337/dc09-1919
21. Xu J, Hamadi HY, Hicks-Roof KK, Zeglin RJ, Bailey CE, Zhao M. Healthcare professionals and telehealth usability during COVID-19. TMT [Internet]. 2021 [cited 2021 September 30];6(3). Available from: https://telehealthandmedicinetoday.com/index.php/journal/article/view/270