Older Adults and Diabetes Prevention Programs in the Veterans Health Administration

Pearl G. Lee,[1,2] Laura J. Damschroder,[3] Robert Holleman,[3] Tannaz Moin,[4,5,6] and Caroline R. Richardson[7]

Diabetes Care 2018;41:2644–2647 | https://doi.org/10.2337/dc18-1141

OBJECTIVE

To investigate whether older veterans enrolled in two diabetes prevention programs (DPPs) in the Veterans Health Administration will have similar weight loss as younger veterans.

RESEARCH DESIGN AND METHODS

Post hoc analysis of data from two prospective, pragmatic, nonrandomized studies of behavioral weight management interventions that were delivered in-person (Department of Veterans Affairs [VA]-DPP) or online (Online-DPP), comparing participation and weight loss between participants aged ≥65 years (*N* = 120) vs. <65 years (*N* = 258).

RESULTS

Over 70% of participants in both age groups completed eight or more sessions within 6 months; a higher proportion completed eight or more sessions in the Online-DPP intervention than in the VA-DPP intervention ($P < 0.05$). The overall weight changes at 6 and 12 months were similar across the two age groups: ∼5 kg or 5% weight loss compared with baseline ($P > 0.05$).

CONCLUSIONS

DPPs delivered in person or online can be similarly effective in older and younger veterans. Online programs may be an important means to improve the reach of DPPs for older adults.

Older veterans are disproportionally affected by diabetes, with prevalence as high as 34% in 2011 (1), compared with 25% of the general population ≥65 years of age (2). Thirty-six percent of older veterans have obesity, a major risk factor for diabetes (1). Clearly, effective intervention to prevent diabetes in older adults, especially older veterans, is urgently needed. The Diabetes Prevention Program (DPP) trial demonstrated that modest weight loss through lifestyle interventions can reduce diabetes incidence in high-risk individuals (2). However, few programs translating the DPP into real clinical settings included older veterans or online programs. Veterans receiving care in the Department of Veterans Affairs (VA) Veterans Health Administration (VHA) are likely to have lower overall health status and socioeconomic status than nonveterans (3). In addition, many older adults with prediabetes already have comorbidities and functional impairment that may limit their ability to complete lifestyle-based DPP programs (4). Thus, we conducted a post hoc analysis of two DPP trials in the VHA, in person (VA-DPP) and online (Online-DPP), and investigated whether veterans ≥65 years of age had similar participation and weight loss as younger veterans.

[1]Division of Geriatric and Palliative Medicine, Department of Internal Medicine, University of Michigan, Ann Arbor, MI
[2]Geriatric Research Education and Clinical Center (GRECC), Veterans Affairs Ann Arbor Healthcare System, Ann Arbor, MI
[3]Personalizing Options through Veteran Engagement (PROVE) Quality Enhancement Research Initiative (QUERI) Program, Ann Arbor Veterans Affairs Center for Clinical Management Research, Ann Arbor, MI
[4]Department of Medicine, Veterans Affairs Greater Los Angeles Healthcare System, Los Angeles, CA
[5]Department of Medicine, David Geffen School of Medicine, University of California, Los Angeles, Los Angeles, CA
[6]VA Health Services Research and Development (HSR&D) Center for Healthcare Innovation, Implementation and Policy, Veterans Affairs Greater Los Angeles Healthcare System, Los Angeles, CA
[7]Department of Family Medicine, University of Michigan, Ann Arbor, MI

Corresponding author: Pearl G. Lee, pearllee@med.umich.edu.

Received 24 May 2018 and accepted 19 September 2018.

The findings and conclusions in this manuscript are those of the authors and do not necessarily represent the views of the Department of Veterans Affairs, the Centers for Disease Control and Prevention, or the National Institutes of Health.

RESEARCH DESIGN AND METHODS

VA-DPP and Online-DPP were two prospective, pragmatic, nonrandomized comparative effectiveness trials of translating DPP into the VHA, conducted in 2012–2015 and 2012–2016, respectively (5,6). They had similar participant eligibility criteria and outcome measures. Eligible participants for both studies were obese (BMI $\geq$30 kg/m^2) or overweight (BMI $\geq$25 kg/m^2) with at least one obesity-related condition (e.g., hypertension, hyperlipidemia) and had prediabetes (VA laboratory–confirmed HbA_{1c} 5.7–6.4%; fasting plasma glucose 100–125 mg/dL within the last 6 months). Participants with diabetes were excluded. Participants in the VA-DPP were ineligible for the Online-DPP. Recruitment for both Online-DPP and VA-DPP was done at four primary care clinics, located in Minnesota, California, Maryland, and Wisconsin.

VA-DPP used the Group Lifestyle Balance curriculum, with 22 in-person group-based intensive lifestyle change sessions over 12 months (16 core sessions in the first 6 months followed by six monthly maintenance sessions). Online-DPP was a 12-month intensive intervention with weekly online modules delivered sequentially as they were completed, through a web-based platform developed by Omada Health (7).

The VA-DPP weight data were obtained from the VHA Corporate Data Warehouse, a national data repository comprising data from local VHA electronic health records or from a follow-up visit. For the Online-DPP, objective weight data were obtained from participants using a cellular-enabled uploading scale. For participants who failed to upload, clinical weights were extracted from the VHA Corporate Data Warehouse.

To ensure comparable samples across the two studies, only participants who completed at least one module/session and had at least one follow-up weight were included in the analysis: 198 of the 273 subjects enrolled in the VA-DPP and 180 of the 268 subjects enrolled in the Online-DPP. A multilevel mixed-effects regression model was used to predict 6- and 12-month changes in baseline weight by age category and tested for differences between the VA-DPP and Online-DPP. The model adjusted for baseline weight, sex, race, and program days since enrollment. Additional pairwise comparisons were made between participants enrolled in each study by age groups. All analyses were conducted using Stata 14.1.

RESULTS

At baseline (Table 1), compared with adults <65 years of age (N = 258), adults $\geq$65 years of age (N = 120) included fewer females, had lower BMI, and had a lower percentage of African Americans ($P < 0.001$); more older adults had hypertension and coronary artery disease, fewer had mental health conditions (each $P < 0.05$). The two age groups had the same HbA_{1c} percentage at 6.0% (P = 0.77). Similar proportions of older and younger adults completed four or more and eight or more sessions within each study during the first 6 months ($P > 0.05$). Higher proportions of both older and younger adults completed eight or more sessions in the Online-DPP compared with the VA-DPP ($P < 0.05$).

Both age groups lost a clinically and statistically significant amount of weight (~5 kg or 5% weight from baseline at 6 and 12 months; $P > 0.05$) and had similar weight loss trajectories over the 12 months ($P > 0.05$). Both age groups in the Online-DPP program regained weight at 12 months compared with 6 months: <65 years old, +0.88 kg (95% CI 0.60–1.16; $P < 0.01$); and $\geq$65 years old, +0.41 kg (95% CI 0.08–0.73; P = 0.01). In a multilevel mixed-effects model predicting weight changes, no significant interactions were found among age, study, and time ($P > 0.05$); sex was not a significant factor in predicting weight loss (P = 0.98).

CONCLUSIONS

In this post hoc analysis of two DPP translation studies in the VHA, veterans $\geq$65 years of age achieved similar participation and weight loss as younger adults, whether DPP was delivered in person or online. In a previous community-based DPP study involving in-person sessions (8), older adults were more likely to complete intervention sessions and achieve weight lost goals than younger adults. Our study population included veterans receiving care in the VHA, who generally have lower socioeconomic status and have higher comorbidity burden, particularly mental health comorbidities, compared with the general U.S. adult population (3). These factors likely contributed to the lower participation and less weight loss found in our study compared with other studies. Nevertheless, participation in the VA-DPP was higher than that in MOVE! (the VHA weight-loss program), and nearly all of the Centers for Disease Control and Prevention Diabetes Prevention Recognition Program standards for recognition were met (9). Overall participation in the Online-DPP (84.4% completed nine or more modules in the first 6 months) was slightly lower than the 92% reported in a Medicare population (10).

Our results suggest that the two VHA DPPs are likely to be effective in older adults who have a high burden of comorbidities. Participants in a previous study (8) were likely healthier, as only 34.8% of them had comorbid hypertension, whereas twice as many participants in our study had hypertension, including 75% of those $\geq$65 years of age. Future studies are needed to assess the uptake of DPP among individuals with cognitive or mobility impairment because nearly 20% of adults $\geq$53 years of age with prediabetes already have mild cognitive impairment, and 32% have mobility limitations such as difficulty walking several blocks and/or climbing a flight of stairs (4).

We also found that Online-DPP is effective in older adults. Although a number of DPPs have shown success in weight loss, three-quarters of the DPPs delivered in person had low reach (<33% of eligible individuals participated) (11). Distance is known to be an important barrier in seeking health care in rural veterans and other populations (12,13), increasing the likelihood of failing to complete the program. Online programs will likely become an increasingly important means to reach more older adults because >90% of adults >50 years old own a computer, and >40% of them, including those $\geq$70 years of age used their computers to obtain health and fitness information (14).

Despite the potential for inherent bias involved in post hoc analyses, our hypotheses and analyses were specified prior to examination of the data by age groups. Our study is limited because of the small sample size, predominately male, and does not include populations outside of the VHA, but the sample population was geographically and racially

Table 1—Participant baseline characteristics and participation and weight loss outcomes in VA-DPP and Online-DPP, comparing those <65 and ≥65 years of age

	Age <65 years (*N* = 258)			Age ≥65 years (*N* = 120)			*P* values, overall comparison between age <65 vs. ≥65
	Overall	VA-DPP (*N* = 139)	Online-DPP (*N* = 119)	Overall	VA-DPP (*N* = 59)	Online-DPP (*N* = 61)	
Baseline characteristics							
Age, mean (SD)	54.7 (7.2)	55.1 (7.0)	54.4 (7.5)	70.1 (5.5)	68.7 (4.8)	71.4 (5.9)	<0.001
Female, *n* (%)	82 (31.8)	24 (17.3)	58 (48.7)	8 (6.7)	2 (3)	6 (10)	<0.001
Weight, kg; mean (SD)	106.2 (21.1)	111.8 (20.3)	99.2 (19.9)	103.4 (18.9)	106.6 (19.1)	100.2 (18.2)	0.23
BMI, kg/m^2; mean (SD)	35.1 (5.6)	36.2 (5.5)	33.8 (5.4)	32.9 (5.6)	33.6 (5.1)	32.3 (6.0)	<0.001
Race, *n* (%)							<0.001
Black	92 (35.7)	64 (46.0)	28 (23.5)	21 (17.5)	16 (27)	5 (8)	
White	147 (57.0)	63 (45.3)	84 (70.6)	96 (80.0)	40 (68)	56 (92)	
Other	11 (4.3)	4 (2.9)	7 (5.9)	1 (0.8)	1 (2)	0 (0)	
Missing	8 (3.1)	8 (5.8)	0 (0.0)	2 (1.7)	2 (3)	0 (0)	
Comorbidities, *n* (%)							
HTN	160 (62.0)	90 (64.7)	70 (58.8)	90 (75.0)	44 (75)	46 (75)	0.013
CAD	20 (7.8)	12 (8.6)	8 (6.7)	26 (21.7)	14 (24)	12 (20)	<0.001
Mental health	140 (54.3)	81 (58.3)	59 (49.6)	43 (35.8)	24 (41)	19 (31)	<0.001
HbA_{1c} %, mean (SD)	6.0 (0.2)	6.0 (0.2)	6.0 (0.2)	6.0 (0.2)	6.0 (0.2)	6.0 (0.2)	0.77
Participation outcomes, *n* (%)							
Completed 4+ sessions	219 (84.9)	109 (78.4)	110 (92.4)*	103 (85.8)	48 (81)	55 (90)	0.81
Completed 8+ sessions	181 (70.2)	79 (56.8)	102 (85.7)*	91 (75.8)	37 (63)	54 (89)*	0.25
Predicted mean change in weight, kg (95% CI)							
6-month weight loss	−5.79 (−6.65, −4.92)	−5.05 (−6.09, −4.01)	−5.85 (−6.76, −4.95)	−5.91 (−7.02, −4.81)	−5.30 (−6.62, −3.98)	−5.96 (−7.10, −4.81)	0.81
12-month weight loss	−5.00 (−5.89, −4.10)	−5.22 (−6.46, −3.98)	−4.98 (−5.92, −4.03)	−5.55 (−6.68, −4.41)	−5.43 (−7.03, −3.82)	−5.55 (−6.73, −4.37)	0.32
Predicted mean change in weight, % (95% CI)							
6-month weight loss	−5.76 (−6.58, −4.93)	−4.98 (−5.96, −3.99)	−5.83 (−6.70, −4.96)	−5.97 (−7.01, −4.93)	−4.78 (−6.02, −3.54)	−6.05 (−7.12, −4.97)	0.66
12-month weight loss	−5.02 (−5.88, −4.17)	−5.17 (−6.35, −3.99)	−5.01 (−5.91, −4.11)	−5.60 (−6.67, −4.53)	−4.95 (−6.47, −3.43)	−5.63 (−6.74, −4.52)	0.26

P values are results from ANOVA for continuous variables and Pearson χ^2 test for categorical and binary variables comparing participants <65 years of age to those ≥65 years of age. Pearson χ^2 test for pairwise comparisons and proportion test were performed to compare VA-DPP to Online-DPP participants within each age group (*$P < 0.05$) and to compare participants <65 years of age to those ≥65 years of age within each study (all $P > 0.05$). CAD, coronary artery disease; HTN, hypertension.

diverse, including many with mental health comorbidities. Because nearly 50% of the veterans are ≥65 years of age, or ~9.4 million (15), results from the current analysis are especially important for the VHA effort to prevent diabetes. In fact, our participants successfully lost 5% of baseline weight, on average, achieving the primary goal set for the National DPP trial. Thus, our findings suggest that, along with younger adults, DPP delivered in person or online may also be equally effective in older adults.

Acknowledgments. Impact statement: The authors certify that this work is novel. These findings contributed to the decision by the Centers for Medicare and Medicaid Services to provide reimbursement for the National Diabetes Prevention Program beginning in April 2018 for eligible Medicare beneficiaries.

Funding. This work was funded through a VA Office of Research and Development research grant (SDP 13-230). P.G.L. received support from VA Rehabilitation Research and Development Service Career Development Award 5-IK2-RX001190. T.M. received support from the VA Office of Research and Development (QUE 15-272, QUE 15-286, VACSP#2002), Centers for Disease Control and Prevention (U18-DP-006140), and National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK) (R18-DK-105464). C.R.R. was partially supported by NIDDK grant P30-DK-020572 (MDRC).

The sponsors had no role in the project beyond funding.

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

Author Contributions. P.G.L. contributed to the conception, analysis design, interpretation of data, and drafting and revision of the manuscript. L.J.D., T.M., and C.R.R. contributed to analysis design, interpretation of the data, and revision of the manuscript. R.H. contributed to the analysis and interpretation of the data and revision of the manuscript. All authors read and approved the final manuscript. P.G.L. is the guarantor of this work and, as such, had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

References

1. Liu Y, Sayam S, Shao X, et al. Prevalence of and trends in diabetes among veterans, United States, 2005-2014. Prev Chronic Dis 2017;14:E135

2. Centers for Disease Control and Prevention. *National Diabetes Statistics Report, 2017: Estimates of Diabetes and Its Burden in the United States*. Atlanta, GA, Department of Health and Human Services, Centers for Disease Control and Prevention, 2017.

3. Wong ES, Wang V, Liu CF, Hebert PL, Maciejewski ML. Do Veterans Health Administration enrollees generalize to other populations? Med Care Res Rev 2016;73:493–507

4. Lee PG, Cigolle CT, Ha J, et al. Physical function limitations among middle-aged and older adults with prediabetes: one exercise prescription may not fit all. Diabetes Care 2013;36:3076–3083

5. Damschroder LJ, Moin T, Datta SK, et al. Implementation and evaluation of the VA DPP clinical demonstration: protocol for a multi-site non-randomized hybrid effectiveness-implementation type III trial. Implement Sci 2015;10:68

6. Moin T, Damschroder LJ, AuYoung M, et al. Results from a trial of an online diabetes prevention program intervention. Am J Prev Med 2018;55:583–591

7. Omada Health Inc. FAQ [Internet]. Available from https://www.omadahealth.com/frequently-asked-questions. Accessed 20 July 2018

8. Brokaw SM, Carpenedo D, Campbell P, et al.; Montana Cardiovascular Disease and Diabetes Prevention Workgroup. Effectiveness of an adapted Diabetes Prevention Program lifestyle intervention in older and younger adults. J Am Geriatr Soc 2015;63:1067–1074

9. Moin T, Damschroder LJ, AuYoung M, et al. Diabetes Prevention Program translation in the Veterans Health Administration. Am J Prev Med 2017;53:70–77

10. Castro Sweet CM, Chiguluri V, Gumpina R, et al. Outcomes of a digital health program with human coaching for diabetes risk reduction in a Medicare population. J Aging Health 2018;30:692–710

11. Aziz Z, Absetz P, Oldroyd J, Pronk NP, Oldenburg B. A systematic review of real-world diabetes prevention programs: learnings from the last 15 years. Implement Sci 2015;10:172

12. Oleson JJ, Breheny PJ, Pendergast JF, Ryan S, Litchfield R. Impact of travel distance on WISEWOMAN Intervention attendance for a rural population. Prev Med 2008;47:565–569

13. Buzza C, Ono SS, Turvey C, et al. Distance is relative: unpacking a principal barrier in rural healthcare. J Gen Intern Med 2011;26(Suppl. 2):648–654

14. Anderson GO. Getting connected: older Americans embrace technology to enhance their lives [Internet]. Washington, DC, AARP Research, 2017. Available from https://www.aarp.org/research/topics/technology/info-2018/technology-use-attitudes.html. Accessed 3 April 2018

15. National Center for Veterans Analysis and Statistics; U.S. Department of Veterans Affairs. Veteran population [Internet], 2018. Available from https://www.va.gov/vetdata/veteran_population.asp. Accessed 25 April 2018