



Case Reports on Adults >80 Years of Age in the National Diabetes Prevention Program

Kate Zachary^{1,2} and Natalie Dawn Ritchie³⁻⁵

More than half of U.S. seniors are estimated to have prediabetes (1), creating a high level of need for effective interventions that prevent progression to type 2 diabetes. Evidence shows that lifestyle interventions for weight loss are especially effective among older adults, suggesting great potential to reduce disease burden in this priority population. In the landmark Diabetes Prevention Program (DPP) clinical trial, participants ≥ 60 years of age who received lifestyle intervention had a 71% initial reduction in diabetes incidence, exceeding the 48% average reduction for those 25–44 years of age and the 59% average reduction for those 45–59 years of age (2). Seniors have continued to achieve the most weight loss in the National Diabetes Prevention Program (NDPP), a widely disseminated translation of the DPP's lifestyle arm intervention (3). Yet, limited prior study of seniors >80 years of age leaves a knowledge gap for whether to recommend the NDPP and similar programs for these older adults. Specifically, an American Geriatrics Society consensus report posits that seniors close to the age of 65 years with diabetes risks should generally receive lifestyle intervention, whereas 95-year-olds should not (4), without providing guidelines for seniors between those ages. Even prior research focused on delivering the NDPP to older adults has included participants predominately around the age of 63 years without reporting outcomes specific to older seniors (5). To explore whether the NDPP may benefit seniors in their 80s and understand special considerations that may be necessary for this population, we examined case studies of NDPP participants >80 years of age.

We delivered the year-long NDPP intervention in a Denver, CO, health care system to adults meeting eligibility criteria established by the Centers for Disease Control and Prevention (CDC), including BMI ≥ 24 kg/m² (≥ 22 kg/m² if Asian) and prediabetes, history of gestational diabetes, or positive score on a diabetes risk questionnaire (6). Participants were largely referred by their primary care providers. Trained NDPP coaches led 22–25 group sessions over 1 year (16 sessions in months 1–6 and 6–9 sessions in months 7–12) following guidelines developed by the CDC (7). From March 2013 to June 2019, >1,500 individuals participated, four of whom were >80 years of age at the time of enrollment. This article describes the health status and program outcomes, focusing on improvement in A1C and diabetes incidence over time, for these four individuals using medical records as of June 2020. The Colorado Multiple Institutional Review Board designated the project as a program evaluation.

Case Presentations

Case 1

The first case is an 82-year-old, single, Spanish-speaking Latina woman residing with family when she began the NDPP in October 2015 after a referral from her provider. Her diabetes risks at enrollment included obesity (BMI 30.4 kg/m²) and prediabetes (A1C 6.0%). Her A1C had increased from 5.7% when first recorded in the medical record in 2013. At baseline, her relevant health conditions included hypertension, hyperlipidemia, hypothyroidism, osteoarthritis, osteoporosis, and leg edema. Additionally, she experienced eye problems, including glaucoma and cataracts, and was diagnosed with hearing loss soon after enrolling.

She completed most of the year-long NDPP, attending 18 sessions over 315 days. While participating, she neared the program's goal of 150 minutes/week of physical activity (mean 130.0, SD 64.8). She lost 9 lb (6.9% of her starting body weight), exceeding the NDPP goal of $\geq 5\%$ weight loss. Her A1C initially decreased to 5.6% after starting the NDPP, increasing to 5.8% by the end of her participation. Her A1C again decreased to 5.6% 1 year

¹Behavioral Health Services, Denver Health and Hospital Authority, Denver, CO; ²The Chicago School of Professional Psychology, Washington DC; ³Office of Research, Denver Health and Hospital Authority, Denver, CO; ⁴Department of Psychiatry, School of Medicine, University of Colorado Anschutz Medical Campus, Aurora, CO; ⁵College of Nursing, University of Colorado Anschutz Medical Campus, Aurora, CO

Corresponding author: Natalie Ritchie, Natalie.Ritchie@dhha.org

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CASE STUDY

later and remained normal thereafter, with no indication of developing diabetes based on laboratory testing through March 2020, which was >4 years since starting the NDPP. She was not prescribed metformin before or after her participation. Her other health conditions remained stable and controlled by medication.

Case 2

The second case is an 82-year-old, widowed, English-speaking Latina woman who lived alone when she attended the NDPP in mid-2014 after receiving a referral from her provider. Her diabetes risks at NDPP enrollment included overweight (BMI 25.0 kg/m²) and prediabetes (A1C 6.4%). Her A1C had been increasing from 5.8% when first recorded in 2011 to 6.0% when next recorded in 2013. At baseline, her relevant health conditions included hypertension, osteoarthritis, osteoporosis, joint pain, fibromyalgia, depression, anxiety, hearing loss, and vision loss (glaucoma and cataracts), as well as cancer in remission.

She nearly completed the first half of the NDPP, attending 15 sessions over 175 days. While participating, she neared the NDPP's goal of 150 minutes/week of physical activity (mean 144.4, SD 144.4). Overall, she maintained her weight while participating, with a 1-lb increase (0.8%) from her initial body weight. Her A1C initially lowered to 5.9% after participating in the NDPP and remained at this level for about 2 years, more recently increasing to 6.3% in 2019. She has not been prescribed metformin. Her cancer also reoccurred in 2019, while other health conditions appeared stable overall.

Case 3

The third case is an 84-year-old, widowed, Spanish-speaking Latina woman residing with family, who began the NDPP in mid-2014. Her diabetes risks at NDPP enrollment included obesity (BMI 37.2 kg/m²) and prediabetes (A1C 6.3%). Referral information was unavailable. Her A1C was 6.4% 6 months before enrollment, which was the first recorded test result. At baseline, her relevant health conditions included hypertension, osteoporosis, osteoarthritis, and leg edema. She was also diagnosed with memory loss and vision loss with cataracts before enrollment.

She attended seven sessions over 36 days. Her average reported physical activity was 145.0 minutes/week (SD 115.0), as collected after session 3 when monitoring typically begins in the NDPP (8). Overall, she maintained her weight in the program, losing 1 lb (0.5% of her starting body weight). Her A1C initially decreased to 5.8%

1 year after starting the NDPP and remained consistent thereafter without metformin. Her last available medical records from 2016 (before she moved out of state with family) indicated stable health overall.

Case 4

The fourth case is an 82-year-old, divorced, English-speaking African American woman residing alone who first attended the NDPP in early 2014 for 36 days (attending five sessions) and then briefly resumed participation in two more sessions in early 2017. She had been referred to the NDPP by her provider. Her baseline diabetes risks included overweight (BMI 26.8 kg/m²) and prediabetes (A1C 6.4%); her A1C had increased from 5.7% when first recorded in 2012. Other relevant health conditions included hypertension, osteoporosis, chronic knee pain, leg edema, and breast cancer (in remission with continued oral chemotherapy). She was also diagnosed with hearing loss and vision problems before enrollment.

She had achieved 160 minutes/week of physical activity on the one reported occasion. She lost 2.6% of her baseline body weight during her participation in 2014, yet gained 1.3% during her second enrollment, resulting in a net loss of 2 lb. She was diagnosed with Alzheimer's disease in 2017, near the time of her second participation in the NDPP. Her most recent A1C in 2019 was 6.2%, indicating no onset of diabetes over the course of follow-up, with no prescribed metformin.

Questions

1. Should the NDPP be added to recommended clinical practice guidelines to reduce diabetes risks for seniors >80 years of age?
2. What considerations are needed to serve seniors >80 years of age in the NDPP, given their likelihood of complex health histories, including musculoskeletal, hearing, memory, and vision problems?
3. What strategies may help seniors >80 years of age complete the year-long NDPP program?

Commentary

This is the first report to our knowledge on seniors >80 years of age in the NDPP. Overall, very few participants in our program were in this age category. The four cases reported here were diverse women with common problems of prediabetes, overweight/obesity, hypertension, and musculoskeletal conditions. Overrepresentation of women is typical in the NDPP (9).

Memory, vision, and hearing loss were frequent additional concerns. The majority were referred by their health care provider after experiencing increased A1C in recent years. Participation for these individuals ranged from 1 to 2 months total for two individuals to 6 months for one, to nearly 1 year for another, which is fully consistent with national reports that three-fourths of participants complete <9 months of the NDPP (3,9). Of note, the minimum dose of intervention to reduce risks has not been definitively established (3,9).

In these case studies, women with diagnosed memory loss had lower attendance, suggesting potential difficulties engaging in an intensive lifestyle intervention with cognitive impairment (although not verifying reasons for dropout was a study limitation). Follow-up records were available for 2–5 years and showed that all four participants had lowered A1C despite their varying engagement and the fact that only one participant met the NDPP's goal of $\geq 5\%$ weight loss. Although memory impairment can lead to weight loss (10), this association was not observed here, as cases with diagnosed memory loss experienced minimal weight change.

All four individuals reported weekly physical activity exceeding 2 hours, which is a protective behavior for reducing diabetes risk (11). None were prescribed metformin to reduce their risk, suggesting that lifestyle intervention may have been beneficial. However, one limitation of the CDC's standards for NDPP delivery is that the type of physical activity performed is not collected for evaluation (6).

In summary, there was no indication of harmful outcomes from the NDPP, and all four participants >80 years of age appeared to benefit from the program with reduced diabetes risks, although it is unclear whether these older women would have developed diabetes without the NDPP.

Case reports are preliminarily encouraging that the NDPP may benefit older seniors; yet, these findings are not generalizable, and implications are uncertain. Few participating seniors >80 years of age may reflect the present lack of guidelines for those in their 80s with diabetes risks (4), whereas these case studies suggest that referrals may be appropriate with special considerations. First, given such patients' often complex medical histories, ensuring a patient's ability to participate in a lifestyle intervention and concurrent medical care appears to be important. Because musculoskeletal conditions are common, extra precautions may be needed for physical activity. Balance training exercises (e.g., tai chi) could be prioritized to reduce a patient's fall risk and improve mobility, as well as

guidance to decrease sedentary time (12). Sensory and cognitive issues may further challenge participation in a class geared to the abilities of relatively younger individuals, in which the average age is 55.1 years (3). Strategies may include offering large-print materials, microphones for discussion, and extra contact for reminders about upcoming sessions and reinforcement of topics. Older participants may also be encouraged to attend alongside a support partner, if available, as participation with a partner was previously found to improve NDPP outcomes (13). Alternatively, offering an NDPP class especially for older seniors may further help to address age-specific needs, including in assisted-living or senior centers (5). The NDPP's group class format may also be beneficial to decrease social isolation that can be problematic in older adults (14). Assessing and addressing health literacy may also be important for these individuals (15). Further study appears to be merited in larger, more diverse samples, including a focus on broader quality of life outcomes that may be especially important for older adults.

Clinical Pearls

- Case studies preliminarily suggest that the NDPP is not harmful to and may benefit seniors >80 years of age who have diabetes risks.
- The curriculum's focus on diet and physical activity are consistent with general recommendations for seniors (9) and may be further modified to address maintaining flexibility and balance (6).
- Further study of individuals who are >80 years of age and referred to the NDPP is needed to demonstrate any resulting reduction in diabetes risks, while ensuring concurrent medical attention.

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CASE STUDY

AUTHOR CONTRIBUTIONS

K.Z. and N.D.R. conceived the project, analyzed data, conducted medical chart reviews, and drafted the manuscript. K.Z. is the guarantor of this work and, as such, had full access to all the data reported and takes responsibility for the integrity of the data and the accuracy of the report.

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