Pragmatic and Observational Research

Dovepress
Taylor & Francis Group

Open Access Full Text Article

ORIGINAL RESEARCH

Outcomes During a One-Year Multidisciplinary Lifestyle Program in Japanese Specialty Care: A Retrospective Observational Study

Yuji Nakatani[1], Keisuke Masuno[1], Mao Tanabe[2], Yuta Nakaniida[2], Hitoshi Tabuchi[2,3]

[1]Department of Internal Medicine, Nakatani Hospital, Himeji, Hyogo, Japan; [2]Department of Ophthalmology, Tsukazaki Hospital, Himeji, Hyogo, Japan; [3]Department of Ophthalmology, Hyogo Medical University, Nishinomiya, Hyogo, Japan

Correspondence: Hitoshi Tabuchi, Department of Ophthalmology, Tsukazaki Hospital, Himeji, Hyogo, Japan, Tel +81-79-272-8555, Fax +81-79-272-8550, Email h.tabuchi@tsukazaki-eye.net

Pragmatic and Observational Research downloaded from https://www.dovepress.com/
For personal use only.

Background: Multidisciplinary lifestyle care in routine practice occurs alongside medication changes and irregular testing. We described outcomes during a one-year high-contact specialty-clinic program, separating average post-baseline differences from approximately 12-month change.

Materials and Methods: This retrospective single-center study included 170 adults with hypertension, dyslipidemia, or diabetes. The primary estimand was the adjusted average difference between baseline and any available post-baseline measurement. Separate linear mixed models included a participant random intercept and fixed terms for follow-up status, age at measurement, sex, and time-varying antidiabetic, antihypertensive, and lipid-lowering medication classes. A complete-pair analysis used the measurement nearest 12 months within a 10–14-month window. Outcome-specific missingness was reported. A Bonferroni benchmark of $P<0.0028$ was applied across 18 mixed-model outcomes; paired P values were adjusted across all 18 prespecified outcomes.

Results: Mean age was 63.0 years (SD 12.6), and 92 participants (54.1%) were women. Body-composition data were nearly complete, whereas physical-function data were available for a selected subset. Differences meeting the multiplicity benchmark were body weight (−2.11 kg, 95% CI −2.68 to −1.54), body fat percentage (−2.04 percentage points, −2.53 to −1.56), waist circumference (−2.72 cm, −3.43 to −2.01), body mass index (−0.90 kg/m^2, −1.13 to −0.68), 1-min walk (+7.50 steps, 4.51 to 10.49), chair stand (+2.27 repetitions, 1.47 to 3.07), one-leg stand (+7.19 s, 3.37 to 11.00), and low-density lipoprotein cholesterol (−6.44 mg/dL, −10.49 to −2.39). The 10–14-month complete-pair analysis was directionally consistent.

Conclusion: During this single-arm program, adiposity measures changed modestly and lower-extremity performance showed larger standardized differences. No comparator, outcome-specific missingness, unknown attendance, and medication-measurement limitations preclude causal attribution.

Plain Language Summary: Lifestyle programs in everyday clinical care differ from tightly controlled trials: people may miss sessions, medicines may change, and tests are not always repeated at exactly the same time. We reviewed routine data from 170 adults who joined a one-year program at a Japanese specialty clinic. The program combined physician visits with support from exercise trainers, nurses, pharmacists, and dietitians. During follow-up, weight, body fat, waist size, and several lower-body function tests improved on average. Changes in glucose and blood lipids were generally smaller. A separate analysis of people tested again around 12 months showed a similar pattern. These findings describe what was observed in one clinic; they do not prove that the program itself caused the changes because there was no comparison group and physical-function data were available for only a subset of participants.

Keywords: real-world evidence, lifestyle-related disease, multidisciplinary care, longitudinal observational study, physical function, Japan

https://doi.org/10.2147/POR.S623362
Received: 9 May 2026
Accepted: 12 August 2026
Published: 5 September 2026

© 2026 Nakatani et al. This work is published and licensed by Dove Medical Press Limited. The full terms of this license are available at https://www.dovepress.com/terms.php and incorporate the Creative Commons Attribution – Non Commercial (unported, v4.0) License (http://creativecommons.org/licenses/by-nc/4.0/). By accessing the work you hereby accept the Terms. Non-commercial uses of the work are permitted without any further permission from Dove Medical Press Limited, provided the work is properly attributed. For permission for commercial use of this work, please see paragraphs 4.2 and 5 of our Terms (https://www.dovepress.com/terms.php).

Introduction

Cardiometabolic conditions such as hypertension, dyslipidemia, diabetes mellitus, and obesity are major contributors to morbidity, functional limitation, and health expenditure. These conditions are associated with modifiable behaviors, including diet and physical inactivity.[1,2] In this study, the term lifestyle-related disease refers specifically to the physician-diagnosed conditions used for program eligibility: hypertension, dyslipidemia, or diabetes mellitus.

Structured lifestyle programs can improve weight, glycemic markers, lipid profiles, and physical performance in high-risk adults. However, results from explanatory trials do not always translate directly to routine clinical care, where participants differ in baseline risk, attendance, staffing contact, comorbidity, and concurrent medication use.[3–7]

Real-world observational studies can complement trial evidence by describing the outcomes achieved by specific service configurations. The distinctive contribution of the present study is the joint evaluation of body composition, lower-extremity function, and metabolic markers in a high-contact Japanese specialty-clinic program, together with explicit reconstruction of concurrent medication classes and detailed reporting of outcome-specific data availability.[8,9]

The primary objective was to estimate the adjusted average difference between baseline and available post-baseline measurements collected during the one-year program. This estimand summarizes the overall follow-up period and is not a fixed 12-month change. A secondary objective was to summarize within-person change among participants with a measurement nearest 12 months. We also report direct program cost solely to characterize resource intensity in the Japanese setting; the study was not designed to evaluate affordability, efficiency, or cost-effectiveness.

Materials and Methods

Study Design and Setting

This retrospective longitudinal observational study evaluated a one-year multidisciplinary lifestyle program delivered in routine practice at a Japanese healthcare facility specializing in lifestyle-related disease management between January 2020 and December 2021. Reporting was guided by relevant items from the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement.[10]

The program was a routine clinical service. Participants were not prospectively assigned for research, and no parallel usual-care or no-intervention comparator group was available. The study therefore estimates associations within an observed service cohort rather than intervention effects.

Participants and Cohort Assembly

Adults enrolled in the program with hypertension, dyslipidemia, or diabetes mellitus were eligible. The de-identified analytic extract contained 170 participants with at least one analyzable measurement for a prespecified outcome; no additional participant in that extract was excluded (0/170, 0%). A separate screening log for all program enrollees before creation of the analytic extract was unavailable, so the number of enrollees who were not transferred into the extract could not be reconstructed.

Pregnancy and previous bariatric surgery were not prespecified exclusion criteria and were not available as structured variables in the analytic extract. For the mixed models, a participant could contribute a baseline record, a post-baseline record, or both for a given outcome. The fixed 10–14-month paired analysis required both a baseline value and an eligible follow-up value for that outcome.

Sex was extracted from the medical record as biological sex. Gender identity was not available. Sex was included as a covariate in the mixed models; sex-stratified estimates were not prespecified and were not generated because the physical-function subset was small and outcome-specific missingness would have produced unstable subgroup estimates.

Multidisciplinary Service Model and Attendance

The clinic prescribed monthly physician consultations and weekly or twice-weekly multidisciplinary sessions. Exercise trainers supervised moderate-intensity resistance and functional training; nurses and pharmacists provided disease-management education and medication-adherence support; and registered dietitians provided individualized nutrition counseling aimed at sustainable dietary improvement.

The scheduled contact frequency describes the intended program dose. Session-level attendance and adherence were not available in the analytic extract, so actual exposure to the program could not be quantified. This high-contact configuration should not be assumed to represent a low-intensity or usual primary-care workflow.

Outcomes and Measurement Timing

Three outcome domains were evaluated: body composition (body weight, body fat percentage, basal metabolic rate, waist circumference, skeletal muscle mass, and body mass index [BMI]); physical function (sit-and-reach right and left, one-leg stand with eyes open, grip strength right and left, 1-min walk, and chair stand); and blood indices (fasting glucose, hemoglobin A1c [HbA1c], triglycerides, high-density lipoprotein cholesterol [HDL-C], and low-density lipoprotein cholesterol [LDL-C]).

Measurement date was the calendar date on which an outcome was recorded in routine care. Baseline was the program-entry record at elapsed month 0. A post-baseline measurement was any later available record during the program. The analytic files contained one baseline record and at most one post-baseline record per participant for each outcome. Device-specific protocols were not retained in the analytic extract.

Medication-Class Reconstruction

Prescription records contained prescription date, drug name, and medication addition or discontinuation events. Drug names were normalized and mapped to three therapeutic classes: antidiabetic therapy (DM), antihypertensive therapy (AH), and lipid-lowering therapy (DL).

For each outcome measurement date, current use of each class was represented by a binary indicator. An addition event changed the indicator to 1 from that date, a discontinuation event changed it to 0, and the most recent status was carried forward to the measurement date; no fixed look-back window was used. When no dated record for a class was available before baseline, that class was coded as not documented in use (0). This coding assumption can misclassify prevalent therapy that was absent from the dated source record. Dose, regimen intensity, indication, dispensing, and actual medication adherence were unavailable.

Statistical Analysis

The primary analysis used a separate linear mixed-effects model for each outcome with a participant-specific random intercept. The model was: $Y_{it} = \beta0 + \beta1\text{Post}_{it} + \beta2\text{Age}_{it} + \beta3\text{Sex}_i + \beta4\text{AH}_{it} + \beta5\text{DM}_{it} + \beta6\text{DL}_{it} + b_i + \varepsilon_{it}$. Post_{it} was 0 for baseline and 1 for any post-baseline observation. Therefore, β1 is the medication-class-adjusted average difference between baseline and available post-baseline measurements; it is not a fixed one-year change and is not interpreted as a causal effect.

Age at measurement was included because routine measurements occurred on different calendar dates and the cohort covered a wide age range. We acknowledge that within-person aging over the one-year program is mechanically related to follow-up status; this is another reason not to interpret β1 as an annual time effect. Models were estimated in Python using statsmodels, with 95% confidence intervals (CIs).

Outcome data were analyzed on an available-case basis. No missing outcome value was imputed. Outcome-specific numbers of baseline records, post-baseline records, participants, observations, and 10–14-month complete pairs are reported. Because 18 mixed models were fitted, nominal P values are shown for estimation and a conservative Bonferroni benchmark of $0.05/18 = 0.0028$ is identified. Standardized coefficients were calculated by dividing β1 by the corresponding baseline standard deviation.

A supportive complete-pair analysis retained all 18 prespecified outcomes, including basal metabolic rate and separate right-and left-side sit-and-reach and grip-strength measurements. The eligible post-baseline observation was the available record nearest 12 months only when the recorded elapsed month was 10-14. Two-sided paired t tests summarized within-person change, and Bonferroni-adjusted P values were calculated across all 18 outcomes. No missing value was imputed. This analysis is directly interpretable as approximately 12-month change but applies only to participants with an eligible complete pair.

A sensitivity analysis replaced time-varying medication indicators with baseline medication-class indicators. This analysis addressed the concern that medication changes during follow-up could be part of the multidisciplinary management pathway; conditioning on time-varying medication may remove part of the total observed program-associated change. Accordingly, the time-varying and baseline-only models are interpreted as complementary conditional associations, not as competing causal estimates.

Direct Program Cost Context

The clinic estimated a direct annual program cost of 81,120 Japanese yen (JPY) per participant. We report this amount and its monthly equivalent only to describe resource intensity. We removed outcome-based cost ratios because the study had no comparator, utilization data, quality-adjusted life-years, or decision threshold and therefore cannot estimate incremental efficiency or cost-effectiveness.

Results

Cohort Characteristics and Data Availability

The analytic extract contained 170 participants, and no additional record was excluded after dataset assembly. Mean age was 63.0 years (standard deviation 12.6), and 92 participants (54.1%) were women. Baseline characteristics are shown in Table 1.

Outcome availability differed markedly by domain (Table 2). Body-composition outcomes had 165 complete 10–14-month pairs (97.1% of the cohort). Physical-function outcomes had 26-34 complete pairs (15.3%–20.0%), and blood

Table 1 Baseline Characteristics of the Analytic Cohort

Characteristic	Value
Number of participants	170
Age, years	63.0 ± 12.6 (n=170)
Women	92 (54.1%)
Baseline antidiabetic medication use	35 (20.6%)
Baseline antihypertensive medication use	90 (52.9%)
Baseline lipid-lowering medication use	89 (52.4%)
Body weight, kg	68.30 ± 13.54 (n=170)
Body fat, %	32.73 ± 8.40 (n=170)
Basal metabolic rate, kcal	1358.84 ± 217.64 (n=170)
Waist circumference, cm	88.41 ± 11.48 (n=170)
Skeletal muscle mass, kg	25.093 ± 6.165 (n=170)
BMI, kg/m^2	26.35 ± 4.11 (n=170)
Sit-and-reach right, cm	−0.81 ± 13.26 (n=58)
Sit-and-reach left, cm	−0.34 ± 12.77 (n=58)
One-leg stand, s	19.14 ± 20.69 (n=58)
Grip strength right, kg	25.25 ± 7.46 (n=59)
Grip strength left, kg	24.26 ± 7.78 (n=59)
1-min walk, steps	52.85 ± 9.79 (n=55)

(*Continued*)

Table 1 (Continued).

Characteristic	Value
Chair stand, repetitions	10.79 ± 3.86 (n=58)
Fasting glucose, mg/dL	111.19 ± 32.70 (n=161)
HbA1c, %	5.919 ± 0.613 (n=158)
Triglycerides, mg/dL	154.60 ± 81.68 (n=168)
HDL-C, mg/dL	57.44 ± 13.52 (n=168)
LDL-C, mg/dL	124.50 ± 33.73 (n=168)

Note: Values are mean ± standard deviation or n (%). Medication classes were reconstructed from dated prescription events. Participants without a documented pre-baseline event for a class were coded as not documented in use for that class.

Table 2 Outcome-Specific Data Availability and Missingness

Outcome	Baseline n (%)	Any Post-Baseline n (%)	Mixed-Model Participants	Observations	10-14-Month Pairs n (%)	Pair Missing n (%)
Body weight	170 (100.0)	170 (100.0)	170	340	165 (97.1)	5 (2.9)
Body fat percentage	170 (100.0)	170 (100.0)	170	340	165 (97.1)	5 (2.9)
Basal metabolic rate	170 (100.0)	170 (100.0)	170	340	165 (97.1)	5 (2.9)
Waist circumference	170 (100.0)	170 (100.0)	170	340	165 (97.1)	5 (2.9)
Skeletal muscle mass	170 (100.0)	170 (100.0)	170	340	165 (97.1)	5 (2.9)
BMI	170 (100.0)	170 (100.0)	170	340	165 (97.1)	5 (2.9)
Sit-and-reach right	58 (34.1)	51 (30.0)	58	109	34 (20.0)	136 (80.0)
Sit-and-reach left	58 (34.1)	51 (30.0)	58	109	34 (20.0)	136 (80.0)
One-leg stand	58 (34.1)	52 (30.6)	58	110	32 (18.8)	138 (81.2)
Grip strength right	59 (34.7)	54 (31.8)	59	113	34 (20.0)	136 (80.0)
Grip strength left	59 (34.7)	54 (31.8)	59	113	34 (20.0)	136 (80.0)
1-min walk	55 (32.4)	41 (24.1)	56	96	26 (15.3)	144 (84.7)
Chair stand	58 (34.1)	49 (28.8)	58	107	31 (18.2)	139 (81.8)
Fasting glucose	161 (94.7)	125 (73.5)	164	286	119 (70.0)	51 (30.0)
HbA1c	158 (92.9)	124 (72.9)	164	282	115 (67.6)	55 (32.4)
Triglycerides	168 (98.8)	170 (100.0)	170	338	163 ((95.9)	7 (4.1)
HDL-C	168 (98.8)	170 (100.0)	170	338	163 (95.9)	7 (4.1)
LDL-C	168 (98.8)	170 (100.0)	170	338	163 (95.9)	7 (4.1)

Note: Percentages use the full cohort (N=170) asdenominator. The 10–14-month pair required both a baseline value and afollow-up value with recorded elapsed month 10–14.

outcomes had 115–163 complete pairs (67.6%–95.9%). The smaller physical-function subset may therefore represent a selected group of participants who underwent repeated functional testing within the prespecified window.

Medication events were available for 152 participant identifiers; 31 participants had their first dated medication event after baseline, and 19 had no dated medication event in the source record. Medication-class status changed between

measurements for 22 participants in the body-composition datasets and did not change in the analytic physical-function or blood subsets.

Adjusted Average Post-Baseline Differences

Complete mixed-model estimates are shown in Table 3 and standardized estimates in Figure 1. Eight outcomes met the conservative Bonferroni benchmark of P<0.0028: body weight (−2.11 kg, 95% CI −2.68 to −1.54), body fat percentage (−2.04 percentage points, 95% CI −2.53 to −1.56), waist circumference (−2.72 cm, 95% CI −3.43 to −2.01), BMI (−0.90 kg/m^2, 95% CI −1.13 to −0.68), 1-min walk (+7.50 steps, 95% CI 4.51 to 10.49), chair stand (+2.27 repetitions, 95% CI 1.47 to 3.07), one-leg stand (+7.19 s, 95% CI 3.37 to 11.00), and LDL-C (−6.44 mg/dL, 95% CI −10.49 to −2.39).

Fasting glucose, HbA1c, triglycerides, HDL-C, and sit-and-reach left had nominal P values below 0.05 but did not meet the multiplicity benchmark. Basal metabolic rate, skeletal muscle mass, bilateral grip strength, and sit-and-reach right showed little or uncertain average change.

In absolute terms, the adjusted weight difference was approximately 3.1% of the baseline mean. The functional differences were approximately 14% of the baseline mean for the 1-min walk, 21% for chair stand, and 38% for one-leg

Table 3 Time-Varying Medication-Class Mixed-Model Results

Outcome	Participants	Observations	Adjusted Average Post-Baseline Difference	95% CI	P value	Standardized Coefficient
Body weight (kg)	170	340	−2.11	−2.68 to −1.54	<0.001*	−0.16
Body fat (%)	170	340	−2.04	−2.53 to −1.56	<0.001*	−0.24
Basal metabolic rate (kcal)	170	340	−0.75	−5.09 to 3.59	0.735	0.00
Waist circumference (cm)	170	340	−2.72	−3.43 to −2.01	<0.001*	−0.24
Skeletal muscle mass (kg)	170	340	−0.016	−0.136 to 0.105	0.798	0.00
BMI (kg/m^2)	170	340	−0.90	−1.13 to −0.68	<0.001*	−0.22
Sit-and-reach right (cm)	58	109	1.37	−0.04 to 2.78	0.057	0.10
Sit-and-reach left (cm)	58	109	1.79	0.39 to 3.18	0.012	0.14
One-leg stand (s)	58	110	7.19	3.37 to 11.00	<0.001*	0.35
Grip strength right (kg)	59	113	0.47	−0.36 to 1.30	0.266	0.06
Grip strength left (kg)	59	113	0.35	−0.55 to 1.25	0.444	0.04
1-min walk (steps)	56	96	7.50	4.51 to 10.49	<0.001*	0.77
Chair stand (repetitions)	58	107	2.27	1.47 to 3.07	<0.001*	0.59
Fasting glucose (mg/dL)	164	286	−6.22	−11.57 to −0.88	0.022	−0.19
HbA1c (%)	164	282	−0.095	−0.173 to −0.016	0.019	−0.15
Triglycerides (mg/dL)	170	338	−15.77	−29.34 to −2.19	0.023	−0.19
HDL-C (mg/dL)	170	338	1.45	0.40 to 2.51	0.007	0.11
LDL-C (mg/dL)	170	338	−6.44	−10.49 to −2.39	0.002*	−0.19

Note: Each model included a participant random intercept and fixed terms for post-baseline status, age at measurement, sex, and time-varying medication classes. The coefficient is an adjusted average difference between baseline and available post-baseline measurements, not a fixed one-year change. *Meets the conservative Bonferroni benchmark P<0.0028 (0.05/18).

Abbreviation: CI, confidence interval.

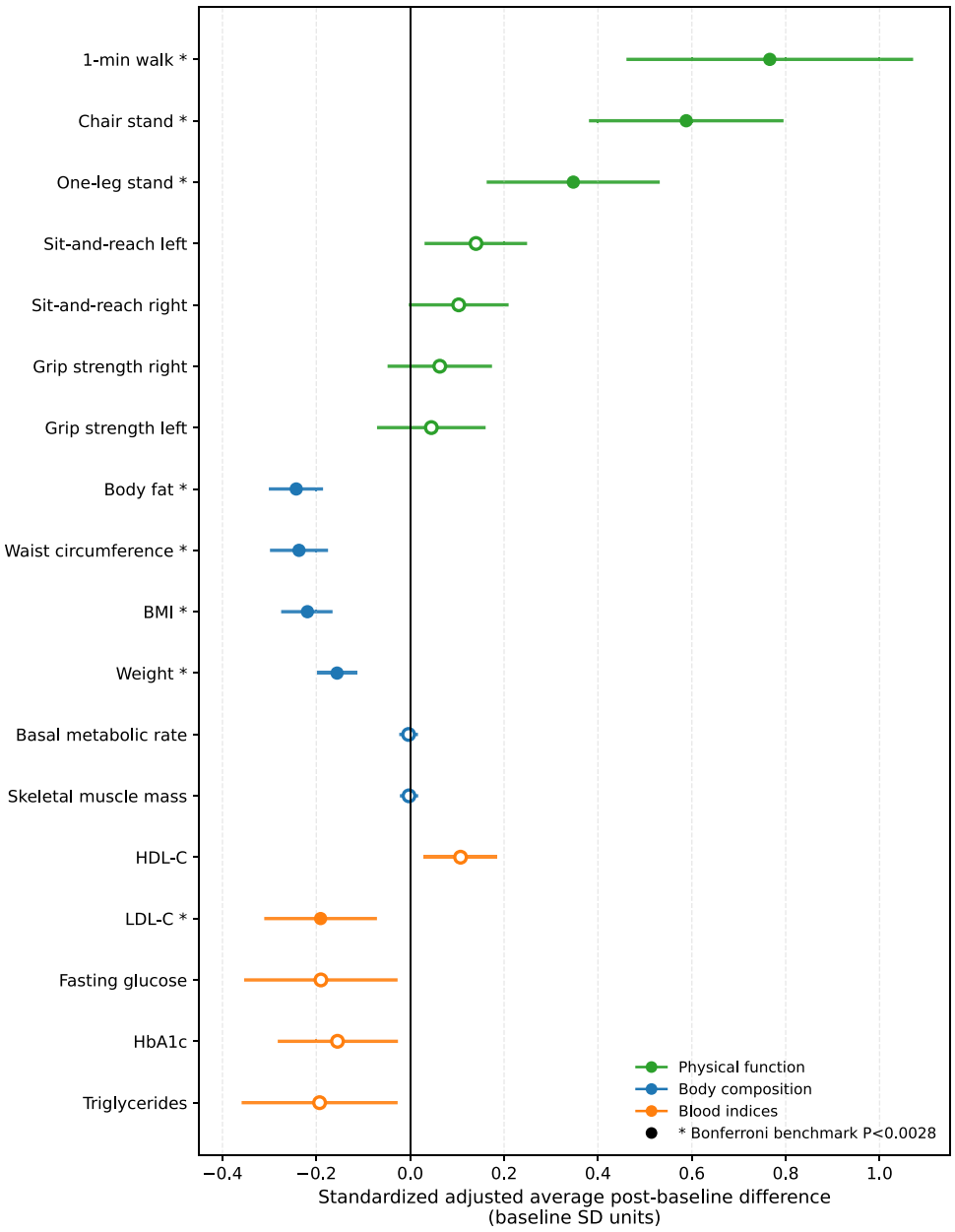

Figure 1 Standardized adjusted average post-baseline differences from the time-varying medication-class mixed models. Points show standardized coefficients (adjusted average post-baseline difference divided by the baseline standard deviation); horizontal lines show 95% confidence intervals. Colors identify outcome domains. Filled points and an asterisk identify outcomes meeting the conservative Bonferroni benchmark of P<0.0028 across 18 outcomes; open points do not meet that benchmark. Negative values are favorable for outcomes in which a reduction is clinically desirable. The figure displays associations and not causal effects.

stand. These relative changes and standardized coefficients suggest a stronger signal for lower-extremity performance than for metabolic indices, but established clinical-importance thresholds were not available for the exact locally implemented tests.

Complete-Pair Change Near 12 Months

The complete-pair analysis is shown in Table 4. After Bonferroni adjustment across 18 outcomes, changes remained statistically supported for body weight, body fat percentage, waist circumference, skeletal muscle mass, BMI, 1-min walk, chair stand, fasting glucose, and LDL-C. Skeletal muscle mass decreased modestly; the other supported changes were in the favorable direction. Basal metabolic rate, bilateral sit-and-reach, one-leg stand, bilateral grip strength,

https://doi.org/10.2147/POR.S623362

Table 4 Complete-Pair Outcomes Nearest 12 Months (10–14-Month Window)

Outcome	n	Baseline Mean (95% CI)	Follow-up Mean (95% CI)	Mean Change	Paired P Value	Bonferroni-Adjusted P Value
HbA1c (%)	115	6.06 (5.94–6.18)	5.94 (5.83–6.04)	−0.12	0.0054	0.097
Triglycerides (mg/dL)	163	154.17 (141.38–166.96)	135.77 (123.56–147.98)	−18.40	0.0091	0.165
HDL-C (mg/dL)	163	57.37 (55.26–59.48)	58.73 (56.47–61.00)	+1.36	0.0117	0.211
LDL-C (mg/dL)	163	124.75 (119.49–130.00)	117.55 (113.32–121.78)	−7.20	<0.001	0.014
Fasting glucose (mg/dL)	119	117.65 (111.25–124.05)	108.38 (103.76–112.99)	−9.27	0.0026	0.047
Body weight (kg)	165	68.55 (66.47–70.62)	66.05 (64.14–67.96)	−2.50	<0.001	<0.001
Body fat (%)	165	32.83 (31.55–34.11)	30.75 (29.51–31.99)	−2.08	<0.001	<0.001
Basal metabolic rate (kcal)	165	1361.41 (1327.86–1394.95)	1354.99 (1322.57–1387.41)	−6.42	0.0034	0.061
Waist circumference (cm)	165	88.65 (86.90–90.41)	85.57 (83.96–87.17)	−3.09	<0.001	<0.001
Skeletal muscle mass (kg)	165	25.17 (24.22–26.12)	24.98 (24.06–25.90)	−0.19	0.0022	0.040
BMI (kg/m2)	165	26.44 (25.81–27.06)	25.46 (24.89–26.03)	−0.98	<0.001	<0.001
1-min walk (steps)	26	50.85 (47.15–54.54)	58.58 (53.79–63.37)	+7.73	<0.001	0.008
Chair stand (repetitions)	31	9.87 (8.80–10.95)	12.32 (10.95–13.70)	+2.45	<0.001	0.003
One-leg stand (s)	32	14.74 (9.43–20.05)	21.42 (14.16–28.68)	+6.68	0.0108	0.194
Sit-and-reach right (cm)	34	−3.06 (−8.02–1.90)	−1.68 (−6.48–3.13)	+1.38	0.1197	1.000
Sit-and-reach left (cm)	34	−2.79 (−7.65–2.06)	−1.12 (−5.75–3.51)	+1.68	0.0632	1.000
Grip strength right (kg)	34	24.96 (22.17–27.76)	25.04 (22.49–27.60)	+0.08	0.8883	1.000
Grip strength left (kg)	34	24.37 (21.41–27.33)	24.46 (21.92–27.00)	+0.09	0.8847	1.000

Note: Follow-up was the available observation nearest 12 months and was eligible only when the recorded elapsed month was 10–14. All 18 prespecified outcomes were retained; right and left sit-and-reach and grip-strength measurements were analyzed separately. Two-sided paired t tests were used. Bonferroni-adjusted P values were calculated as min(raw P × 18, 1.000). No missing value was imputed. This complete-case analysis estimates approximately 12-month within-person change and excludes participants without an eligible pair. CI, confidence interval.

HbA1c, triglycerides, and HDL-C did not retain adjusted significance. These analyses describe participants with complete 10–14-month measurements and should not be generalized to participants with missing follow-up tests.

Medication Sensitivity Analysis

Baseline-only medication-class models produced estimates that were generally similar in direction to the time-varying models. The similarity was expected because documented medication-class changes were sparse outside the body-composition datasets. These analyses do not distinguish confounding from mediation by medication management.

Direct Program Cost

The direct annual program cost was 81,120 JPY per participant, equivalent to 6,760 JPY per month. No ratio of cost to outcome change and no incremental cost-effectiveness estimate was calculated.

Discussion

This retrospective evaluation describes outcomes observed during a one-year, high-contact multidisciplinary specialty-care program. The most consistent findings were modest reductions in adiposity measures and larger standardized differences in lower-extremity performance. LDL-C showed a smaller favorable difference that remained supported after a conservative multiplicity benchmark. The strict 10-14-month complete-pair analysis showed a broadly similar pattern for adiposity, walking, chair-stand, fasting glicose, and LDL-C, while also identifying a small decrease in skeletal muscle mass; one-leg stand did not retain multiplicity-adjusted significance.

The study adds to prior literature in three ways. First, it reports a routine specialty-clinic service rather than a standardized research intervention. Second, it evaluates physical function alongside body composition and laboratory markers, showing that the largest standardized differences occurred in walking, chair-stand, and balance tests. Third, it makes the medication reconstruction and outcome-specific missingness explicit, which is important when interpreting real-world longitudinal data.[3–9]

Clinical relevance should be judged cautiously. The average weight difference was about 3% of baseline weight, and absolute changes in glycemic and lipid markers were modest. By contrast, the relative and standardized differences in lower-extremity tests were larger. Walking, chair-stand, and balance performance are relevant to mobility preservation and fall prevention in older adults.[11,12] However, the precise minimal clinically important differences for the locally administered 1-min walk, chair-stand, and one-leg-stand protocols were not available, and the tested subset was small. The results therefore support a signal worthy of prospective evaluation rather than a claim of established clinical benefit.

Medication adjustment has two interpretations. Time-varying class indicators can reduce confounding by concurrent pharmacotherapy, but medication changes may also be part of the care pathway. Conditioning on them can therefore attenuate the total change observed during multidisciplinary management or introduce bias. The baseline-only sensitivity analysis was retained to show whether conclusions depended strongly on that choice. Neither approach isolates a lifestyle-only effect, and medication adherence, dose, and subclass were not measured.

Missingness is a central limitation rather than a minor technical issue. Physical-function measurements were available for roughly one-third of the cohort and may have been obtained from participants who were more engaged, healthier, or more able to complete testing. Attendance data were unavailable, so dose-response relationships could not be assessed. Sex-stratified analyses were not performed because the physical-function subset would have produced small and unstable strata; biological sex was adjusted in the models, while gender identity was not recorded.

The direct cost is presented only as resource context. Prior economic evaluations of lifestyle and physical-activity programs show that conclusions depend on the comparator, time horizon, outcomes, and local cost assumptions.[13–16] Without a comparator, healthcare utilization, quality-of-life data, or longer-term outcomes, neither affordability nor efficiency can be inferred. Outcome-based cost ratios were removed because they would depend on arbitrary outcome selection and provide no decision threshold.

Other limitations include the retrospective single-center design, lack of a comparator group, absence of a complete pre-extract screening log, possible misclassification when undocumented medication use was coded as 0, use of a binary post-baseline indicator rather than a continuous trajectory, and unavailable device-specific measurement protocols. Participants with only one outcome record could contribute information to mixed-model estimation but not a within-person pair. Age at measurement was mechanically related to time, and the mixed-model coefficient should not be interpreted as an annual effect. Finally, pregnancy, previous bariatric surgery, detailed comorbidities, and gender identity were not available as structured variables.

Conclusion

During a one-year multidisciplinary program in a Japanese specialty clinic, routine-care data showed modest favorable differences in adiposity measures and larger standardized differences in lower-extremity performance. The results are descriptive associations from a single-arm cohort. Prospective comparator-based studies with complete attendance records, standardized functional testing, detailed medication data, and prespecified subgroup analyses are needed.

AI Statement

OpenAI ChatGPT was used for language editing, journal-format reorganization, and preparation of submission-ready text and figure files based on author-supplied study results. It was not used for data collection or primary statistical analysis. The authors reviewed, edited, and verified all AI-assisted content and take responsibility for the validity, originality, and integrity of the submitted manuscript.

Abbreviations

AH, antihypertensive therapy; BMI, body mass index; CI, confidence interval; DL, lipid-lowering therapy; DM, antidiabetic therapy; HbA1c, hemoglobin A1c; HDL-C, high-density lipoprotein cholesterol; JPY, Japanese yen; LDL-C, low-density lipoprotein cholesterol; SD, standard deviation; STROBE, Strengthening the Reporting of Observational Studies in Epidemiology.

Data Sharing Statement

The datasets used and/or analyzed during the current study are not publicly available because they contain potentially identifiable clinical information from a single institution. De-identified data may be available from the corresponding author on reasonable request and subject to institutional review board approval.

Ethics Approval and Informed Consent

The retrospective analysis of routinely collected clinical data was performed in accordance with the Declaration of Helsinki and was approved by the Institutional Review Board of Nakatani Hospital (approval number: 20240601). All participants provided written informed consent.

Clinical trial registration was not required because participants were not prospectively assigned to the program for research; this was a retrospective observational evaluation of routine clinical care.

Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

Funding

No external funding was received for this study.

Disclosure

Yuji Nakatani and Keisuke Masuno are affiliated with Nakatani Hospital, the facility that delivered the evaluated program. The authors report no other conflicts of interest in this work.

References

1. Roth GA, Mensah GA, Johnson CO, et al. Global burden of cardiovascular diseases and risk factors, 1990-2019: update from the GBD 2019 study. *J Am Coll Cardiol*. 2020;76(25):2982–3021. doi:10.1016/j.jacc.2020.11.010
2. Ng R, Sutradhar R, Yao Z, Wodchis WP, Rosella LC. Smoking, drinking, diet and physical activity-modifiable lifestyle risk factors and their associations with age to first chronic disease. *Int J Epidemiol*. 2020;49(1):113–130. doi:10.1093/ije/dyz078

3. O'Connor EA, Evans CV, Rushkin MC, Redmond N, Lin JS. Behavioral counseling to promote a healthy diet and physical activity for cardiovascular disease prevention in adults with cardiovascular risk factors: updated evidence report and systematic review for the US preventive services task force. *Jama*. 2020;324(20):2076–2094. doi:10.1001/jama.2020.17108
4. Diabetes Prevention Program Research Group, Knowler WC, Barrett-Connor E, Fowler SE, et al. Reduction in the incidence of type 2 diabetes with lifestyle intervention or metformin. *N Engl J Med*. 2002;346(6):393–403.
5. Wing RR, Look AHEAD Research Group. Long-term effects of a lifestyle intervention on weight and cardiovascular risk factors in individuals with type 2 diabetes: four-year results of the LOOK AHEAD trial. *Arch Intern Med*. 2010;170(17):1566–1575. doi:10.1001/archinternmed.2010.334
6. Ackermann RT, Finch EA, Brizendine E, Zhou H, Marrero DG. Translating the diabetes prevention program into the community: the DEPLOY pilot study. *Am J Prev Med*. 2008;35(4):357–363. doi:10.1016/j.amepre.2008.06.035
7. Reid KF, Laussen J, Bhatia K, et al. Translating the lifestyle interventions and independence for elders clinical trial to older adults in a real-world community-based setting. *J Gerontol a Biol Sci Med Sci*. 2019;74(6):924–928. doi:10.1093/gerona/gly152
8. Saito J, Haseda M, Amemiya A, Takagi D, Kondo K, Kondo N. Community-based care for healthy aging: lessons from Japan. *Bull World Health Organ*. 2019;97(8):570–574. doi:10.2471/BLT.18.223057
9. Arai H, Ouchi Y, Toba K, et al. Japan as the front-runner of super-aged societies: perspectives from medicine and medical care in Japan. *Geriatr Gerontol Int*. 2015;15(6):673–687. doi:10.1111/ggi.12450
10. von Elm E, Altman DG, Egger M, Pocock SJ, Gotzsche PC, Vandenbroucke JP. STROBE Initiative. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies. *PLoS Med*. 2007;4(10):e296. doi:10.1371/journal.pmed.0040296
11. Pahor M, Guralnik JM, Ambrosius WT, et al. Effect of structured physical activity on prevention of major mobility disability in older adults: the LIFE study randomized clinical trial. *Jama*. 2014;311(23):2387–2395. doi:10.1001/jama.2014.5616
12. Sherrington C, Fairhall NJ, Wallbank GK, et al. Exercise for preventing falls in older people living in the community. *Cochrane Database Syst Rev*. 2019;1(1):CD012424. doi:10.1002/14651858.CD012424.pub2
13. Forster M, Veerman JL, Barendregt JJ, Vos T. Cost-effectiveness of diet and exercise interventions to reduce overweight and obesity. *Int J Obes Lond*. 2011;35(8):1071–1078. doi:10.1038/ijo.2010.246
14. Snowsill TM, Stathi A, Green C, et al. Cost-effectiveness of a physical activity and behavior maintenance programme on functional mobility decline in older adults: an economic evaluation of the REACT trial. *Lancet Public Health*. 2022;7(4):e327–e334. doi:10.1016/S2468-2667(22)00030-5
15. Sathish T, Oldenburg B, Thankappan KR, et al. Cost-effectiveness of a lifestyle intervention in high-risk individuals for diabetes in a low- and middle-income setting: trial-based analysis of the Kerala diabetes prevention program. *BMC Med*. 2020;18(1):251. doi:10.1186/s12916-020-01704-9
16. Okamoto S, Sakamoto H, Kamimura K, Komamura K, Kobayashi E, Liang J. Economic effects of healthy aging: functional limitation, forgone wages, and medical and long-term care costs. *Health Econ Rev*. 2023;13(1):28. doi:10.1186/s13561-023-00442-x

Pragmatic and Observational Research

Dovepress
Taylor & Francis Group

Publish your work in this journal

Pragmatic and Observational Research is an international, peer-reviewed, open access journal that publishes data from studies designed to reflect more closely medical interventions in real-world clinical practice compared with classical randomized controlled trials (RCTs). The manuscript management system is completely online and includes a very quick and fair peer-review system. Visit http://www.dovepress.com/testimonials.php to read real quotes from published authors.

Submit your manuscript here: http://www.dovepress.com/pragmatic-and-observational-research-journal