Obesity treatment initiation, retention, and outcomes in the Veterans Affairs MOVE! Program among rural and urban veterans

Kathleen M. Robinson1 | Mark Vander Weg2,3 | Helena H. Laroche4 | Margaret Carrel5 | Jason Wachsmuth1 | Krista Kazembe6 | Mary Vaughan Sarrazin1,2,7

1Department of Internal Medicine, University of Iowa Carver College of Medicine, Iowa City, Iowa, USA
2Center for Access & Delivery Research and Evaluation (CADRE), Iowa City VA Health Care System, Iowa City, Iowa, USA
3Department of Behavioral and Community Health, University of Iowa College of Public Health Iowa City, Iowa City, Iowa, USA
4Center for Children’s Healthy Lifestyles and Nutrition, University of Missouri-Kansas City School of Medicine, Kansas City, Missouri, USA
5Department of Geography, University of Iowa College of Liberal Arts, Iowa City, Iowa, USA
6MOVE! Treatment Program, Iowa City VA Health Care System, Iowa City, Iowa, USA
7Investigator, VA Office of Rural Health, Veterans Rural Health Resource Center-Iowa City (VRHRC-IC), Iowa City Veterans Affairs Health Care System, Iowa City, Iowa, USA

Correspondence
Mary Vaughan Sarrazin, Iowa City VA Health Care System, 601 Highway 6 West, Bldg 42, Iowa City, IA 52246, USA.
Email: mary-vaughan-sarrazin@uiowa.edu

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Abstract

Objective: Rural veterans have high obesity rates. Yet, little is known about this population’s engagement with the Veterans Affairs (VA) weight management program (MOVE!). The study objective is to determine whether MOVE! enrollment, anti-obesity medication use, bariatric surgery use, retention, and outcomes differ by rurality for veterans with severe obesity.

Methods: This is a retrospective cohort study using Veterans Health Administration patient databases, including VA patients with severe obesity during 2015-2017. Patients were categorized using Rural-Urban Commuting Area codes. Primary outcomes included proportion of patients and risk-adjusted likelihood of initiating VA MOVE!, anti-obesity medication, or bariatric surgery and risk-adjusted highly rural Hazard Ratio (HR) of any obesity treatment. Secondary outcomes included treatment retention (≥12 weeks) and successful weight loss (5%) among patients initiating MOVE!, and risk-adjusted odds of retention and successful weight loss.

Results: Among 640,555 eligible veterans, risk-adjusted relative likelihood of MOVE! treatment was significantly lower for rural and HR veterans (HR = 0.83, HR = 0.67, respectively). Initiation rates of anti-obesity medication use were significantly lower as well, whereas bariatric surgery rates, retention, and successful weight loss did not differ.

Conclusions: Overall treatment rates with MOVE!, bariatric surgery, and anti-obesity medications remain low. Rural veterans are less likely to enroll in MOVE! and less likely to receive anti-obesity medications than urban veterans.

Keywords
bariatric surgery, behavior therapy, drug treatment, population studies, treatment outcomes
The obesity rate in veterans receiving care through the Veterans Affairs (VA) health system is high, with an overall VA obesity rate of 45.2% in 2020 compared to a national rate of 42.4% in 2018. VA patients are also more likely to have risk factors for obesity, and more likely to suffer negative health outcomes associated with obesity. Evidence suggests the negative health effects of obesity are particularly severe among those with Class II (Body Mass Index [BMI] 35–39.9 kg/m²) or Class III (BMI≥40 kg/m²), and include increased risk of chronic health conditions, reduced quality of life, and earlier mortality. Roughly 16% of all VA patients have Class II or III obesity.

The VA’s MOVE! Weight Management Program for Veterans has provided obesity treatment to VA patients for almost 2 decades. To be eligible, a patient must receive care at the VA and have overweight or obesity. Patients seen in VA primary care (PC) clinics are screened for overweight and obesity at least every 2 years. Referral to MOVE! is typically made by the patient’s PC provider. The program is a comprehensive lifestyle modification intervention (CLMI) that typically includes 8 to 16 sessions with structured curricula. Treatment is aimed at behavioral change, and encourages use of self-management strategies, increased physical activity and dietary improvement. Participation can be individual or in a group, and in-person or through telemedicine. MOVE! treatment may include pharmacotherapy or bariatric surgery when behavioral treatment alone is insufficient.

Overall, veterans’ participation in MOVE! is low, with rates ranging from 10% to 13% over periods of 5–8 years among eligible veterans with overweight or obesity. Contributory factors include local constraints in the availability of MOVE! staff and facilities, and patient factors. Outcomes have been somewhat encouraging, with 18.6% of veterans attending at least two CLMI visits sustaining clinically meaningful weight loss, defined as ≥5% of body weight. Better retention and increased number of visits lead to greater weight loss.

As compared to the general population, a higher proportion of veterans live in rural areas. Rural populations have higher rates of obesity and sedentary lifestyle than non-rural populations, and face barriers to care including distance to treatment, higher poverty rates, and limited Internet access. Despite the high prevalence of obesity and large proportion of rural veterans, little research to date has examined the efficacy of the VA MOVE! program among rural veterans. Some studies suggest lower rates of MOVE! initiation and lower retention with increasing distance to a MOVE! clinic. No data are available regarding rurality and MOVE! treatment outcomes, weight loss medication usage, or bariatric surgery rates.

MOVE! treatment rates, retention, and outcomes for veterans with severe obesity (classes II and III) living in rural (R) and highly rural (HR) locations as compared to urban (U) locations were evaluated. It was hypothesized that rural and HR veterans have lower MOVE! participation, anti-obesity medication use, and bariatric surgery rates compared to urban veterans. It was additionally hypothesized that rural and HR veterans who initiated MOVE! would have lower retention and less successful weight loss compared to urban veterans.

2 | METHODS

2.1 | Data sources and patients:

This is a retrospective study using VHA national patient databases available through the VA Informatics and Computing Infrastructure (VINCI). All data management and analyses were conducted on VINCI. Data sources included VA Corporate Data Warehouse pharmacy, inpatient, and outpatient encounter data, Geocoded Enrollment data from the VA Planning Systems and Support Group (PSSG), VHA Vital Signs file, and VHA Vital Status File.

Veterans Affairs patients age 18 and older with at least 2 valid weight and height measurements during 2015–2017 were identified. Patients with obesity categories Type II or III during two consecutive years from 2015 to 2017 were identified. Individuals with class II and III obesity were selected given these individuals are more likely to develop complications from obesity. For each eligible patient an ‘Index Date’ for treatment eligibility was defined as the start of the second year with Obesity Class II or III. Patients over age 80 were excluded, given that evidence for the benefits of weight loss in older patients is more limited. Patients were also excluded if they received obesity treatment during the 12 months prior to the Index Date, had less than 1 year of VA healthcare enrollment, had missing residential information for determining rurality, or resided outside the 50 states and District of Columbia. Cohort inclusion and exclusion criteria are described in Figure 1. Patients were categorized as residing in urban, rural, or HR regions using Rural-Urban Commuting Area (RUAL) codes assigned to residence census tracts. We separated HR from rural veterans, as veterans living in HR areas are typically more isolated and lack access to medical resources available in some rural communities.
2.2 Variables

The primary endpoint was obesity treatment initiation, including 1) initiation in MOVE! comprehensive lifestyle intervention (CLMI) as identified by clinic stop codes 371–373; 2) pharmacologic obesity treatment (Table 1)31; and 3) bariatric surgery as identified by ICD9, ICD10, and CPT procedure codes. Treatment initiation was assessed from the Index date through December 2019. Secondary outcomes included MOVE! CLMI retention and successful weight loss among patients who initiated the program through December 2018, to ensure at least one year of data collection. Two definitions of MOVE! CLMI treatment retention were used: 12 weeks minimum duration between first and last MOVE! CLMI encounter, and 12 individual visits within the first year. The cutoff of 12 visits was selected based on VA DOD Clinical Practice Guidelines, and consistency with a recent AHRQ systematic review showing more weight loss for patients participating in CLMI programs with 12 or more sessions as compared to fewer than 12 sessions.32,33 Successful weight loss was defined as a loss of 5% or more of original body weight between 12 and 24 months after MOVE! initiation. Of the 82,847 patients who initiated MOVE! through December 2018, there were valid weight measurements 12–24 months after the first MOVE! encounter for 75,454 patients. The analyses for successful weight loss were first conducted excluding patients with missing data, and second, assuming they did not meet the benchmark for successful weight loss (i.e., based on penalized imputation).

| Weight gain                          | Weight gain                          | Anti-obesity                        |
|--------------------------------------|--------------------------------------|-------------------------------------|
| Alpha Blockers                       | Glucocorticoids                      | Topiramate                          |
| Terazosin                            | Prednisone                           | Zonisamide                          |
| Antidepressants                      | Hydrocortisone                       | Metformin                           |
| Mirtazapine                          | Methyl-prednisolone                  | Exenatide                           |
| Paroxetine                           | Hormonal Agents                      | Lixisenatide                        |
| Sertraline                           | Medroxyprogesterone                  | Dulaglutide                         |
| Citalopram                           | Megestrol acetate                    | Pramlintide                         |
| Escitalopram                         | Anti-hyperglycemic                   | Miglitol                            |
| Fluoxetine                           | Insulin                              | Acarbose                            |
| Phenerzine                           | Chlorpropamide                      | Liraglutide                         |
| Amitriptyline                        | Glimepiride                          |                                     |
| Clomipramine                         | Glipizide                            |                                     |
| Doxepin                              | Glyburide                            |                                     |
| Imipramine                           | Nateglinide                          |                                     |
| Mirtirptyline                        | Repaglinide                          |                                     |
| Protriptyline                        | Pioglitazone                         |                                     |
| Antiepileptic/Mood Stabilizing       | Rosiglitazone                        |                                     |
| Gabapentin                           | Beta-blockers                        |                                     |
| Pregabalmin                          | Metoprolol                           |                                     |
| Carbamazepine                        | Atenolol                             |                                     |
| Lithium                              | Propranolol                          |                                     |
| Valproic Acid                        | Anti-histamines                      |                                     |
| Vigabatrin                           | Cetirizine                           |                                     |
| Antipsychotics                       | Cyproheptadine                       |                                     |
| Quetiapine                           |                                     |                                     |
| Clozapine                            |                                     |                                     |
| Olanzapine                           |                                     |                                     |
| Risperidone                          |                                     |                                     |
| Thioridazine                         |                                     |                                     |
analysis was performed given that patients who drop out of CLMI programs may be more likely to have unsatisfactory weight loss or weight regain.34

Additional patient characteristics were identified to adjust for differences between urban, rural and HR patients. Demographics included patient age, sex, race, and ethnicity. Comorbid conditions were defined using ICD-9-CM and ICD-10-CM codes on claims incurred during the 12 months prior to the index date. Comorbid conditions included those originally defined by Elixhauser (1998), and additional conditions potentially related to obesity including ischemic heart disease, prior revascularization, and sleep apnea.35 Prior use of VA services included acute inpatient hospital days, number of PC visits, and use of prescription medications associated with weight gain or weight loss during the 12 months prior to the index date, as defined previously (Table 1).32,36 Finally, distances to nearest VA PC site and nearest VA tertiary care site were assessed (as identified from PSSG geo-coded enrollment files and categorized into quartiles).

2.3 Statistical analysis

Treatment engagement, retention and weight loss were compared for urban, rural, and HR patients using bivariate statistics, and using multivariable regression that also adjusted for patient characteristics. First, comparisons were made for patient baseline characteristics and the proportion of patients who initiated MOVE! CLMI, weight-loss pharmacotherapy, and bariatric surgery within 365 days of the index date between urban, rural and HR patients with severe obesity using Chi-square tests. Then multivariable Cox regression models were used to estimate the risk-adjusted relative hazard of treatment initiation for rural and HR patients relative to urban patients while adjusting for patient demographics, comorbidities, and history of VA service and medication use. Analyses of time to treatment initiation were censored for death and end of follow-up (31 December 2019). Models also included random effects for the patient’s preferred facility to account for commonalities within facilities, where preferred facility was identified in the VA enrollment files. In analysis of secondary outcomes, treatment retention and successful weight loss were compared up to 1 year after MOVE! initiation, among urban, rural, and HR patients who initiated MOVE! through December 2018. Differences in MOVE! retention and weight loss were also evaluated using logistic regression to further adjust for patient characteristics. Because distance to nearest facility is correlated with rural residence, distance was not adjusted for in multivariable models. Instead, sensitivity analyses were conducted using distance to nearest facility as an alternative measure for rurality.

All analyses were repeated in patient subsets defined by diabetes status, as treatment options differ. For example, liraglutide is used to treat diabetes and is also FDA-approved for obesity treatment so patients with diabetes might have improved access to this medication. All analyses were conducted using SAS version 9.4. The project received Human Subjects Research approval with a waiver of consent from the University of Iowa and Iowa City VA Medical Center (MC) Institutional Review Board.

3 RESULTS

3.1 Study population

The final eligible cohort included 640,555 patients with Obesity Class II or III, including (Figure 1) 400,173 urban, 230,942 rural, and 9440 HR (62.5%, 36.0%, and 1.5% respectively). The mean BMI was 39.3 kg/m² (standard deviation = 4.6; median = 38.3) and did not differ by rurality. Across groups, the majority of patients were male, white, and age 60 or older.

The most common medical comorbidities (based on ICD9/ICD10 codes) included hypertension, diabetes, sleep apnea and depression. The majority of veterans were prescribed medications associated with weight gain, and approximately one quarter of veterans were prescribed medications associated with weight loss (Tables 2 and 3).

3.2 Obesity treatment initiation

The proportions of patients initiating MOVE! within 365 days of the Index date were 6.3% (U), 4.5% (R), and 3.8% (HR) HR and were significantly lower among rural and HR compared to urban veterans (p < 0.001). The proportions that initiated anti-obesity medication or underwent bariatric surgery were also significantly lower among rural and HR veterans, compared to urban (Table 4). This pattern was similar in analysis of obesity treatment over the entire follow-up period, which averaged 3.9 years over all patients (Table 4). Differences in likelihood of MOVE! behavioral treatment remained significant in the Cox regression model, with the HR for treatment among rural veterans 0.83, and 0.67 among HR veterans (p < 0.001; Table 5).

Similarly, the use of anti-obesity medication was still lower for rural and HR veterans compared to urban veterans after risk adjustment, with HR = 0.93 for rural veterans and 0.73 for HR veterans (p < 0.001). There were no significant differences in bariatric surgery rate by rurality after risk adjustment.

3.3 Retention and weight loss outcomes

MOVE! retention and weight loss were examined among 82,847 veterans who initiated MOVE! Retention was significantly higher for rural and HR as compared to urban veterans in unadjusted analysis (U: 11.6%, R: 12.3%, HR: 12.2%, p = 0.007) (Table 6). After risk adjustment, there were no significant differences in retention rates by rurality. Results were nearly identical in analyses that defined MOVE! retention as 12 unique weeks with a MOVE! encounter (Table 6).

Overall, nearly 21% of veterans lost 5% or more of body weight 12 months after initiating MOVE!, with no significant differences by
rurality. There were no differences after further controlling for patient characteristics in multivariable logistic regression, or in analysis assuming that veterans without available weights after 12 months did not meet the benchmark.

All analyses were repeated in 271,376 patients with a history of diabetes as of the Index Date, and 369,179 patients without diabetes. Results within diabetes cohorts mirrored those of the primary analysis. Specifically, patients in rural and HR areas were significantly less likely to initiate treatment compared to urban patients, regardless of diabetes status (Table S1), and there were no differences in MOVE! retention or likelihood of successful weight loss by rurality in patients with or without diabetes (Table S2).

### TABLE 2: Patient characteristics by rurality

| Patient characteristics | Urban (Overall %) | Rural (Overall %) | Highly rural (Overall %) |
|-------------------------|------------------|------------------|-------------------------|
| BMI mean in kg/m² (sd)  | 39.3 (4.5)       | 39.3 (4.6)       | 39.3 (4.6)              |
| Age (%)                 |                  |                  |                         |
| <60                     | 195,656 (48.9)   | 88,864 (38.5)    | 2854 (30.2)             |
| 60–64                   | 63,512 (15.9)    | 42,268 (18.3)    | 1828 (19.4)             |
| 65–69                   | 87,337 (21.8)    | 62,645 (27.1)    | 2819 (29.9)             |
| 70–74                   | 35,149 (8.8)     | 24,608 (10.7)    | 1198 (12.7)             |
| 75–79                   | 18,519 (4.6)     | 12,557 (5.4)     | 741 (7.8)               |
| Gender (%) = Male       | 358,561 (89.6)   | 214,928 (93.1)   | 8945 (94.8)             |
| Race (%)                |                  |                  |                         |
| White                   | 243,741 (60.9)   | 187,115 (81.0)   | 8156 (86.4)             |
| Black                   | 96,714 (24.2)    | 21,263 (9.2)     | 296 (3.1)               |
| Other                   | 39,637 (9.9)     | 10,653 (4.6)     | 482 (5.1)               |
| Unknown                 | 20,081 (5.0)     | 11,911 (5.2)     | 506 (5.4)               |
| Years since Initial VA enrollment | 10.2 (5.0) | 10.3 (4.9) | 10.7 (4.8) |
| % Enrolled <=3 years    | 43,519 (10.9%)   | 22,539 (9.8%)    | 795 (8.4%)              |
| Region (%)              |                  |                  |                         |
| Northeast               | 50,793 (12.7)    | 25,523 (11.1)    | 1112 (11.8)             |
| South                   | 183,026 (45.7)   | 102,724 (44.5)   | 2586 (27.4)             |
| Midwest                 | 76,134 (19.0)    | 66,652 (28.9)    | 4012 (42.5)             |
| West                    | 83,786 (20.9)    | 34,201 (14.8)    | 1554 (16.5)             |
| Other                   | 6434 (1.6)       | 1842 (0.8)       | 176 (1.9)               |
| Medication at baseline  |                  |                  |                         |
| Weight loss med use     | 95,607 (23.9)    | 57,543 (24.9)    | 2375 (25.2)             |
| Diabetes Medication (Metformin) | 89,514 (22.4%) | 54,469 (23.6%) | 2291 (24.3%) |
| Anti-Seizure            | 7590 (1.9%)      | 3900 (1.7%)      | 125 (1.3%)              |
| Weight gain med use     | 246,362 (61.6%)  | 145,814 (63.1%)  | 5961 (63.2%)            |
| Beta Blockers           | 98,273 (24.6%)   | 63,561 (27.5%)   | 2843 (30.1%)            |
| Antidepressants         | 92,940 (23.2%)   | 55,136 (23.9%)   | 1981 (21.0%)            |
| Mood stabilizing, Anti-epileptic | 77,043 (19.3%) | 47,109 (20.4%) | 1748 (18.5%) |
| Corticosteroids         | 37,557 (9.4%)    | 19,969 (8.7%)    | 781 (8.3%)              |
| Antipsychotics          | 17,989 (4.3%)    | 8434 (3.7%)      | 289 (3.1%)              |
| Antihyperglycemic       | 100,403 (25.1%)  | 62,718 (27.2%)   | 2578 (27.3%)            |
| Other                   | 1715 (0.4%)      | 845 (0.4%)       | 35 (0.4%)               |
TABLE 3  Patient comorbidities by rurality

| Comorbidities                                      | Urban     | Rural     | Highly rural |
|----------------------------------------------------|-----------|-----------|--------------|
| Alcohol dependency or abuse                        | 26,541 (6.6) | 11,883 (5.1) | 493 (5.2)  |
| Cardiomyopathy                                     | 6733 (1.7)  | 3653 (1.6)  | 146 (1.5)   |
| Heart Failure                                       | 20,754 (5.2) | 13,174 (5.7) | 533 (5.6)  |
| Chronic Obstructive Lung disease                   | 60,574 (15.1) | 39,509 (17.1) | 1742 (18.5) |
| Coronary Artery disease                            | 60,554 (15.1) | 43,155 (18.7) | 1902 (20.1) |
| Cerebrovascular disease/Stroke                     | 14,487 (3.6)  | 8794 (3.8)  | 350 (3.7)   |
| Depression                                          | 84,059 (21.0) | 46,613 (20.2) | 1697 (18.0) |
| Diabetes Mellitus                                  | 166,034 (41.5) | 101,197 (43.8) | 4145 (43.9) |
| Hypertension                                        | 269,085 (67.2) | 163,462 (70.8) | 6777 (71.8) |
| Hypothyroidism                                      | 31,234 (7.8)  | 19,866 (8.6)  | 833 (8.8)   |
| Metastatic Cancer                                  | 1209 (0.3)  | 715 (0.3)  | 25 (0.3)    |
| Prior Cardiac revascularization                    | 12,076 (3.0)  | 8681 (3.8)  | 372 (3.9)   |
| Psychosis                                           | 62,146 (15.5) | 29,856 (12.9) | 972 (10.3)  |
| Pulmonary Circulatory Disorder                     | 6175 (1.5)  | 3411 (1.5)  | 157 (1.7)   |
| Renal disease                                       | 25,453 (6.4)  | 13,906 (6.0)  | 535 (5.7)   |
| Sleep Apnea                                         | 109,384 (27.3) | 62,651 (27.1) | 2500 (26.5) |
| Tobacco use                                         | 51,989 (13.0) | 33,197 (14.4) | 1378 (14.6) |
| Tumor                                               | 23,344 (5.8)  | 13,799 (6.0)  | 612 (6.5)   |

TABLE 4  Number (%) of patients who initiated obesity treatment within 365 days a of Index Date and Rate of treatment per patient-year

| Number (%) of treatment initiations within 365 days | Urban 400,173 (62.5) | Rural 230,942 (36.0) | Highly rural 9440 (1.5) | p-value |
|---------------------------------------------------|-----------------------|-----------------------|-------------------------|---------|
| Move! behavioral Therapy                          | 25,107 (6.3)          | 10,397 (4.5)          | 360 (3.8)               | <0.001  |
| Obesity Medications                               | 1160 (0.3)            | 474 (0.2)             | 14 (0.1)                | <0.001  |
| Bariatric surgery                                 | 136 (0.02)            | 53 (0.02)             | 2 (0.0)                 | 0.04    |
| Treatment initiation rate per 100 patient-years through 3.9 mean years of follow-up | | | | |
| MOVE! behavioral therapy                          | 71,324 (4.57)         | 31,645 (3.40)         | 1049 (2.70)             | <0.001  |
| Obesity Medication Therapy                        | 10,320 (0.60)         | 5491 (0.55)           | 171 (0.42)              | <0.001  |
| Bariatric surgery                                 | 933 (0.05)            | 425 (0.04)            | 9 (0.02)                | <0.001  |

TABLE 5  Risk-adjusted Relative Hazards of Obesity Treatment (95% CI; p-value) for veterans residing in Rural and highly rural Hazard Ratio (HR) areas, relative to Urban areas, based on multivariable COX and Logistic regression models

| Initiated MOVE! clinic | Relative hazard or odds ratio (95% CI) | p-value | Relative hazard or odds ratio (95% CI) | p-value |
|-----------------------|----------------------------------------|---------|----------------------------------------|---------|
| Initiated obese Medicine therapy | 0.93 (0.89–0.96) | <0.001 | 0.73 (0.62–0.85) | <0.001 |
| Bariatric surgery     | 1.08 (0.96–1.23)                      | 0.21    | 0.66 (0.33–1.33)                      | 0.26    |

Note: Risk adjustment Cox regression models control for patient age, sex, race, census region, and comorbid conditions defined by Quan et al (2005), and patient primary care facility using random effects. Risk adjustment logistic regression model controls for patient age, sex, race, census region, and comorbid conditions defined by Quan et al (2005), and patient primary care facility using random effects.
TABLE 6  Treatment retention and successful weight loss among 82,847 patients who initiated MOVE!

| Treatment retention | Urban  
|---------------------|-----------------
| 12 weeks of Move! retention among those who initiated MOVE! through December 2018 (%) | 8247 (11.6%) 3875 (12.3%) 128 (12.2%) 0.007
| Successful Weight Loss |  
| Number of patients with non-missing weight after 12 months | 51,771 (90.8%) 22,920 (91.8%) 763 (91.4%)  
| % of patients who lost 5% or more body weight (complete case analysis only) includes patients with non-missing weight | 10,683 (20.6%) 4820 (21.0%) 166 (21.8%) 0.37  
| % of patients who lost 5% or more body weight (assumes patients with missing weight did not lose 5%) | 10,683 (18.7%) 4820 (19.3%) 166 (19.9%) 0.12  

Risk adjusted relative odds of treatment retention and successful weight loss

| Rural versus urban | Highly rural versus urban |  
|-------------------|--------------------------|  
| Relative odds of completing ≥ 12 weeks of MOVE! (among patients who initiated Move! through December 2018) | 1.04 (0.99–1.09; p = 0.11) 0.97 (0.79–1.20; p = 0.81)  
| Relative odds of 5% or more body weight loss 12 months after initiating MOVE! |  
| Complete case analysis | 0.98 (0.94–1.02; p = 0.37) 1.00 (0.84–1.21; p = 0.99)  
| Assumes missing weight = failure | 0.99 (0.96–1.03; p = 0.77) 1.00 (0.86–1.20; p = 0.96)  

Note: risk adjustment logistic regression model controls for patient age, sex, race, census region, and comorbid conditions defined by Quan et al. (2005), and patient primary care facility using random effects.

Finally, the sensitivity analysis of treatment initiation, retention, and weight loss by distance to nearest VA PC or tertiary MC was consistent with findings of the primary analysis. Patients residing farther from VA PC or MC had lower unadjusted rates of MOVE! initiation, compared to patients residing closest (Table S3). After risk adjustment, this difference remained significant for distance to nearest VA MC but not for distance to nearest VA PC. There was no difference in receipt of bariatric surgery by distance after risk adjustment. Notably, there was no relationship between use of anti-obesity medications and distance to VA PC after risk adjustment, whereas distance to VA MC was inversely related to anti-obesity medication use (Table S4). Treatment retention and subsequent weight loss were not related to distance to VA PC or MC (Table S5).

4  DISCUSSION

This study is the first to compare obesity treatment rates in urban, rural, and HR veterans using RUCA codes. Overall, it was found that obesity treatment rates are low among veterans with severe obesity, with fewer than 5% of VA patients with obesity class II or III initiating MOVE! over 1 year. Moreover, treatment initiation was significantly lower among rural and HR veterans compared to urban veterans, even after adjusting for patient characteristics. Use of anti-obesity medications and bariatric surgery were also low overall. Anti-obesity medication use was significantly lower for rural and HR veterans, but there were no differences in receipt of bariatric surgery. Despite the differences in treatment initiation, there were no significant differences by rurality in the likelihood of retention in obesity treatment or experiencing successful weight loss after treatment.

The generally low obesity treatment initiation rates are consistent with prior literature.14,16,17 Published rates of MOVE! initiation range from 4.3% to 10.8% in FY2016 for veterans with class II or III obesity including return visits, to 10%–13% of eligible veterans over longer term studies lasting 5–8 years.14,16,17 Published rates of anti-obesity medication use are also low, ranging from <0.1% to 0.1% of eligible veterans, or 1.1%–2.0% of all MOVE! participants.12,13 Thus, the finding that 3.9%–4.6% of veterans in the MOVE! treatment program receive anti-obesity medication may represent an improvement. Notably, restrictions on the use of anti-obesity medications in the VA have eased since 2016.12 Additionally, the cohort consists only of veterans with obesity class II or III, which may increase the likelihood of medication use.21 Factors contributing to low levels of anti-obesity medication use include inadequate physician training, VA formulary restrictions, high rates of comorbidities and contraindications to use, concerns about safety and efficacy, and limited patient-provider time.11,12,27 Additionally, some clinicians may believe that obesity is a behavioral problem not warranting medication.27

Finally, the low rate of bariatric surgery (0.02%) is consistent with previous findings. Gunnar (2017) found bariatric surgery in 0.007% of eligible veterans nationwide in FY2015, while Maciejewski (2019) determined that 0.2% of veterans with BMI ≥ 35 kg/m² in one geographic region underwent bariatric surgery.14,38 Barriers to bariatric surgery include strict BMI and comorbidity requirements, the requirement to have attempted behavioral weight loss or anti-
obesity medication, and the limited number of VA MC’s capable of performing bariatric surgery. Recent legislation designed to increase access to care outside the VA, such as the 2015 Mission Act, may improve access to bariatric surgery.

Although other studies have examined the impact of distance to obesity treatment, no other study that has examined VA obesity treatment by rurality. Jackson (2015) found that 11.7% of veterans living >48 km from MOVE! initiated treatment, as compared to 14.7% of the remainder of their cohort. Similarly, Spring (2014) found an inverse relationship between distance to a VA facility and retention in the in-person MOVE! program, with 28% of patients residing within 10 miles of a VA facility completing 6 or more visits, compared to 19.3% of participants living 30 miles or more from a VA facility.

These findings have important clinical implications for the delivery of obesity treatment for rural veterans. First, the finding that rural veterans are just as likely to remain in treatment and lose weight as urban veterans, once they engage in treatment, suggests that the key to overcoming rural disparities in obesity treatment is to improve referrals to and engagement in treatment. Several factors may contribute to lower enrollment rates among rural and HR veterans including distance to treatment, limited Internet access, and lack of programs designed to meet unique needs of rural populations.

Health care providers and veterans themselves may be aware of these barriers, making referral less likely. The data showing equal retention for urban and rural participants contrasts prior findings demonstrating reduced retention as distance increases. This may be explained by increased use of telemedicine visits over time, as this technology plays an increasingly important role in the program.

Telemedicine interventions at the VA including MOVE! have generally met with success, and this may be an important opportunity to improve treatment initiation. The significantly lower use of anti-obesity medications among rural veterans may reflect the lack of specialized providers at community-based outpatient clinics where many rural veterans may receive care. Moreover, the use of medications associated with weight gain is high among all veterans. Encouraging use of safe and effective alternatives may improve weight loss efforts. Finally, the potential impact of new legislation designed to improve access to community-based services, such as bariatric surgery, is not yet fully understood.

This study has several limitations. The sample is mostly white, male, and contained a higher percentage of rural participants than the national average, potentially limiting generalizability. There is great variability in the VA MOVE! program across sites, including differences in the use of alternative technology for MOVE! such as video or telehealth encounters. While the study was not able to control for all site-specific differences, the multivariable models did adjust for the patient’s preferred VA facility to account for facility-level practice differences. However, the multivariable models adjusted for the patient’s preferred VA facility to account for facility-level practice differences. Finally, the study was not able to capture services received outside the VA that were not paid through a VA fee-based community service program. Strengths of the study include large sample size with representation from all major U.S. regions, availability of rural indicators assigned to individual patient census tracts, and the use of multivariable regression modeling that adjusted for a variety of demographics, comorbidities, and medication use. Additionally, sensitivity analyses were performed examining diabetes status and distance to VA MC and PC. The findings of these analyses were consistent with the primary findings.

5 CONCLUSION

Rates of MOVE! initiation and retention, anti-obesity medication use, and bariatric surgery remain low. The analyses suggest that obesity treatment, once initiated, is at least as effective for rural veterans as for urban veterans, with similar rates of 5% body weight loss for rural and urban veterans who initiate treatment. This finding is modestly encouraging and was contrary to the initial hypothesis that rural and HR veterans would have worse retention and weight loss outcomes. Nevertheless, rural veterans with severe obesity are significantly less likely than urban veterans to initiate obesity treatment and are less likely to receive a prescription for a weight loss medication. More research is needed to understand barriers to treatment initiation in order to meet this critical health care need.

AUTHOR CONTRIBUTIONS

Kathleen M. Robinson: Writing – Original Draft; Writing – Review & Editing; Conceptualization. Mark Vander Weg: Conceptualization; Supervision; Writing – Review & Editing. Helena H. Laroche: Conceptualization; Supervision; Writing – Review & Editing. Jason Wachsmuth: Methodology; Formal analysis. Krista Kazembe: Writing – Review & Editing. Mary Vaughan Sarrazin: Conceptualization; Methodology; Supervision; Writing – Review & Editing; Funding acquisition.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

ORCID

Kathleen M. Robinson https://orcid.org/0000-0002-5697-6323
Helena H. Laroche https://orcid.org/0000-0003-3708-5207
Margaret Carrel https://orcid.org/0000-0003-0430-9235
Mary Vaughan Sarrazin https://orcid.org/0000-0001-8717-1061
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Additional supporting information can be found online in the Supporting Information section at the end of this article.

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