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Joshua D. Brown
Wake Forest Baptist Health

Sarah Hales
Medical University of South Carolina

T. Ed Evans
Seneca Lakes Family Medicine

Tonya Turner
Medical University of South Carolina

David O. Sword
Medical University of South Carolina

See next page for additional authors

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Description, utilisation and results from a telehealth primary care weight management intervention for adults with obesity in South Carolina

Joshua D Brown[1], Sarah Hales[2], T Ed Evans[3], Tonya Turner[2], David O Sword[2], Patrick M O'Neil[2], Sara Ballentine[4], Oscar Lovelace[4] and Ragan Aleise DuBose-Morris[2]

Abstract

Introduction: In the US, obesity rates are higher in rural areas than in urban areas. Rural access to treatment of obesity is limited by a lack of qualified clinicians and by transportation and financial barriers. We describe a telemedicine weight management programme, Wellness Connect, developed through a partnership of academic clinicians and rural primary care providers in South Carolina, and present utilisation and weight outcomes from seven patient cohorts.

Methods: Eight bi-weekly sessions were provided via telemedicine videoconferencing for groups of patients at these rural primary care clinics. Protocol-based sessions were led by registered dietitians, exercise physiologists and clinical psychologists at a central urban location.

Results: Of 138 patients who started the programme, 62% ($N = 86$) of patients met the criteria for completion. Completers lost an average of 3.5% (standard deviation (SD) = 3.9%) body weight, which was statistically significant ($p < .001$) and corresponded with an average loss of 3.8 kg (SD = 4.5 kg). There were no differences in weight change among clinics ($p = .972$). Overall, patients and providers reported satisfaction with the programme and identified several challenges to sustainability.

Discussion: The use of innovative telemedicine interventions continues to be necessary to alleviate barriers to accessing evidence-based services to reduce chronic diseases and decrease obesity rates among rural populations.

Keywords

Telemedicine, weight management, obesity, primary care, access

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Introduction

US obesity rates are higher in rural areas than urban.[1] The U.S. Preventive Services Task Force recommends multicomponent behavioural interventions for obese adults (2012). A number of barriers exist that often prevent obese adults from accessing appropriate obesity care. These barriers include the dearth of qualified clinicians, specifically multidisciplinary teams including registered dietitians, psychologists and exercise physiologists, especially in largely rural states[2] (such as South Carolina). Case in point, using publicly available data from the Commission on Dietetic Registration[3] and the Centers for Disease Control and Prevention,[4] we overlaid South Carolina county-by-county obesity prevalence rates with the disbursement of registered dietitians throughout the state (Figure 1). It is clear that, in South Carolina, the counties with the highest rates of obesity tend to have the least access to registered dietitians. In their review of obesity treatment in rural primary care settings for older adults, Batsis et al. identified several barriers to care including a lack of time to address obesity with patients, lack of multidisciplinary teams within primary care, and transportation barriers for patients who are required to travel to clinics outside of their geographic area.[2] These authors suggest using a telemedicine approach (remote face-face video conferencing in real-time) to reduce the aforementioned barriers.

Several studies examined the efficacy and cost-effectiveness of using telemedicine to provide behavioural

[1]Wake Forest Baptist Health, Winston-Salem, USA
[2]Medical University of South Carolina, Charleston, USA
[3]Seneca Lakes Family Medicine, Seneca, USA
[4]Lovelace Family Medicine, Prosperity, USA

Corresponding author:
Joshua D Brown, Wake Forest Baptist Health, 4614 Country Club Road, Winston-Salem, NC 27104, USA.
Email: joshuab@wakehealth.edu

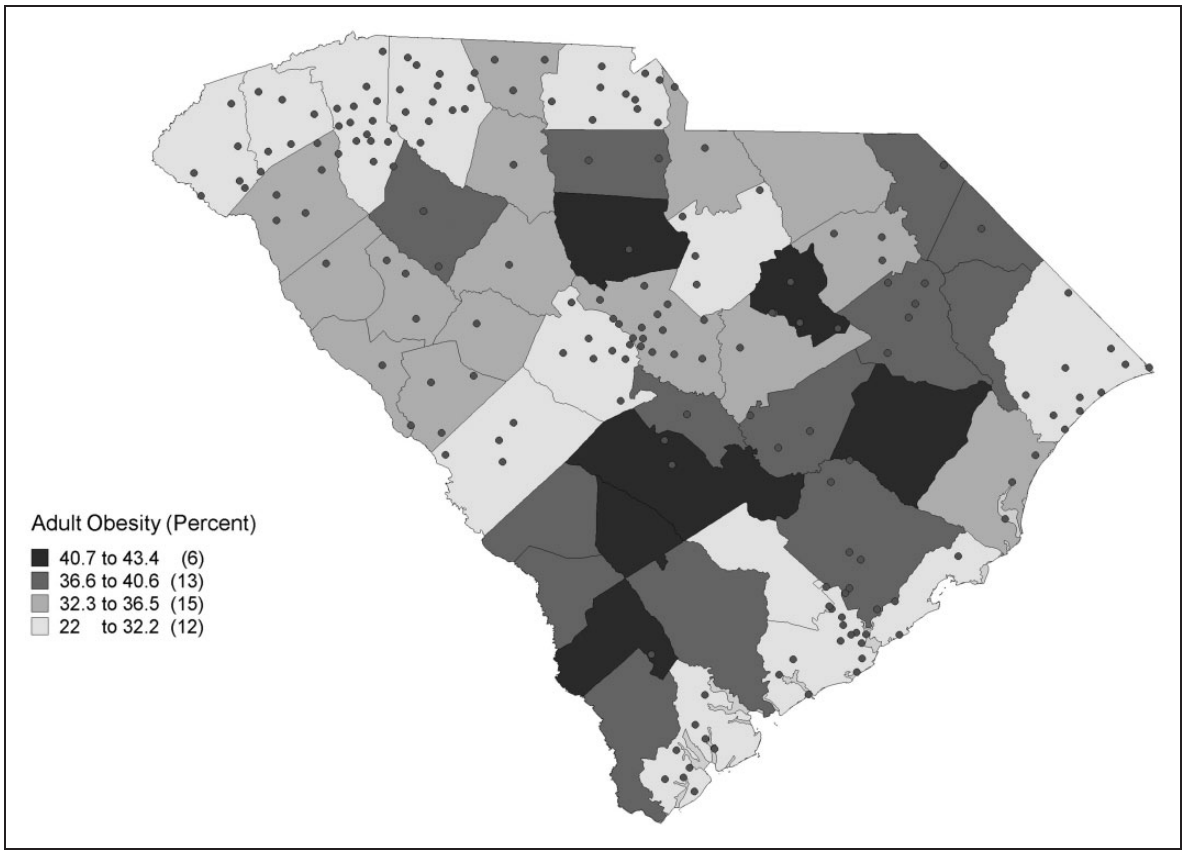

Figure 1. The Commission on Dietetic Registration reported a total of 1,089 dietitians registered with either a home or business address in South Carolina, as of March 2017. The green dots represent the Commission s counts of registered dietitians in each SC zip code. South Carolina counties have been color-coded (in grayscale) to correspond with that county s obesity prevalence rate (BMI > 30), based on the most recent (2013) data from the Centers for Disease Control and Prevention.

weight loss treatment to overweight and obese individuals in the US. Ahrendt et al. conducted a retrospective cohort analysis examining a programme that utilised telemedicine video conferencing to deliver a 12-week weight management programme to male veterans. Results indicated greater weight loss as compared to controls (mean weight difference between groups: -5.5 ± -2.7 kg, $p < .0001$).[5] Chung and colleagues found that implementing a telemedicine weight management programme was more cost-effective than implementing the same face-to-face services delivered weekly by dietitians, a physical therapist, a psychologist and a wellness nurse for 12 weeks (US$17.09 for telemedicine and US$28.24 for face-to-face, direct costs only). In both groups, direct costs included clinician hours providing services to patients; the telemedicine group also included equipment costs and indirect costs were omitted from analyses in both groups.[6] Dunn and colleagues concluded that online synchronous delivery of a weight management programme had outcomes (Body Mass Index (BMI), weight and waist circumference) comparable to an in-person programme.[7] Others have used a telemedicine approach to deliver paediatric obesity treatment. Davis et al. found both telemedicine and telephone methods to be feasible and acceptable methods of providing treatment to rural children with no significant differences in BMI *z*-scores between groups from pre- to post-treatment.[8] Irby et al. found that an outreach programme (TeleFIT: telemedicine monitors in four rural clinics) for obese children living in rural areas had similar attrition rates and comparable improvements in weight status as compared to traditional programmes.[9]

The overarching purpose of this project was to support rural, primary care clinics and their patients by providing access to an evidence-based behavioural weight loss programme delivered by a multidisciplinary team of weight loss specialists. By and large, specialised multidisciplinary weight management treatment is simply not available in rural communities. This project utilised a novel model of care coordination, whereby the primary care practices retained their respective patients on-site while weight management specialists from an urban academic medical centre used telemedicine to remotely deliver an evidence-based behavioural weight loss intervention. The objectives of the present paper are to describe a telemedicine-based weight management programme for adults who are overweight and obese, Wellness Connect, that was developed through a partnership between academic clinicians and

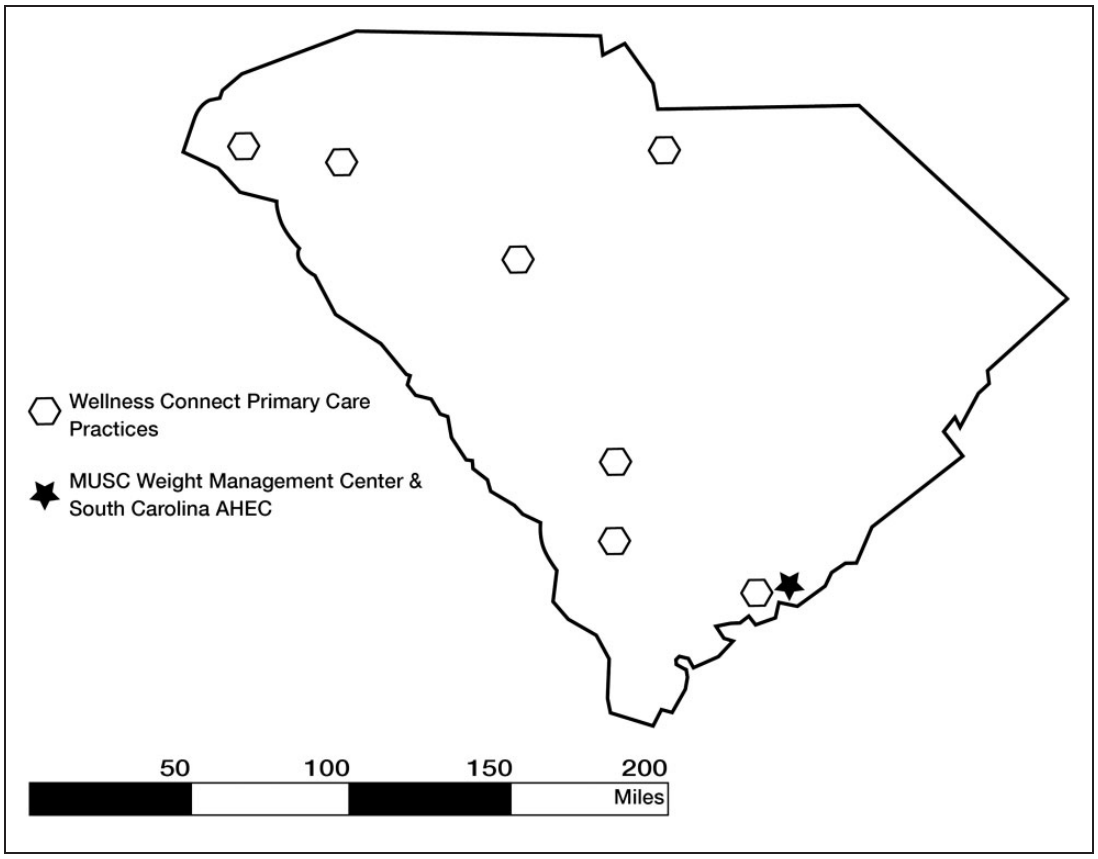

Figure 2. Location of Wellness Connect primary care clinics in South Carolina.

rural primary care providers, and present utilisation and pre–post weight outcomes from seven cohorts.

Methods

The Wellness Connect team consisted of a multidisciplinary team with experience in obesity management, technical experts in software and app development, education technologists and a group of primary care physicians throughout South Carolina (Figure 2). Key partners involved in the development and implementation of Wellness Connect included the Medical University of South Carolina (MUSC) Weight Management Center (WMC), MUSC's Technology Applications Center for Healthy Lifestyles (TACHL), the South Carolina Area Health Education Consortium (SCAHEC) and Lovelace Family Medicine.

The WMC is a multidisciplinary behavioural weight management clinic serving a variety of in-person and virtual-care settings. The TACHL develops apps including software and information systems for mobile technologies including physical activity, diet, stress reduction, smoking prevention/cessation, biomarker monitoring and medication adherence.[10–13] The SCAHEC provides educational services to providers and communities in order to improve access to care. Lovelace Family Medicine is located in Prosperity, South Carolina, and previously piloted a practice group education programme.

Clinical intervention

Weight management group sessions were provided every other week to groups of patients (4 to 6 practices per cohort) via interactive two-way videoconferencing technology; the patient groups of 1 to 10 participants met at the offices of their respective primary care providers throughout South Carolina (Figure 2). There were a total of eight 1-hour group sessions, which occurred over a period of 16 weeks. Studies have demonstrated that brief weight loss interventions, as short as 3–4 months, can produce clinically meaningful weight losses.[14,15] Group sessions were largely didactic in nature and were led by clinicians at the WMC: registered dietitians, exercise physiologists and clinical psychologists. Example topics were portion control, self-monitoring, stress management, relapse prevention and effective exercise. Participants at each practice were encouraged to participate in group discussions. Clinicians and patients could see and hear one another in real-time. Group lessons covered a variety of weight management topics related to the dietary, exercise and behavioural management of obesity.

Funding and equipment

Grant funding provided by the South Carolina Telehealth Alliance (SCTA) and the MUSC Center for Telehealth provided the following materials necessary to implement

Wellness Connect in primary care practices throughout SC. Telemedicine technologies were used to provide the live group sessions to patients and to obtain and transmit clinical data back to MUSC. Each practice was furnished with a Cisco SX 10 Codec featuring a high-resolution camera and a large LCD monitor. Each primary care practice was also provided with a wireless A&D Medical weight scale and blood pressure device, both of which transmitted patient data in real-time via Bluetooth to a secure iPad app that was developed by TACHL. A tape measure was provided to primary care practices to obtain anthropometric measurements, which could also be entered into the iPad app at three cohort intervals.

A yearly stipend of US$5000 was furnished by the SCTA and the MUSC Center for Telehealth and provided to primary care practices to offset provider and staff time associated with recruitment of approximately 20 patients annually, as well as time associated with patient communication and input of clinical data. This project was deemed quality improvement by the Institutional Review Board of MUSC and was not therefore subject to review.

Patients

Patients participating in Wellness Connect were identified by their respective primary care clinics. The only inclusion criteria were that the patients had a BMI $\geqslant 30$ and $\geqslant 18$ years of age. There were no specific exclusion criteria; thus, each primary care practice determined which of their patients would participate. There were 138 patients from seven primary care practices throughout South Carolina who voluntarily enrolled in and started Wellness Connect over the course of seven cohorts from January 2015 through April 2017. All the practices (7/7) were located in Medically Underserved Areas and 57% (4/7) were in rural counties, as defined by the Health Resources Services Administration.[16] Patients who participated in Wellness Connect remained patients of their respective primary care practices and their medical records were not shared with the study team. Therefore, the study team did not have access to patient data such as demographics, medical diagnoses and medications. The study team were able to obtain patient demographic data from the practices for only about one-third of patients; of those patients, 74% were female, 96% were Caucasian, with 2% being African American and Hispanic, respectively. The mean age of the sample was 55 years (standard deviation (SD) = 14.4), and their mean baseline BMI was 39.2 kg/m^2 (SD = 8.1).

Outcomes and data analysis

Data collected were height, weight, waist and hip measurements, blood pressure measurements and body composition measurements; BMI was calculated. Weight and blood pressure were measured using Bluetooth-enabled peripherals, which synced data in real-time to a secure iPad app. Tape measures were used to measure height, waist and hip measurements, which were manually entered into the iPad app. The iPad app securely transmitted all data in real-time to servers at MUSC and the data remained viewable by practice cohort within the app.

A programme evaluation was administered to patients using a secure online data collection survey system (REDCap). Due to administrative issues, however, only patients in cohorts 2–5 received the programme evaluation. Of the 120 patients who received it, 33 (28%) completed the programme evaluation. Evaluation questions focused on patient satisfaction with and perceived benefit of Wellness Connect, allowing respondents to indicate, on a four-point Likert scale, their agreement with a number of statements related to the programme. Upon a review of all Wellness Connect cohorts, the primary care providers were asked to provide written responses to several open-ended questions to assess the perceived utility and benefits of the programme, as well as practice-perceived challenges associated with implementing the programme.

Weight change was the primary clinical outcome examined in the present project. Patient and provider feedback regarding programme satisfaction was also examined. Data analyses conducted included descriptive statistics, *t*-tests, chi-square, and repeated measures analysis of variance.

Results

Weight outcomes

Of the 138 patients who attended at least one Wellness Connect session, 62% ($N = 86$) went on to complete the programme. Programme completion is operationalised as a) attending at least half of all possible classes *and* b) attending at least one session at or beyond the 70% programme mark. There was no difference in baseline weight between eventual completers, $M = 107.7$ kg, SD = 24.8, and non-completers, $M = 111.6$, SD = 26.8, $t(156) = -0.94$, $p = .347$. Likewise, there was also no difference in baseline BMI between eventual completers, $M = 38.7$, SD = 8.06, and non-completers, $M = 39.8$, SD = 8.2, $t(136) = -.740$, $p = 0.46$. Comparing programme completion rates, there were no differences across clinics $\chi^2(7, N = 158) = 4.96$, $p = .665$. Patients who completed the programme lost an average of 3.5% (SD = 3.9%) from baseline to final weight, which corresponded with 3.8 kg (SD = 4.5). This represented a significant change in weight from baseline to final weight across all clinics, $F(1, 79) = 44.94$, $p < .001$. (see Figure 3). There were no differences in weight change between clinics, $F(6, 79) = 0.21$, $p = .97$. Baseline, final weights and percent weight changes are presented in Table 1. There was a significant difference in weight change between cohorts, $F(6, 79) = 3.94$, $p = .002$, which was due to one cohort having only one patient who completed the programme, and that patient's weight loss was an outlier (i.e. 10.9%). When that patient was removed from analyses, there were no significant between-cohort differences in weight change.

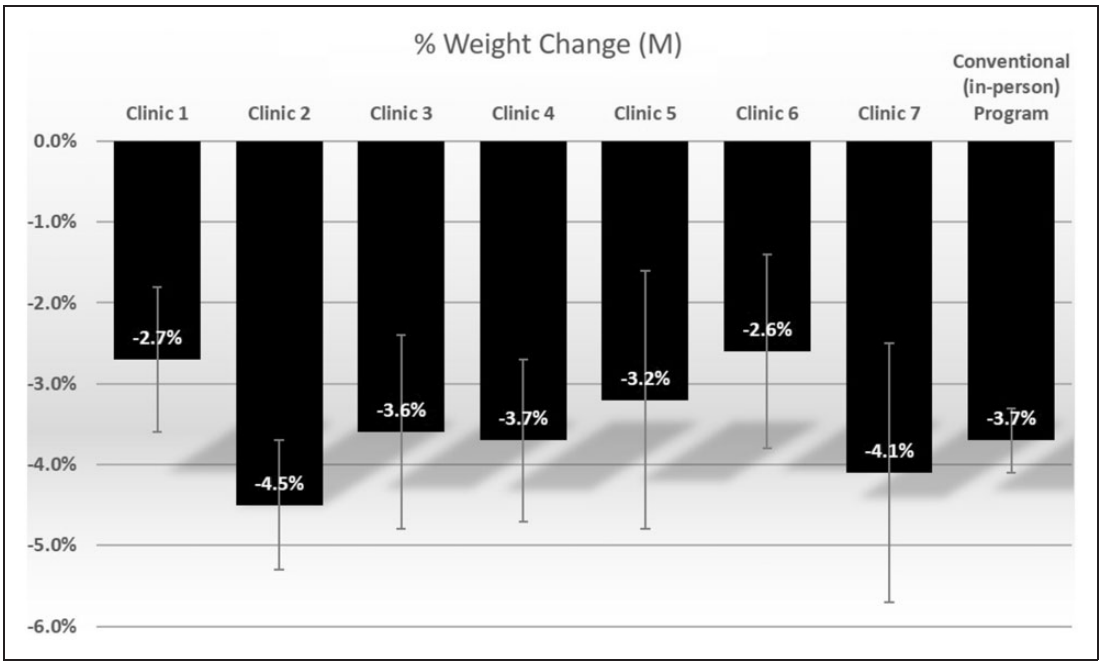

Figure 3. Weight change among Wellness Connect clinics.

Although we did not include a control condition as part of this project, post hoc comparisons of our weight loss outcomes to unpublished weight loss data from a similar, but conventionally delivered weight management programme that one of the primary care clinics delivered concurrent with our Wellness Connect programme, revealed very similar findings. Patients in that conventional weight management programme lost an average of 3.7% (SD = 3.9%), which represented statistically significant weight change from baseline to final weight, $F(1, 85) = 62.09$, $p < .001$, but was not statistically different from the amount of weight lost by patients in the Wellness Connect programme, $F(1, 161) = 0.04$, $p = .835$.

Patient and provider evaluations

Post-programme evaluations indicated that patients were satisfied with Wellness Connect. They found it useful, felt comfortable with the technology, believed it improved their knowledge of weight management behaviours, and had or would lead to improvements in their health (Table 2). Providers from two of the primary care practices responded with feedback regarding their experiences. They generally reported being very satisfied with the programme and the functions it served in their practice. For instance, one provider noted that the programme provided access to an evidence-based obesity intervention that would otherwise not have been available to his patients. He added that the educational materials served as resources for patients even if they could not attend all classes in-person. Another provider appreciated that Wellness Connect provided accurate information about things like nutrition, unlike a lot of the misinformation about weight loss that is in the public domain. Providers also noted some practical challenges they experienced while implementing the programme: sustaining adequate clinic staff, availability to recruit for and administer the group sessions, finding sufficient clinic space for the group meeting, sustaining reliable internet connections, and aligning the group sessions on days and times when patients and clinic staff were available. Despite the challenges, providers believed that continuing telemedicine services for weight management, as well as other specialty care areas, had considerable merit, especially for those further away from large medical centres.

Discussion

Lessons learned and future needs

This project demonstrated the feasibility and acceptability of offering weight management classes via telemedicine technology to small groups of patients meeting at primary care providers' offices. Sixty-two percent of participants met the criteria for completion of the programme and they lost an average of 3.5% of their start weight. There were similar weight losses across all seven participating clinics and, with the exception of a single patient who lost an extraordinary amount of weight in the seventh cohort, across cohorts. This lends to the replicability of the programme's results. Despite the fact that the weight loss interventions were delivered remotely, patient weight losses were of a magnitude that has been empirically shown to improve health outcomes (i.e. 3–5% reduction in body weight).[17] Patients reported high levels of satisfaction with the telemedicine-based obesity care they received (97% would recommend to it others). Additionally, nearly all patients (94.9%) indicated that

Table 1. Baseline and final weights by clinic, for programme completers.

		Baseline weight ($N = 86$)		Final weight ($N = 86$)		
	N	Mean (kg)	SE (kg)	Mean (kg)	SE (kg)	% Weight change (SE)
Clinic 1	18	119.5	5.6	116.1	5.4	−2.7% (0.9)
Clinic 2	21	104.0	5.2	99.3	5.0	−4.5% (0.8)
Clinic 3	11	98.7	7.2	94.8	7.0	−3.6% (1.2)
Clinic 4	14	101.9	6.4	98.2	6.2	−3.7% (1)
Clinic 5	6	91.6	9.8	88.8	9.4	−3.2% (1.6)
Clinic 6	10	119.3	7.6	116.1	7.3	−2.6% (1.2)
Clinic 7	6	112.6	9.8	108.4	9.4	−4.1% (1.6)

Table 2. Patient programme evaluation items and results.

Programme evaluation item	*N* (%)
I felt comfortable with my weight management classes being conducted through the telemedicine system *(indicated either "Strongly Agree" or "Agree")*	33 (100%)
I would not have been able to participate in a weight loss programme had it not been for this telemedicine weight management programme. *(indicated either "Strongly Agree" or "Agree")*	28 (94.9%)
I believe that I have a better knowledge of the dietary, exercise, and behavioural components of weight management because of this programme. *(indicated either "Strongly Agree" or "Agree")*	32 (97%)
I believe that having taken part in this telemedicine weight management programme has or will lead to improvements in my health. *(indicated either "Strongly Agree" or "Agree")*	33 (100%)
Overall, I am very satisfied with the telemedicine weight management programme. *(indicated either "Strongly Agree" or "Agree")*	33 (100%)
Would you recommend this tele-weight management programme to others? *(indicated "Yes")*	32 (97%)
How would you compare this programme to other group- or class-based weight loss programmes you might have done in the past? *(indicated either "Much Better Than" or "Better Than")*	19 (57.6%)*

*The remainder of patients ($N = 14$, 42.4%) indicated they had never done a group-/class-based weight loss programme.

they would not have been able to participate in a weight loss programme had it not been for Wellness Connect.

As for challenges, minimal technology issues arose over the course of the programme; however, it was important that the programme maintained strong partnerships among the clinical, technical and educational teams so that issues could be quickly addressed when they did occur. One of the primary challenges was sustaining high levels of patient recruitment and engagement over time. These difficulties could potentially be improved by altering the days and times of the group sessions, conducting weekly versus bi-weekly group sessions, and offering patient incentives for attendance and/or weight-/health-related outcomes. In addition, a shortage of clinic staff availability was a challenge noted by providers.

Arguably the most significant challenges throughout the programme were related to reimbursement. Specifically, third-party payer coverage of remotely delivered medical services remains sparse and inconsistent, in South Carolina and across the country.[18–21] Parity in payment for providers who manage weight issues in partnership with physicians will be required to reasonably increase access to un- and underserved patient populations. Obesity prevention and weight management interventions provided by multidisciplinary teams of weight management experts should be accessible regardless of delivery modality (in-person and/or telemedicine). Payment models that incorporate remotely delivered evidence-based interventions could benefit broader populations, as well as their corresponding healthcare delivery systems. Though some of the practices attempted to obtain reimbursement for their local portion of the weight management service delivery (e.g. site fee), these efforts, and the communication of outcomes related to these efforts, were inconsistent across practices. Therefore, very little was learned about the potential reimbursement for services related to Wellness Connect. It will be important that future efforts improve consistency of

communication related to tracking reimbursement efforts across practices. Also important will be making sure that programme outcomes are conveyed to policymakers and payers to encourage reimbursement.

Because this project was more of a clinical proof of concept than a clinical trial, there are several research-related limitations to note. Foremost among them is the fact that we did not incorporate a control comparison group, receiving treatment-as-usual care; this limits the generalizability of the programme outcomes. However, post hoc comparisons of our data to unpublished data from one of the primary care clinics that concurrently ran a more conventional (i.e. in-person) weight management programme revealed very similar weight loss outcomes among programme completers. Another notable limitation is the fact that we did not have access to patients' medical records, including demographics, comorbidities and medications. This limits our ability to account for the potential effects of medical factors on weight loss, as well as extend the results of this project across population groups. Future research should include a control condition, randomisation across treatment groups, and include complete demographic and medical information on each patient in order to increase generalizability of findings and assess potential third variables.

Conclusions

Innovative methods, such as use of telemedicine-based interventions, has become an important tool to remedy the access problems that prevent patients from obtaining appropriate evidence-based medical care for chronic diseases such as obesity. Primary care providers, including and especially those in rural locations, who can partner with obesity experts in programmes such as Wellness Connect can provide their patients with specialised evidence-based obesity care without them having to travel long distances. This project describes a novel model for primary care practices to partner with distally located multidisciplinary specialty clinics so that their patients have access to specialised medical care that they otherwise would not have.

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Declaration of conflicting interests

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