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REVIEW

Clinical Trials and Investigations

The benefit of telemedicine in obesity care

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Abstract

It has been estimated that, by 2030, nearly 80% of adults in the United States will have pre-obesity or obesity. Despite the continued rise in obesity prevalence and the difficulty for many affected patients to lose weight and maintain lost weight, the use of guideline-supported treatments, including pharmacotherapy, intensive behavioral counseling, and bariatric surgery, remains low. There are many potential barriers to effective use of antiobesity treatments, including limited access to guideline-supported obesity care (often driven by practical challenges, geographic barriers, limited insurance coverage, and high cost of care) and a dearth of specialists and comprehensive treatment teams. Driven in part by the COVID-19 pandemic, the recent expansion of telemedicine offers unique opportunities to mitigate these factors. This review discusses the use of telemedicine to facilitate obesity treatment. Continued growth and utility of telemedicine for obesity care require further formative and experimental research to determine best practices, assess challenges for implementation, and evaluate long-term outcomes, as well as proactive policy changes to promote ongoing use of telemedicine beyond the COVID-19 pandemic.

BACKGROUND OF TELEMEDICINE

The World Health Organization defines telemedicine as "the delivery of health care services, where distance is a critical factor, by all health care professionals using information and communication technologies for the exchange of valid information for diagnosis, treatment, and prevention of disease and injuries, research and evaluation, and the continuing education of health care providers, all in the interests of advancing the health of individuals and their communities" (1). Based on a search of English-language documents in the PubMed database, this narrative review will survey the use of telemedicine for weight management in adult patients. For this review, we will explore the landscape of telemedicine according to the World Health Organization's definition to highlight the ways in which telemedicine can help overcome barriers to effective long-term weight-management care.

With the growth of the internet for commerce and communication, health care providers (HCPs) have been increasingly able to implement telemedicine approaches, such as web-based (e.g., text and email messaging, tele-consultations, videoconferences) and multimedia (e.g., video, digital imagery) collaborations (1). Such innovations enable new possibilities and herald still greater opportunities for the use of telemedicine in health care.

The use of telemedicine has grown rapidly in recent years. Data from a large private health plan in the US show that annual telemedicine visits increased from 206 in 2005 (0.020 per 1,000; 95% CI: 0.018-0.021) to 202,374 in 2017 (6.57 per 1,000; 95% CI: 6.54-6.60). The use of telemedicine in primary care and mental health services accounted for most of these visits (2). In a 2016 report by the US Department of Health and Human Services, it was estimated that 61% of health care institutions in the US were using some version of telemedicine (3).

The COVID-19 pandemic has led to further and even more rapid expansion in the use of telemedicine, because most patients have been unable to attend, unwilling to attend, or dissuaded to attend in-person care. According to the US Centers for Disease Control and Prevention, there was a 154% increase in telehealth visits during the last week of March 2020 compared with the last week of March

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2019 ($p < 0.05$) (4). Results from a study conducted from January 1, 2020, to April 14, 2020, at a large academic health care system in the US showed a sizable increase in the volume of telemedicine use for both urgent and nonurgent care (5). For urgent care, the volume of telemedicine increased from 82 visits on March 4 to 1,336 visits 155 days later. On the first day of expanded telemedicine visits for all ambulatory care, the number of visits increased from the pre-COVID-19 average of 50 to greater than 1,000; more than 7,000 visits were reached within 10 days. Telehealth claims for private payers in the US increased 3,060% from October 2019 to October 2020, coinciding with the onset of COVID-19 in the US in early 2020 (6).

In response to the COVID-19 pandemic, federal agencies relaxed regulations and increased funding for telemedicine. For example, waivers were approved allowing Medicare reimbursement for telemedicine visits equivalent to that for in-person visits. In addition, agencies suspended enforcement of certain software-related violations of the Health Insurance Portability and Accountability Act and allowed patient care across state lines. Although these measures were intended to remain in effect only temporarily during the COVID-19 public health emergency, there has been extensive interest in continuing or adapting these measures to support ongoing use and growth of telemedicine and virtual care (7). However, in some states, emergency orders to expand telehealth are expiring, and modified requirements for telehealth are being rolled back to pre-COVID-19 policies (8).

Although the responses to COVID-19 have accelerated its adoption, telemedicine was already being integrated into health care practice. For example, among patients enrolled in a large private US health plan, from 2005 to 2017, telemedicine visits increased at an annual compound growth rate of 49% (95% CI: 41-58) (2). Telemedicine visits for primary care increased 26% annually before 2016 and grew rapidly to 136,366 visits in 2017; the rise in 2016 and 2017 occurred after an expansion of coverage for prescribing via telemedicine. By 2017, telemedicine was used most frequently in primary care practice (2).

Although telemedicine has been most frequently used in primary care practice (2), several medical specialties, including mental health care, dermatology, and radiology, have incorporated telemedicine to overcome limited patient access to care (9-11), due in part to a dearth of specialty providers in these areas, and to decrease costs (10,12). From 2005 to 2017, the use of telemedicine in mental health care grew steadily (2). A review of the tele-mental health literature for the period between July 2003 and March 2013 found that videoconferencing appeared to be as effective as in-person care with respect to feasibility, age of patient, outcome, satisfaction with a single assessment, and consultation or follow-up use for conditions that include depression, substance use, posttraumatic stress disorder, and developmental disabilities (10).

A systematic search of the literature relating to telemedicine in dermatology found that, of 204 articles reviewed, 138 reported that tele-dermatology was feasible, reliable, and effective (13). A recent randomized controlled trial evaluated an online, collaborative, connected-health model for psoriasis care from the perspective of both patients and providers. Patients considered collaborative, connected telehealth to be accessible, efficient, effective, safe, equitable, and patient centered. HCPs, including primary care providers (PCPs) and dermatologists, reported that they found telehealth to be valuable in delivering high-quality, coordinated care (9). Results from a survey of 937 US radiologists showed that tele-radiology has become widely employed in many practice settings and subspecialties and that it is used across numerous imaging modalities. Most respondents reported that tele-radiology was valuable in reducing turnaround times and increasing after-hours, geographic, and subspecialty coverage (11).

In aggregate, these data suggest that patients are interested in and may prefer virtual visits with their doctors. The increase in patient demand for telemedicine may be due to several factors, including the convenience of appointments, the decrease in the time commitment required for visits, the increased availability of reimbursement for visits, and the development of technology leading to improvements in the quality of the video interaction. Overall, the landscape of telemedicine will continue to evolve well beyond the COVID-19 pandemic.

Study Importance

What is already known?

- Prior publications have examined the use of telemedicine in obesity care prior to the COVID-19 pandemic.

What does this review add?

- This work reviews the landscape for telemedicine in obesity care in the pre- and post-COVID-19 environments.
- This work discusses how the expansion of telemedicine may address barriers to effective weight management.

BARRIERS TO OBESITY TREATMENT

By 2030, nearly 80% of adults in the US are projected to have pre-obesity (BMI of 25-29.9 kg/m^2) or obesity (BMI ≥ 30 kg/m^2) (14,15). ("Pre-obesity" is used in lieu of "overweight" throughout this review because the authors believe that the term better reflects the tendency for continued weight gain to obesity and the nature of obesity as a chronic disease.) Excess weight is associated with increased morbidity (12,16) and mortality (16,17). Additionally, patients with obesity are at increased risk for severe COVID-19 and have increased morbidity and mortality due to COVID-19 (18); this risk extends to those patients at lower levels of excess weight (19,20).

Guideline-based treatments for obesity, including intensive behavioral treatment, pharmacotherapy, and bariatric surgery, are overwhelmingly underutilized. According to a cross-sectional analysis of data from the 2011-2018 National Health and Nutrition

Examination Survey, only 19.6% of patients with pre-obesity and 57.5% of patients with obesity reported receiving weight-management counseling from an HCP in the previous 12 months (8). Only 1% to 2% of patients with pre-obesity or obesity are managed with pharmacotherapy (21,22). Despite its efficacy, only about 1% of eligible patients receive bariatric surgery (23). Notable barriers to the use of these treatments, and to effective long-term weight management overall, include limited access to specialized care, high cost, and limited insurance coverage.

Poor access to an HCP with training in obesity medicine and interdisciplinary treatment teams (e.g., obesity medicine physicians, behavioral therapists, dietitians, health coaches, exercise physiologists) pose a significant barrier to effective care (24). Geographic barriers, particularly in rural areas, further reduce access to care (24,25). Access may also be limited by a perceived shortage of time and the relatively low priority given to obesity treatment during primary care office visits. In a recent survey, only 38% of patients with obesity reported discussing a weight-loss plan with an HCP within the past 6 months (26). The reason cited most frequently (52%) by clinicians who did not initiate discussions about weight loss was a lack of time during the appointment (26). Another study found the most common limitations to obesity counseling were lack of time (67% of HCP respondents), lack of training in obesity management (56%), poor insurance reimbursement (53%), and limited tools to help patients recognize obesity risks (53%) (27).

Although addressing cost barriers does not always improve uptake of care (28), cost and reimbursement issues present additional obstacles to effective weight-management care (25). Success in weight-management programs improves with more frequent visits (29). Even when insurance coverage exists, time off work for travel to specialist centers, as well as the economic burden of insurance copays required for numerous visits, may be prohibitive for many persons in need of ongoing care. Lack of coverage by health care systems for weight-management interventions is a persistent challenge, adding to the cost barrier (25). Traditionally, insurance coverage for obesity counseling and treatment has been limited. Medicare explicitly excludes the prescription of pharmacotherapy to treat obesity for its beneficiaries, and most private health insurance plans have limited coverage for antiobesity medication (30,31).

Another hindrance to effective treatment is lack of patient adherence to weight-management plans. In a systematic review, Burgess et al. (32) identified numerous determinants of patient attrition from behavioral interventions. Key barriers to behavioral change included the patient's lack of time, health and physical limitations, and socioeconomic constraints. Moreover, obesity (16) is a chronic condition for which the pathophysiologic underpinnings make long-term weight maintenance difficult and weight regain common. A meta-analysis of 29 long-term weight-loss studies found that >50% of weight lost was regained within 2 years and >80% of weight lost was regained within 5 years (19,33). To address these issues, ongoing management (often including frequent clinical interaction) is indicated, placing a significant burden of time, resources, and expense on both HCPs and affected patients.

Telemedicine offers emerging opportunities to reduce barriers faced by both HCPs and patients alike, improve access to care, and ultimately improve long-term weight management and weight-related health outcomes. In this review, we discuss the landscape of telemedicine for weight management and describe opportunities for telemedicine to facilitate interactions between patients and their HCP.

OPPORTUNITIES FOR TELEMEDICINE TO ADDRESS SEVERAL KEY BARRIERS TO BETTER OBESITY TREATMENT

Access

Analogous to PCP referrals for areas of medicine with constrained availability of specialized HCPs, such as mental health and dermatologic care (2,9), telemedicine can improve access to specialized obesity care. Telemedicine may be used by PCPs to make referrals for their patients with pre-obesity or obesity, both within their communities and beyond their geographic locations. Telemedicine may also be useful for increasing access to treatment for patients with severe obesity who have mobility limitations. Moreover, there is considerable need for physicians who practice obesity medicine and related integrated teams (including obesity medicine specialists, psychologists, nurses, registered dietitians, and exercise therapists) to serve patients living in rural areas, who often have higher rates of obesity and severe obesity compared with patients living in urban and suburban areas (24,34,35). Specific barriers that patients in rural areas may encounter when trying to access effective care include long travel times to reach a medical practitioner, adverse weather conditions, and a lack of available local services (36). Whereas the use of telemedicine in rural areas may not have been feasible in the recent past because of technological limitations (such as requirements for access to high-speed internet and computer hardware), routine telemedicine visits can be performed with mobile phones (37), making visits for behavioral counseling and obesity treatment a feasible option for most patients.

Telemedicine has been used successfully to provide weight-management intervention to patients in rural and medically underserved areas (35,36,38-42). A multidisciplinary behavioral weight program implemented in seven primary care practices in South Carolina provided group sessions with clinical psychologists, registered dietitians, and exercise physiologists using two-way videoconferencing. Patients who completed the program lost an average of 3.5% (SD = 3.9%), a significant weight loss ($p < 0.001$) compared with weight measurements at baseline. Patient satisfaction was high; 97% of patients reported that they would recommend it to others. Critically, almost 95% of patients stated that, if not for the format provided, they would have been unable to participate in a weight-management program (35).

Specific interventions have been developed for certain communities, including patients with obesity who are members of racial/

ethnic minority populations (43). For example, a primary-care–based intervention focused on weight-gain prevention was developed for Black women that included behavioral goals, skills-training materials, and a gym membership, as well as telemedicine elements including weekly self-monitoring via interactive voice response and monthly counseling calls. In a randomized clinical trial to evaluate the program's efficacy in preventing weight gain among premenopausal Black women with a BMI in the range of 25-34.9, 62% of patients were at or below their baseline weights at month 12, compared with 45% of patients receiving usual care ($p = 0.03$). At 18 months, patients had maintained significantly greater weight loss compared with a control group (mean difference −1.7 kg; 95% CI: −3.3 to −0.2 kg; $p = 0.03$) (44). Another randomized clinical trial demonstrated that a weight-loss intervention combining a digital app and clinician counseling could achieve clinically meaningful weight loss among socioeconomically disadvantaged patients. The study included men and women with obesity (BMI of 30.0-44.9) at an elevated risk for cardiovascular disease. Patients receiving the intervention showed greater weight losses relative to usual care at 6 months (net effect: −4.4 kg; 95% CI: −5.5 to −3.3; $p < 0.001$) and 12 months (net effect: −3.8 kg; 95% CI: −5.0 to −2.5; $p < 0.001$). A significantly greater proportion of patients lost ≥5% of their baseline weight at 6 months (43% vs. 6%; $p < 0.001$) and 12 months (40.4% vs. 16.7%; $p < 0.001$) (45).

Telemedicine has also been utilized to improve access to obesity treatment for patients who are active-duty members of the military, military families (46), and veterans (36,47). A retrospective cohort study evaluated the effectiveness of providing a weight-management program to veterans via videoconferencing. The care team for the study included three registered dietitians, a psychologist, a physical therapist, and a wellness nurse. The veterans who participated in videoconferencing lost a significant amount of weight compared with controls; the mean difference between the groups was −5.5 (2.7 kg) (95% CI: −8.0 to −3.0; $p < 0.0001$) (36).

Although there are many programs addressing telemedicine in rural areas, most telemedicine users live in urban settings (2). While telemedicine can increase access to HCPs and team members trained in obesity medicine for underserved populations, telemedicine has the potential to also facilitate similar access for a wide variety of patients.

Cost

Telemedicine may reduce the costs of obesity care. Virtual interactions between patients and HCPs may be less expensive and more cost-effective than in-person visits (48). Krishnan et al. (49) reported a cost-effectiveness analysis of a digital behavioral weight-gain prevention trial that included telephonic coaching by health-system personnel, personalized behavioral goals, a skills-training curriculum, patient self-monitoring via an automated interactive system, counseling calls with a registered dietitian, and a gym membership. The program was shown to be cost-effective in preventing weight gain (49).

Spring et al. (50) evaluated individual components of behavioral obesity treatments, including those delivered remotely, to assess their cost-effectiveness in contributing to weight loss over a period of 6 months; a goal of this study was to optimize a weight-loss treatment package for ≤$500 per person. A treatment package was identified that provided maximum weight loss for $427 per person. This package combination, which led to 57.1% of participants losing ≥5% of body weight and 51.8% losing ≥7% body weight, included a smartphone app, personalized goals, online lessons, 12 coaching calls, training a support buddy, and progress reports sent to a PCP (50).

Additionally, telemedicine may reduce health care costs by supporting integrated, efficient team-based care and use of auxiliary personnel. A study in the UK reported that a web-based weight-management intervention supplemented by remote nurse support was more cost-effective than the same program using in-person nurse support. The estimated incremental overall cost per kilogram of weight lost compared with the control group was 18 pound sterling (£18 [US $24]) (95% CI: −£129 to £195) for the program with in-person support and −£25 (95% CI: −£268 to £157) for the program with remote support. The probability of being cost-effective (at a threshold of £100 per kilogram lost) was 88% for in-person support and 98% for remote support (48). Moreover, use of virtual care reduces indirect costs of health care interactions, such as time off work to travel to in-person appointments.

Adherence

By decreasing the time and resource commitments needed for frequent counseling appointments, telemedicine may also help improve long-term adherence. In one study, a comparison between patients who participated in a weight-loss intervention visit via videoconference and those who attended in person showed a significantly higher retention rate (96%) for those who participated by videoconference compared with those who attended in person (70%) (46). In a fully online, medically monitored weight-management program, Alencar et al. (51) investigated whether weekly health coaching delivered via videoconferencing could increase adherence to the use of remote-monitoring devices (scale and tracker). The patients receiving video coaching demonstrated significantly greater adherence to use of both the scale and the tracker, compared with self-guided controls (92% [0.10%] vs. 75% [5%], $p < 0.05$, 80% [0.14%] vs. 49% [15%], $p < 0.05$, respectively).

Long-term efficacy of current weight-loss treatment options

Weight regain represents another barrier to effective weight-management care for patients. Ahrendt et al. (36) reported that an

intervention provided via videoconference produced significant weight loss in participants compared with controls (mean difference: −5.5 [2.7] kg; 95% CI: −8.0 to −3.0; $p < 0.0001$) that was maintained for up to 1 year. A combined intervention has been adapted to integrate with population health-management support in the primary care setting. A recent randomized clinical trial evaluated the long-term effectiveness of this approach (52). The intervention, which combined an online weight-management program (BMIQ) with population health management that included additional outreach and support from nonclinical staff, was compared with the online program alone and usual care (patients were mailed information about weight management). Among primary care patients with a BMI between 27 and <40 and hypertension or type 2 diabetes, the combined program produced a small but significantly greater weight loss at 12 months compared with the online program alone (−1.2 kg [95% CI: −2.2 to −0.3 kg; $p = 0.01$]) or usual care alone (−1.9 kg [97.5% CI −2.9 to −0.9 kg; $p < 0.001$]) (52).

Telemedicine can be used by primary care and other medical teams engaged in obesity care to deliver behavioral and pharmaceutical treatment for weight management. Care is also more frequently being delivered by stand-alone telemedicine companies that combine accountability and behavioral management with clinician-directed medication management. Patients with obesity now have many options to access care; however, there are few rigorous studies of these programs, and the effectiveness of many of these care platforms remains undetermined. For example, are there preferred design elements for a behavioral program delivered by telemedicine in the context of obesity care? Whether a patient receives treatment by their PCP, obesity medicine specialist, or a telemedicine provider, in the context of a stand-alone virtual clinic, a virtual clinic that works with a primary care team, or virtual care that is integrated into the existing clinician's multidisciplinary practice, the potential benefits, risks, and challenges of each of these care delivery models warrant further research.

POTENTIAL LIMITATIONS AND OBSTACLES TO THE USE OF TELEMEDICINE

Although the use of telemedicine has been increasing, substantial obstacles have constrained continued growth. These include regulatory challenges (such as unclear and insufficient cross-jurisdictional licensing laws) (53) and inconsistencies between federal-level guidelines and local-level implementation, among others. Although responses to the COVID-19 pandemic have addressed many of these issues, some of these remedies may be temporary (53). Additional potential barriers include the need for HCP training to implement telemedicine (54), the licensing of videoconferencing software that is compliant with the Health Insurance Portability and Accountability Act, and the need to address security concerns (37).

For providers, there may be limitations in technological capabilities, particularly outside of large health systems. Such barriers may include the failure of software to integrate with electronic medical record and scheduling systems (55). Maintaining a reliable internet connection may be a challenge for both practitioners and patients (7,35). Many patients do not have a reliable internet connection, potentially contributing to socioeconomic disparities for care access (56). Concerns regarding insurance reimbursement may also limit participation by both providers and patients (54). Although some patients may prefer telemedicine, drawbacks include the physician's inability to perform a comprehensive physical examination and take vital sign measurements using calibrated scales. In addition, a patient may need to visit an outpatient laboratory for further laboratory testing after the telemedicine visit, adding further burden and inconvenience for the patient. Similarly, some drug and device options may be better suited for in-person prescribing rather than through telemedicine. Notably, prescribing of controlled substances (e.g., phentermine) via telemedicine is restricted in some states. Furthermore, some medications require specific training by a health care professional, such as showing patients the proper administration techniques for injectable treatments. Others require the monitoring of vital signs. These tasks may be more challenging to conduct in a virtual setting.

Additionally, telemedicine requires patients to be sufficiently computer literate to navigate app-based systems. HCPs may require the use of multiple platforms to integrate a variety of information, including food logs, weights, vital-sign capture, and body composition measurements. Patients may also require specialized equipment, such as app-based phones or other devices, an electronic scale, a blood pressure cuff, or a tape measure.

CURRENTLY AVAILABLE TELEMEDICINE PLATFORMS FOR WEIGHT MANAGEMENT

Currently available approaches to weight management via telemedicine encompass a variety of designs. These include web-based behavioral modifications, videoconferencing with lifestyle coaches, videoconference visits with clinicians, access to prescriptions, and various combinations of these elements, offered with or without in-person visits. Table 1 summarizes several currently available platforms for weight-management care encompassing telemedicine.

UNANSWERED QUESTIONS AND FUTURE DIRECTIONS

Physicians who treat patients with obesity have seen firsthand the improvements that telemedicine can make to patient care. For example, access to care for patients who have severe obesity (e.g., BMI > 70) can be limited because of mobility and transportation challenges. By using telemedicine, many more patients can be seen from home. Additionally, many patients experience weight stigma when riding the subway or traveling to the office in a ride share. Patients feel stigmatized when the only way they can get to the clinic is to be transported in an ambulance.

TABLE 1 Telemedicine approaches to weight-management care

Platform	Design	Methods	Payment	Comments
Found	Stand-alone program combining physician consultations, medication, and coaching (57)	Individualized online consultation with board-certified practitioner, personal health coaching via text, and a private community (58)	Cash (https://joinfound.com/)	Practitioner may prescribe FDA-approved (59) medications for weight loss (delivered to the patient); additional nonprescription path and wellness path without prescription medications (58)
Calibrate	One-year stand-alone program combining medication and tele-coaching (60,61)	Personalized video coaching and pharmacotherapy used to reset the patient's metabolic system; supervised by physicians (online); patients connect through an app, which can access a smart scale (61)	Cash; prescription medications and laboratory tests covered by insurance (61)	Physicians prescribe GLP-1 agonist medication (62)
FormHealth	Personalized telehealth with weight-loss specialists; stand alone; PCP involvement required (63)	App used to manage medical care provided via videoconference by certified physicians and dietitians who provide an individualized weight-loss plan; patient may use app to text with the FormHealth team and receive feedback on a food photo journal (64)	Cash; insurance coverage for physician visits (64)	If appropriate, the FormHealth doctor may prescribe FDA-approved weight-loss medication (64)
InHealth Lifestyle Therapeutics	Tele-coaching add-on to existing practices (65)	Videoconferencing via an app with health coaches (e.g., registered nurses, registered dietitians, certified clinical nutritionists); app connects to a smart scale or wearable tracker; after each scheduled visit, the coach reports updates and remote patient monitoring data to physicians (65)	Insurance coverage if physician is registered with inHealth (65)	In a randomized controlled trial, patients participated in a 12-week intervention that had a structure similar to the program commercially available from InHealth Lifestyle Therapeutics; patients who received weekly videoconference coaching with a registered dietitian lost significantly more body weight than control patients, who did not receive coaching support (7.3 ± 5.2 vs. 1.2 ± 3.9 kg, respectively; $p < 0.05$) and lost a significantly higher percentage of body weight ($7.16\% \pm 4.4\%$ vs. $1.5\% \pm 4.1\%$, respectively; $p < 0.05$) (66)
BMIQ (now part of the software platform Evolve) (Intellihealth, San Francisco, CA) (67)	Behavioral management program; add-on to existing practices (68)	Hybrid approach combining a customizable web-based platform providing evidence-based behavioral management used with in-person or virtual clinician visits; also provides meal plans, educational reading materials, and tracking tools; supplies clinicians with patient monitoring and remote guidance (clinical decision support) on disease management (69)	Clinician is charged a monthly fee per member for using the platform; can recover this with insurance billing for services or charge the patient	Clinician using Evolve would choose and deliver prescription medication; Evolve app has clinical decision support to help provider choose medication; results from a retrospective patient chart review showed clinically significant weight loss with BMIQ combined with pharmacotherapy and limited in-office visits with providers (physician and registered dietitian); regular use of the BMIQ platform (i.e., patients who viewed ≥4 BMIQ sessions) was an independent predictor of weight loss at 6 months of ≥5% ($p = 0.042$) and ≥10% ($p = 0.006$) (69)

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TABLE 1 (Continued)

Platform	Design	Methods	Payment	Comments
GetContrave	Prescribing via telemedicine	Contrave (Currax Pharmaceuticals, Morristown, NJ) extended-release naltrexone HCl/bupropion HCl available to patients in the US through a platform providing telemedicine and home delivery (70)	Cash; some insurance coverage (71)	Physicians on the GetContrave platform have a limited scope of practice and do not prescribe other weight-loss medications
Ro-Plenity	Prescribing via telemedicine	Plenity (Gelesis, Boston, MA) oral superabsorbent hydrogel made from modified cellulose cross-linked with citric acid (72); available through the Ro platform (New York, NY), a national direct-to-consumer online pharmacy and physician network (73)	Cash (74)	Physicians on the Ro-Plenity platform have a limited scope of practice and do not prescribe other weight-loss medications

Abbreviations: FDA, Food and Drug Administration; GLP-1, glucagon-like peptide-1; HCl, hydrochloride; PCP, primary care provider.

From a provider perspective, telemedicine has also provided helpful insight into the lives of our patients. For example, through video, a patient can now invite a dietitian to see into their home to advise them about what they are eating. Registered dietitians have found this to be helpful as patients can show them the contents of their cupboards and refrigerators. They can also gain insight into the facilities the patients have available for cooking.

Future research should focus on patient engagement, retention, and specific patient phenotypes that create successful long-term results in a virtual-only program. Obesity treatment has been available for years in person, and now that treatment is available via telemedicine, it remains difficult to predict which patient will do well with a particular treatment. Consideration should be given to determining the ideal patient profile (e.g., younger, few obesity comorbidities, and few other medications) for prescribing via telemedicine. Characterization of the ideal profile for a drug or device is also warranted. For example, a drug or device may be better suited to the telemedicine approach if it has a demonstrated favorable safety profile, an easily understood mechanism of action, a patient-centric route of administration, and a regulatory status that permits it to be prescribed via telemedicine.

Many current platforms only offer isolated treatment, rather than comprehensive care. This raises the question of whether it is better to provide multiple options or to focus on one option, even if that approach is not successful for all patients. It is also important that programs recognize when patients need additional support and refer them appropriately. Overall, because only about 1% of patients with obesity are prescribed medication, it is likely that any program that helps patients gain access to medication and encourages them to continue taking it long term would be beneficial. It is also reasonable to assume that technology will help patients remain engaged based on the ability to connect the patient, the care team, and the pharmacy to encourage continued medication use.

From the HCP perspective, the array of different telemedicine options available, including many that are cash based and separate from a PCP's care, can create confusion in developing a treatment plan. Communication between systems, devices, and obesity care teams is not standardized, creating an obstacle for introduction into the practice. The means to integrate these components of an obesity telemedicine team will require further research.

The advancement of telemedicine in weight management entails ensuring that coverage for these services remains in place. Using remote patient monitoring can improve engagement with the care team and possibly improve outcomes. Combining telemedicine tools with antiobesity medications and procedural interventions can improve comprehensive care delivery.

CONCLUSION

Telemedicine and virtual care have the potential to improve access to, and the efficiency of, obesity treatment by addressing

several barriers to effective and ongoing weight-management care, including the challenges of access, cost, and time limitations. Analogous to the management of many other chronic diseases, obesity-related care is well suited to telemedicine. There exists a need to determine best practices for the implementation of telemedicine in obesity care and continued qualitative and experimental research to understand clinical, health, and cost outcomes.O

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CONFLICT OF INTEREST

SK has served on scientific advisory boards and received funding/grant support and honoraria for consultancy from Gelesis, Novo Nordisk, Vivus, Lilly, and Pfizer. ML has received honoraria for consultancy from Boehringer Ingelheim, Gelesis, and Novo Nordisk. AF serves as the chair of the scientific advisory board for Jenny Craig and has received honoraria for consultancy from Gelesis, MsMedicine, Novo Nordisk, Set Point Health, Found Health, and Suvie.

AUTHOR CONTRIBUTIONS

All authors contributed to the concept/design, data acquisition and interpretation, review and critique of the manuscript throughout development, and approval of the final manuscript draft submitted for publication. All authors agree to be accountable for all aspects of the work, ensuring the accuracy and integrity of the publication.

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