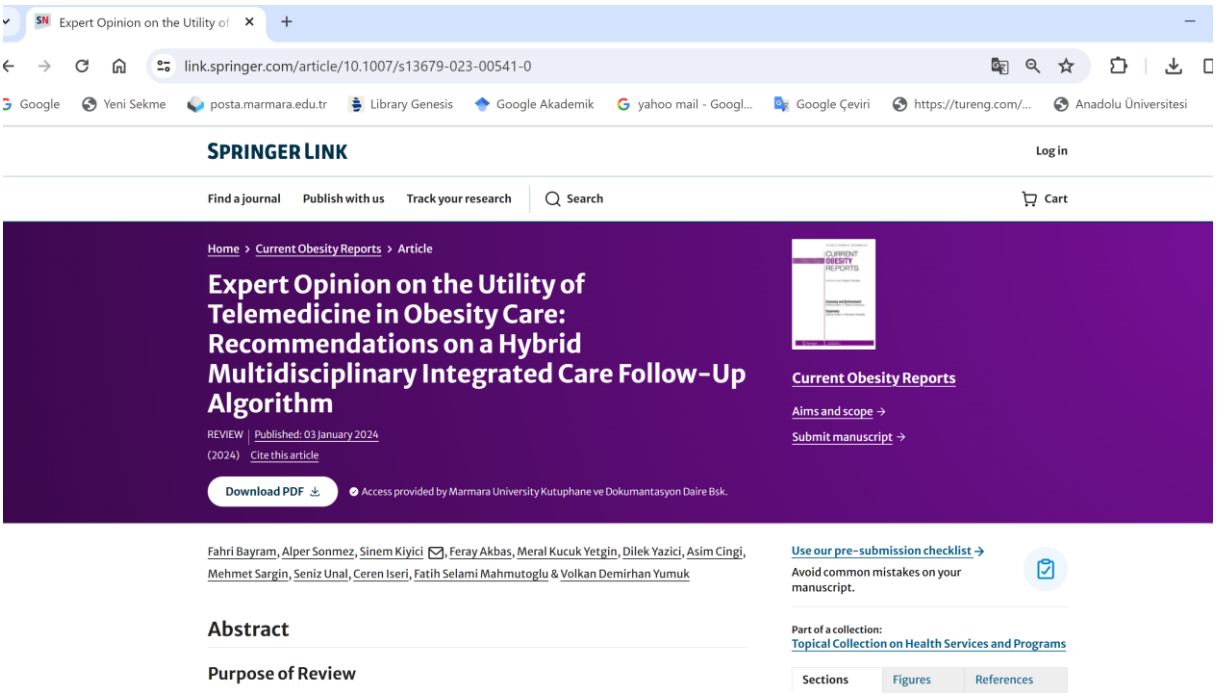
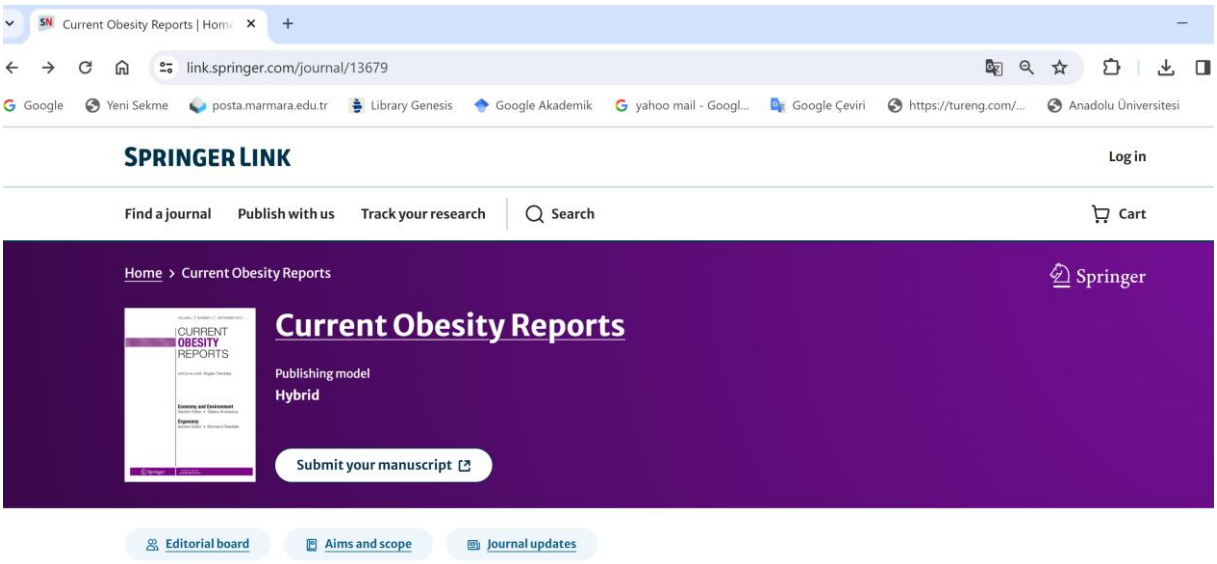

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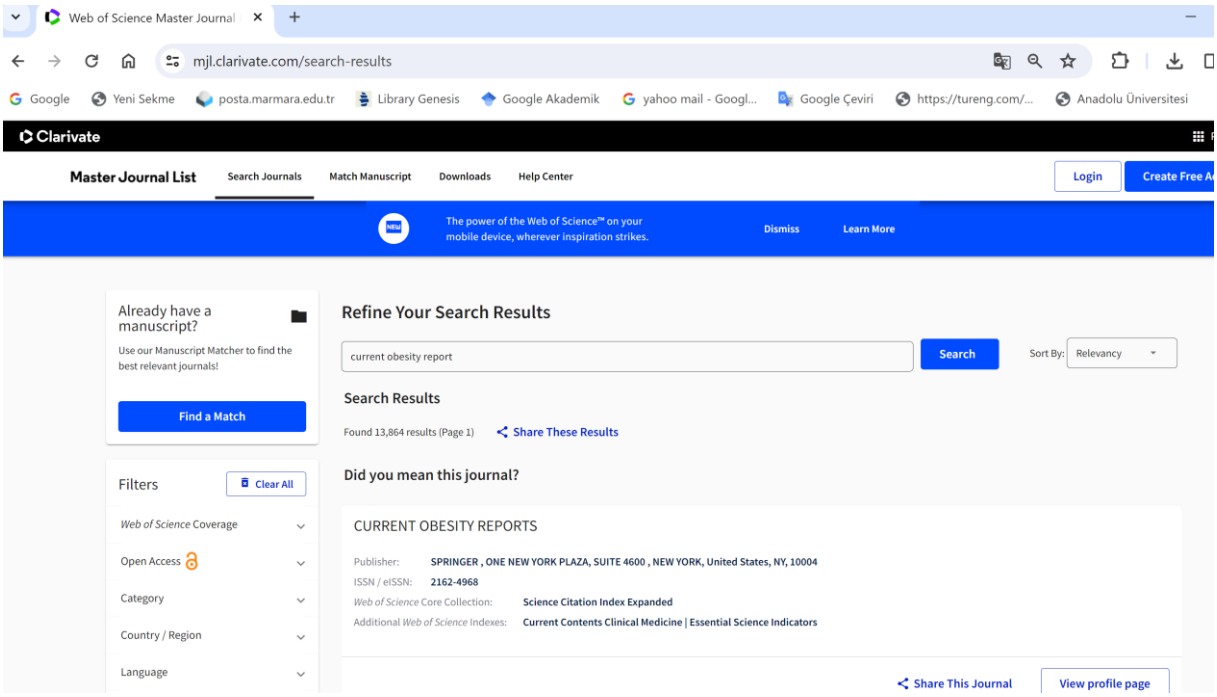
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Expert Opinion on the Utility of Telemedicine in Obesity Care: Recommendations on a Hybrid Multidisciplinary Integrated Care Follow-Up Algorithm

The proposed expert opinion was prepared by a panel of obesity and law specialists from Turkey to review the utility of telemedicine in obesity care...

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REVIEW

Expert Opinion on the Utility of Telemedicine in Obesity Care: Recommendations on a Hybrid Multidisciplinary Integrated Care Follow-Up Algorithm

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Abstract

Purpose of Review The proposed expert opinion was prepared by a panel of obesity and law specialists from Turkey to review the utility of telemedicine in obesity care and to provide a guidance document with recommendations on a hybrid multidisciplinary integrated care follow-up algorithm and the legislation governing telemedicine practice to assist obesity specialists in practicing the telemedicine.

Recent Findings The efficacy and feasibility of telemedicine interventions in supporting obesity management programs even during pandemics confirm that obesity is a particularly well-suited field for telemedicine, emphasizing the strong likelihood of continued utilization of telemedicine in obesity management, beyond the pandemic period.

Summary Telemedicine has great potential to address several barriers to ongoing weight-management care, such as challenges of access to specialized care, cost, and time limitations as well as patient adherence to treatment. However, telemedicine practice should complement rather than replace the in-person visits which are unique in building rapport and offering social support. Accordingly, the participating experts recommend the use of a hybrid integrated care model in the management of obesity, with the use of telemedicine, as an adjunct to in-person visits, to enable the provision of suggested intensive obesity management via frequent visits by a multidisciplinary team of obesity specialists. Further research addressing the utility of telemedicine in terms of optimal modality and du ration for successful long-term obesity management outcomes is necessary to develop specific guidelines on telemedicine practice. In addition, the legislation governing the norms and protocols on confidentiality, privacy, access, and liability needs to be improved.

Keywords Expert opinion · Obesity specialists · Obesity care · Barriers · Telemedicine · Efficacy · Weight management · Tele-visit · In-person visit · Legislations

Introduction

Obesity remains a real epidemic and global public health concern associated with increased risk of comorbidities (i.e., hypertension, dyslipidemia, type 2 diabetes mellitus (T2D), cardiovascular diseases (CVD)) and mortality [1–3]. WHO estimates that 59% of adults in the European Region are living with overweight or obesity [2]. However, the likelihood of meeting the global obesity target (reducing the rate of obesity by half by 2025) is considered highly unlikely due to continuation of post-2000 trend in rising obesity prevalence worldwide doubling from 1980s in more than 70 countries [4, 5].

Turkish national obesity surveys conducted with a 12-year interval revealed a 75% prevalence of overweight and obesity in the Turkish adult population with an increase in obesity by 40% and in central obesity by 35% from 1998 to 2010 [6, 7]. Turkey is among the countries with the highest prevalence of overweight (31%) or obesity (59%) in patients with T2D [8].

The increase in the incidence of obesity is at least as high in the Middle East and North Africa as in Turkey [9]. Many European countries especially England and Hungary are affected by the increased prevalence of obesity [2, 10]. Considering that more than 90% of patients with T2D have excess body weight [8], the importance of the issue becomes much clearer.

Evidence-based clinical guidelines consistently recommend that clinicians screen all adult patients for obesity

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and offer intensive counseling about diet, exercise, and psychological interventions and support to promote long-term maintenance of weight reduction for those with obesity [11, 12].

The success in weight-management programs improves with more frequent visits, while weight regain is common particularly in those no longer receive treatment [13–15]. Therefore, long-term treatment contact with perpetual patient engagement is considered essential for achieving and maintaining weight loss in patients with obesity [13–15].

However, these comprehensive interventions are based on a large amount of contact hours and a high frequency of visits with healthcare providers (HCPs), necessitating a considerable care coordination and a significant investment of time, transportation, effort, and resources [13, 16].

Telemedicine, which literally means "healing at a distance," aims to provide healthcare to remote patients via a two-way real-time interactive communication using modern information technology and to support provision of healthcare services across geographic, time, social, and cultural barriers [13, 17–19]. In this regard, given the need for new modalities for delivering obesity management interventions with broad reach and scalability to counteract the alarming prevalence of adult obesity, telemedicine is suggested to hold significant promise for overcoming barriers in obesity management [16, 20, 21]. By improving access to care across the geographic and logistical barriers, telemedicine offers excellent opportunities for encouraging self-monitoring and ultimately improving long-term obesity management and weight-related health outcomes [16, 20–24].

Consistent with the recent expansion of telemedicine driven by the COVID-19 pandemic, telemedicine has been strongly advocated as a useful tool to relieve pressure on the overwhelmed health system [25, 26]. Specifically, accumulating evidence indicates telemedicine is a promising modality in the obesity setting with great potential to enable meaningful clinical improvements in weight loss, physical activity adherence, and self-efficacy along with high patient acceptability and satisfaction [27–29].

Being expanded and adopted by more HCPs and patients, the landscape of telemedicine is expected to evolve well beyond the COVID-19 pandemic [13, 28, 30]. However, there remains critical research and practice gaps regarding the best practice in telemedicine-based obesity care [13, 28, 30]. These include lack of guidelines on the clinical standards, protocols, policies, and procedures in relation to optimal modality and duration for successful long-term outcomes or legislative measures on the norms and protocols relating to physician-patient relationship and issues of liability and negligence [13, 28, 30].

The proposed expert opinion was prepared by a panel of obesity and law specialists from Turkey to review the utility of telemedicine in obesity care as a promising modality to overcome barriers to effective long-term obesity management. Thereby, we aimed to provide a guidance document with recommendations on a hybrid multidisciplinary integrated care follow-up algorithm and the legislations governing telemedicine practice to assist obesity specialists in practicing the telemedicine.

Methods

The present expert panel of six different specialties involved in the management of obesity (endocrinologist, family physician, general surgeon, internist, dietitian, exercise specialist, clinical psychologist) and a criminal law expert, with at least 15 years of experience in their field, met three times (on October 16, 2021, on January 08, 2022, and on August 24, 2022) to develop expert opinion and recommendations on utility of telemedicine in obesity. The panel critically analyzed recommendations from international guidelines, systematic reviews and meta-analyses, results of randomized control trials (RCTs) focusing on the efficacy of telemedicine-based obesity management interventions, and the current legislations governing telemedicine practice. The participating experts agreed on a series of statements supported by scientific evidence and expert clinical/legal opinion. The proposed expert opinion planned to provide a practical and implementable guidance document addressing the utility of telemedicine in obesity care in terms of (a) telemedicine in healthcare (definition, concept, and tools and utility in healthcare), (b) utility of telemedicine in addressing barriers to obesity treatment, (c) current evidence on efficacy of telemedicine in obesity management (digital health platforms, telemedicine interventions [videoconferencing, remotely delivered televisits], clinical experience during COVID-19 pandemic, patient's perspective on use of telemedicine for obesity), (d) use of telemedicine in multidisciplinary integrated obesity care model (recommendations for a hybrid follow up algorithm), and (e) legal aspect of telemedicine practice.

Telemedicine in Healthcare

Telemedicine: Definition, Concept, and Tools

Telemedicine is the use of electronic information and communication technologies to provide and support healthcare via real-time interactive communication when geographical, socioeconomic, and physical time constraints separate the patient and the HCP [17–19, 27].

While telemedicine is often used interchangeably with other digital health interventions such as electronic health

(eHealth) and mobile health (mHealth), it is a subset of telehealth limited to the provision of healthcare services where traditional face-to-face patient-doctor interaction is replaced by a virtual interaction [17, 18, 31, 32]. Telemedicine can be implemented through different modes of communication that involve video (i.e., apps, chat platforms, and Skype/Facetime), audio (i.e., phone, voice over internet protocol [VOIP], apps), general messaging/text/chat platforms (i.e., WhatsApp, Facebook Messenger, Google Hangouts), or asynchronous communication (i.e., email/ fax) [30]. Nonetheless, telemedicine typically involves the application of remote online televisits, as non-face-to-face patient-initiated digital communications (i.e., secure videoconferencing) by replicating the traditional in-person visits in terms of provision of a clinical decision and the real-time interaction between patients and HCPs [33, 34].

Use of Telemedicine in Healthcare

Owing to advances in Internet technology and further technological advances enabling data analytics and artificial intelligence, the scope of telemedicine is expanded to transform the healthcare provision [17, 35]. Hence, use of telemedicine in healthcare has grown rapidly in recent years and the HCPs have been increasingly able to implement telemedicine approaches [17, 35].

Tele-endocrinology is among the three medical specialties that account for most of the telemedicine solutions along with telecardiology and telepulmonology [35]. The COVID-19 pandemic has led to a rapid expansion in the use of telemedicine, because most patients have been unable, unwilling, or hesitant to attend in-person care (13). According to the US Centers for Disease Control and Prevention, there was a 154% increase in telehealth visits from March 2019 to the last week of March 2020 [36]. Other studies during the first wave of pandemic also reported a sizable increase in the volume of telemedicine use for both urgent and nonurgent healthcare with high patient and physician satisfaction [37–39].

In fact, given the continuing interest and preference of patients toward the televisits due to convenience and flexibility of appointments, the increased availability of reimbursement for visits, and the advances in technology leading to improved quality of the video interaction, the landscape of telemedicine is suggested to continue to evolve well beyond the COVID-19 pandemic [13].

Telemedicine in Addressing Barriers to Obesity Treatment

The limited intervention resources, poor access to multidisciplinary obesity care providers due to geographic barriers, travel time, and costs are considered the major barriers against the implementation and dissemination of gold standard long-term lifestyle interventions in patients with obesity [13–15].

Telemedicine approach is considered to be particularly well suited for obesity with a wide range of modalities applicable across the full spectrum of care from diagnosis and assessment to ongoing management, by addressing the common challenges of providing high-quality obesity care [13, 16, 21, 22, 24].

As summarized in Table 1, the main advantages of telemedicine in overcoming barriers to obesity diagnosis and treatment are as follows [13, 16, 22, 29, 40, 41]:

(a) Improved access to specialized obesity care, particularly for patients living in rural and medically underserved areas or socioeconomically disadvantaged patients
(b) Enhanced efficiency of obesity diagnosis and assessment (via collection of data important for the initial evaluation

Table 1 Telemedicine in overcoming barriers to obesity treatment [12, 15, 21, 28, 39, 40]

Barriers to obesity treatment	Addressed by telemedicine	
	Outcome	How
Limited access to specialized care	Improved access to specialized obesity care	For patients living in rural and medically underserved areas or socioeconomically disadvantaged patients
Time constraints Resources Underdiagnosis	Enhanced efficiency of obesity diagnosis and assessment	Via collection of data important for the initial evaluation (i.e., comprehensive history, an accurate record of usual dietary and physical activity habits) By decreasing the time and resource commitments needed for frequent counseling appointments
High cost	Reduced costs of obesity care	Through less expensive and more cost-effective virtual interactions between patients and HCPs than in-person visits
Lack of sustained motivation and self-efficacy and poor adherence	Improved long-term patient adherence	By decreasing the time and resource commitments needed for frequent counseling appointments and enabling high patient satisfaction with the telemedicine experience

including comprehensive history and an accurate record of usual dietary and physical activity habits)

(c) Reduced costs of obesity care through less expensive and more cost-effective virtual interactions between patients and HCPs than in-person visits

(d) Improved long-term patient adherence by decreasing the time and resource commitments needed for frequent counseling appointments and enabling high patient satisfaction with the telemedicine experience

Current Evidence on Efficacy of Telemedicine in Obesity Management

The components of the traditional in-person treatment model for obesity are entirely compatible and potentially more efficiently delivered with a telemedicine approach, which is also considered among the nonpharmacological ways of obesity management [16, 42].

Currently available approaches to obesity management via telemedicine encompass a variety of modalities including web-based psychological (behavioral and emotional) interventions and support, videoconferencing with lifestyle coaches, or videoconference visits with clinicians and their various combinations, offered with or without accompanying in-person visits [13]. Overall, implementation of different telemedicine modalities in clinical practice and clinical research interventions are considered to be well accepted and satisfying for participants, as well as to improve healthcare access and save time and cost with comparable outcomes to traditional care [16].

Efficacy of Digital Health Platforms

In a systematic review and meta-analysis, using lifestyle mHealth self-monitoring (particularly with smartphones) compared to other interventions or usual care displayed a greater decrease in weight and higher adherence to interventions at 6 and 12 months [43]. The authors also noted that mHealth interventions enhance patients' self-efficacy and daily life autonomy and decrease the workload for HCP [43].

In a systematic review of 39 studies on use of digital self-monitoring in behavioral weight loss interventions, self-monitoring via digital health was concluded to yield a significant weight loss, with similar outcome for interventions with counseling and standalone interventions [20].

The mHealth interventions for treatment of adolescents with overweight and obesity are cost-effective [44]. Apps targeting young people with obesity are suggested to be designed to include interface design patterns for supporting behavior change [45].

In a study from the UK estimating the average effect of a national diabetes prevention program in 65,741 individuals, digital program was associated with clinically significant reductions in weight which were at least equivalent to weight loss in the face-to-face program. Hence, digital services are considered to be just as effective as face-to-face in delivering a population-based approach to the prevention of diabetes [46•].

In another systematic review on the efficacy of web-based weight loss and maintenance interventions, web-based digital health interventions with no provider contact were found to be more effective than control and/or minimal interventions, while to be less effective than face-to-face interventions with tailored or clinician-led feedback [47]. Hence, eHealth-based programs involving nutritional information, exercise and behavioral strategies, monitoring tools (planning meals, nutritional data, daily activity, weight recording), group support forums with a moderator, and self-reported characteristics are considered valuable and economically viable tools in obesity management [48, 49]. Nonetheless, it has also been emphasized that, while eHealth strategies are increasingly recognized as an effective and innovative alternative, they must be used as an add-on to face-to-face intervention programs to enable an effective individualized obesity management [50, 51].

Efficacy of Telemedicine Interventions (Videoconferencing, Remotely Delivered Televisits)

A multidisciplinary behavioral program implemented via group sessions with clinical psychologists, registered dietitians, and exercise specialist using two-way videoconferencing yielded an average of 3.5% weight loss along with high patient satisfaction (97%) [40]. A primary care-based intervention focused on weight-gain prevention via behavioral goals, skills-training materials, and a gym membership as well as telemedicine (weekly self-monitoring via interactive voice response and monthly counseling calls) revealed higher percentage of patients in the intervention vs. usual care group to be at or below their baseline weights at month 12 (62 vs. 45%) and to have greater weight loss at 18 months (− 0.9 kg weight loss vs. 0.8 kg weight gain, respectively; mean difference, − 0.17 kg) [52].

The RCTs on obesity management via use of telemedicine vs. standard treatment of care in obesity management revealed a greater weight loss, satisfaction, and adherence in the telemedicine group [53–56]. In a meta-analysis of 25 RCTs with 6253 people on efficacy of telemedicine vs. control interventions that ranged from 9 weeks to 2 years, the telemedicine group was reported to have more significant reduction in BMI than the control group [42]. Also, telemedicine intervention was considered effective in improving BMI whether it was used for diabetes control, hypertension control, weight loss, or increasing physical activity, emphasizing the likelihood of both patients with chronic disease

and people with overweight/obesity to benefit from telemedicine interventions [42].

Several randomized studies compared the effectiveness of videoconferencing vs. in-person medical care so far. The results show that videoconferencing shows comparable outcomes in up to 24 months of follow-up [57–60].

In a study on the comparison of text vs. videoconference-based behavioral weight control groups (6-month, 24-session), the patients in the videoconferencing group more frequently self-monitor their weight (123 days vs. 8 days) and physical activity (55 days vs. 22 days) and were twice as likely to lose 5% body weight [61].

In sedentary adults, use of personalized feedback from a multidisciplinary team (dietitians, exercise specialists, and a physician) via videoconferencing was associated with greater weight loss (8.23 kg, 7.7% body weight) compared to in-person (3.2 kg, 3.4%) and control (2.9 kg, 3.3%) groups [62].

In a study on the role of providing videoconferencing feedback for scale and activity trackers, receiving feedback was reported to be associated with greater adherence to both the scale (92% vs. 75%) and tracker (80% vs. 49%) and a greater rate of weekly weight loss compared to the control group without feedback [41]. In a study among women living with obesity, implementation of a medical nutritional treatment plus a home-based combined aerobic and resistance exercise model with the aid of audiovisual instructions for 8 weeks revealed significant decrease in body weight (2.4%), BMI (1.8%), body fat ratio (3.8%), and fat mass (5.9%) along with significantly improved QoL [63].

In another study, the telemedicine group with weekly video conferencing had significantly more weight loss (7.3 vs. 1.2 kg, respectively), percent body weight loss (7.16 vs. 1.5%), and clinically significant weight loss (69.2% vs. 8%) than the standard care group at 12 weeks [64]. A 12-week primary care referred telenutrition weight loss intervention enabled a greater proportion of participants from the intervention group compared to enhanced usual care to lose at least 5% of their baseline weight at week 12 (70.4% vs. 41.4%) [65].

In a systematic review of 15 trials, the telephone-based interventions that incorporate motivational interviewing for weight loss were associated with greater weight loss than the no-treatment control arm, indicating the potential contribution of telemedicine-based motivational interviewing in effective obesity treatment [23]. In a systematic review of 25 RCTs in 6253 adults, significantly higher improvement in BMI was reported in the telemedicine vs. the standard care group [27].

In a meta-analysis of seven studies regarding the effects of telemedicine on body weight in subjects with a BMI > 30 kg/m^2, a moderate and significant mean effect size ($g - 0.628$ (95% CI $- 0.739$– $- 0.517$); $p < 0.001$) was observed [66].

Clinical Experience During the COVID-19 Pandemic

Obesity is also a known risk factor for comorbidities (i.e., hypertension, T2D, and CVD) identified as predisposing factors for adverse outcomes in COVID-19 [3]. A nationwide cohort study in 14,000 patients with COVID-19 revealed a three-times higher risk of mortality in those with obesity vs. normal weight [67]. Also, a meta-analysis concluded that obesity was associated with an increased risk of severe disease and composite poor outcomes (odds ratios [ORs] ranged from 1.39 to 2.35) [68]. The consideration of COVID-19 patients with concomitant obesity to be followed and treated as a higher-risk population seems notable given the association of lockdown periods introduced in many countries with physical inactivity and increased susceptibility of people to develop obesity and thus increase in the number of individuals who will likely have a more severe course when infected with COVID-19 [68]. In a Turkish cohort of patients with obesity, the COVID-19 lockdown resulted in significant decrease in the healthy nutrition coefficient and weight gain in about half of the patients, which was related to changes in physical activity and eating habits [69]. Telemedicine utilization is considered a valuable strategy to enable access to vital healthcare services and thus to optimize patient care in the high-risk groups, including the obesity care, during the COVID-19 pandemic [42, 70].

In a cohort comparison study of all new and follow-up visits in 2019 and 2020 at two weight-management centers, transition to telemedicine during the COVID-19 pandemic enabled an improved appointment adherence with a rise in completed new and follow-up visits and a reduction in no-show visits, due to easier access to healthcare and increased motivation of patients to prioritize obesity treatment since obesity is considered a risk factor for COVID-19 severity [71].

An online survey showed that the pandemic significantly worsened eating behaviors, reduced exercise, and decreased patients' mood almost by half of the patients and showed that patients receiving multidisciplinary obesity care via telemedicine were more likely to participate in exercise and to lose weight [72].

In a study on utility of telemedicine (phone call visits) in 86 obesity center patients' follow-ups during COVID-19 pandemic lockdown period in Turkey, lockdown was associated with weight gain in 40.7% of patients, weight loss in 50% of patients, and maintenance of the same prepandemic weight in 9.3% of patients, possibly due to increased motivation of patients toward weight loss to avoid the risk of severe COVID-19 [73].

In another lockdown period study in Turkish individuals with overweight and obesity, telerehabilitation intervention was considered an effective, safe, and viable approach resulting in significantly improved physical fitness compared to the control group [74].

Data from a prospective study on the rate of weight loss in kg/week before, during, and after lockdown among 1550 participants undergoing a 2–6-month program during total lockdown, significantly greater median weight loss was reported in patients who used telemedicine consultations vs. those had no remote consultations (4.4 kg vs. 1.4 kg) [75].

In a US market study on telemedicine in 2020 and beyond, the COVID-19 pandemic was associated with increased use of telemedicine visits as well as the high patient satisfaction regarding feeling more comfortable and having the same or better quality of care when compared to in-person doctor visits [76]. Hence, the authors noted the likelihood of telemedicine to divert a significant percentage of emergency department visits and become an important adjunct to home healthcare support, particularly for specialties such as endocrinology and rheumatology that manage chronic illnesses requiring frequent patient visits [76].

In a study comparing the clinical outcomes and postoperative hospital utilization in patients who receive fully remote vs. in-person preoperative care before bariatric surgery, clinical outcomes and hospital utilization in the telemedicine group were not inferior to the control group, suggesting that telemedicine can be used safely and effectively for bariatric surgical preoperative care [77]. In another study comparing face-to-face bariatric follow-up outpatient clinics (FTFC) with teleclinics (TC) during the lockdown, TC was concluded to be a satisfactory and safe substitute for FTFC, while patients reported the main advantages of TC over FTFC to be saving time, work advantages, and comparable relevance of TC [78].

Also, implementation of a 12-week multidisciplinary intensive lifestyle intervention program with use of a virtual model (VM), hybrid model (HM), and in-person model (iPM) revealed similar body weight reduction or HbA1c reduction in patients with diabetes and obesity during COVID-19 [79•]. Hence, HM is considered to be as effective as VM and iPM in reducing body weight and A1C after 12 weeks, offering an increased flexibility and enhanced accountability for a post-COVID era [79•].

Accordingly, current evidence indicates the efficacy and feasibility of remote monitoring to support weight loss programs even in a difficult pandemic situation, suggesting potential for continued utilization of telemedicine as integrated with in-person visits in obesity management, beyond the pandemic period [75, 76].

Patient Perspective on the Use of Telemedicine for Obesity

The COVID-19 pandemic created a need that rapidly transformed healthcare delivery and telemedicine has become a widely used method in this regard, to improve patient care and maintain safety for both HCPs and patients [80, 81]. Indeed, despite a lack of experience in telemedicine and the high volume of telemedicine visits are well received by patients along with high patient satisfaction reported in the preliminary studies [80–83].

In a study assessing the patients' view on the rapid implementation of a diabetes telemedicine clinic during pandemic, majority of patients with diabetes agreed or strongly agreed that the use of telemedicine was essential in maintaining a good glucose control during the pandemic and reported high satisfaction and their desire to maintain this care model after the COVID-19 pandemic is over [83].

In fact, prepandemic studies also revealed significant health benefits and patient acceptability of integrating the telephone-delivered coaching service or telerehabilitation programs, as an adjunct to multidisciplinary care for adults with obesity [84, 85]. Both tools provided noninferior care in terms of improved weight, BMI, exercise capacity, and quality of life along with high levels of patient satisfaction [84, 85].

Similarly, in a small-group interview of the present expert panel with their patients with obesity regarding the patient perspectives on the use of telemedicine during their follow-up after the pandemic, patients reported high satisfaction with telemedicine visits, particularly those performed with the trusted physician, in terms of treatment success. The use of telemedicine improved adherence to treatment and improved motivation for weight loss practice by enabling more frequent and close interaction with the physician. The patients also emphasized that they prefer the telemedicine visits to be continued after the pandemic in the setting of multidisciplinary obesity team in terms of their motivation and achievement of maintained weight loss in the long term.

The factors that make telemedicine more favorable to patients involve scheduling ease, convenience, seeing a familiar physician's face, quick access to medication refills, lack of travel, and avoiding the risk of exposure to SARS-CoV-2 [81, 86]. Notably, in a systematic review on identifying barriers to using telemedicine in obesity management during COVID-19, the authors reported the clinics with established telemedicine practices prior to the pandemic already received positive feedback [87]. Telemedicine application during the pandemic in fact reduced the barriers to access by becoming more readily available through facilitated access to required technology and more acceptable to both HCP and patients [87].

Use of Telemedicine in a Multidisciplinary Integrated Obesity Care Model: Recommendations for a Hybrid Follow-Up Algorithm

Telemedicine in a Multidisciplinary Integrated Obesity Care Model

The criteria of success in weight loss management include frequent contact with HCPs, frequent self-monitoring of

nutrition, physical activity and body weight, the psychological interventions and support, and the personalized feedback for weight loss challenges [64, 88].

Although heterogeneity across trials limits the availability of clear-cut evidence on the impact of number of sessions on weight loss, weight loss is greater in interventions with at least 14 intended HCP contacts compared to those with fewer than 14 sessions [23]. Accordingly, obesity guidelines recommend the implementation of high-intensity (i.e., at least 14 contacts over 6 months) or at least moderate-intensity (i.e., 1–2 sessions per month) lifestyle interventions rather than a low-intensity (less than monthly) intervention for achievement of effective weight loss [11, 12, 23, 89, 90].

Successful weight loss interventions (both in-person and via telemedicine) have common skill-building objectives for participants [28, 61, 90]. These include self-monitoring (recording weight, steps per day, exercise sessions, and/or dietary details), developing healthy dietary habits (reducing daily energy intake, making healthy food substitutions, portion control, selecting and preparing healthy food, mindful eating, reduced grazing), relapse prevention and problem-solving, and the guided training/exercise sessions [28, 61, 90].

The counseling sessions are the active component of the telemedicine-based obesity management intervention, but may also be supplemented with text messaging groups, online discussion boards, and online educational content available on demand [28]. The counseling sessions are provided often via videoconferencing as usually an-hour-long weekly meetings for 10–12 weeks, while interventions lasting longer than 6 months or those with more than 14 sessions are suggested to result in greater weight loss [23, 28]. The online programs are a second common format of using telemedicine as an adjunct to another primary intervention [28, 41]. They enable participants to receive and process the online intervention content at a time and pace of their choosing, while the providers monitor progress (via apps or remote monitoring devices) and provide feedback and support at regular intervals (20-min telephone counseling sessions every 2 weeks or weekly and monthly feedback) [28, 41].

Telemedicine weight loss intervention is provided within the scope of an integrated care model by a multidisciplinary team including primary care physicians, nurses, dietitians, psychologists, and exercise specialists [23, 38, 41]. Given the likelihood of experiencing stigma when seeking weight loss, many patients with obesity expressed a positive experience with online psychosocial support, suggesting the likelihood telemedicine visits to be an acceptable option tailored to patients' needs (i.e., no travel, saved time and money, and a reduced threat) [28, 91].

Nonetheless, videoconferencing is a relatively new and less extensively studied technology than older technologies (i.e., mobile phones, email, and synchronous online chats) [28, 92]. Telemedicine cannot replace the in-person visits which are unique in building rapport and offering social support to contribute to the potent weight control and are the current gold standard format of delivery for obesity treatment [29, 61, 93, 94].

Hence, consideration for a hybrid integrated care model, based on in-person visits with an adjunct telemedicine component, may help sustained provision of intensive interventions throughout the follow-up via leveraging telemedicine for additional check-in appointments for a maintained weight reduction [94–96].

The Proposed Hybrid Follow-Up Algorithm

The participating experts recommend a hybrid integrated care model in the follow-up of patients with obesity via use of telemedicine, in addition to in-person visits, to enable sustained provision of obesity management interventions with more frequent follow-up visits. The model requires a multidisciplinary team composed of obesity specialists (physician, registered dietitian, psychologist, or exercise specialist). Each member of the team has the responsibility to recognize obesity as a gateway disease necessitating lifelong management with individualized appropriate prevention and treatment schemes. These schemes are based on good clinical care and evidence-based interventions by focusing on realistic goals, weight maintenance, and prevention of weight regain as well as reducing the risk of comorbid diseases [90].

The follow-up period can be categorized into four phases including the critical motivation phase (the first 3 months, where the frequent contact is essential along with evaluation of treatment components), medical treatment phase (first 6 months), maintenance phase (second 6 months, the onset of weight regain under treatment), and long-term follow up phase (after the second year under treatment).

Figure 1 illustrates the scheme for the recommended hybrid multidisciplinary integrated care follow-up algorithm for obesity management interventions.

Physician Visits

The first consultation of the patients with the physician should be through an in-person visit, followed also by monthly televisits within the first 3 months. Physician visits should be based on in-person face-to-face visits in 0, 3, 6, 12, 18, 24, 36 and 48th months and as-needed (more frequently for the first 3 months, less frequently for the next 6 months) televisits in-between.

Overall, in-person physician visits are performed every 3 months within the first 6 months, every 6 months from 6 months to 2 years, and on a yearly basis after the second year, while the visit frequency can be adjusted in

accordance with the presence of comorbidities necessitating a closer follow-up.

Overall, televisits can be performed on a monthly basis during the first year, while depending on the need/condition of the patient either bimonthly (14, 16, 20, and 22nd months) or every 3 months (15 and 21st months) televisits can be performed in the second year.

The physician assessment includes measurement of anthropometrics and body composition analysis along with assessment of the presence and impact of obesity-related diseases. Obesity management should target a realistic weight loss to achieve a reduction in health risks and should include promotion of weight loss and maintenance and prevention of weight re-gain, as well as prevention of obesity-related complications, management of co-morbidities, and improvement of quality of life and well-being of patients with obesity [90].

Pharmacological treatment should be considered as part of a comprehensive strategy of disease management and is recommended for patients with a BMI $\geq$ 30 kg/m^2 or a

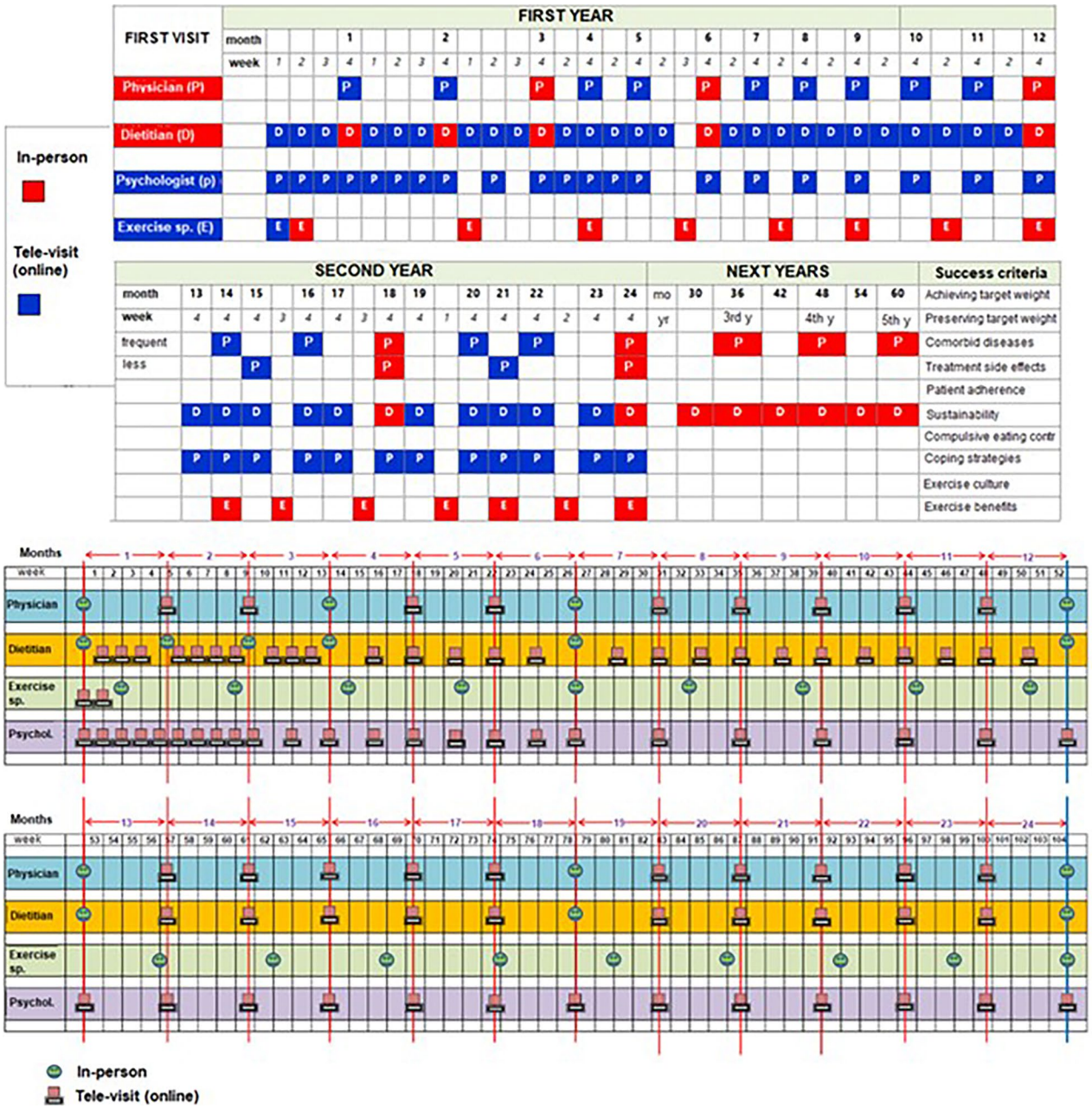


Fig. 1 The obesity hybrid follow-up algorithm

BMI ≥ 27 kg/m^2 plus an obesity-related comorbidity [90]. Anti-obesity drugs should be used according to their licensed indications and restrictions, and the efficacy of pharmacotherapy should be evaluated after the first 3 months. If the weight loss achieved is satisfactory (> 5% weight loss in patients without diabetes and > 3% in patients with diabetes), treatment should be continued, while the treatment should be discontinued in nonresponders [90]. Surgery is the most effective treatment for class III obesity in terms of long-term weight loss, improved quality of life, and reduced risk of morbidity and mortality and can be considered for patients with a BMI ≥ 40.0 kg/m^2 or with BMI of 35.0–39.9 kg/m^2 and comorbidities [90]. Bariatric surgery also may be suggested for patients with poorly controlled type 2 diabetes and class I obesity (BMI between 30 and 35 kg/m^2) despite optimal medical management [97].

Dietitian Visits

Dietitian visits are performed on a weekly basis within the first 3 months (by in-person visits for the first visit and monthly visits and by televisit for the remaining visits), biweekly (one individual, one group sessions) until the 12th month, and on a monthly basis after 12th month or after achievement of a stable weight.

The dietitian was responsible for ongoing dietary assessment, diagnosis of nutrition problems, nutrition education and dietary counseling guided and nutrition monitoring evaluation, by sequential learning objectives mapped to desired dietary behaviors [90, 98]. Before giving dietary advice, motivation for change (importance of weight loss for the patient, self-confidence in achieving weight loss) should be addressed in each patient. Medical nutrition therapy should be individualized considering the personal and cultural choices of the patients to yield sustainability [63, 90]. Dietary advice should encourage healthy eating with increased consumption of vegetables, beans, legumes, lentils, grain, unsweetened cereals and fiber, and low-fat dairy products and meats, while avoiding the consumption of foods containing added sugars and solid fats, sugary drinks, and alcohol-containing beverages [90].

Exercise Specialist Visits

Exercise specialist visits are performed based on the first televisit for exercise anamnesis, a second televisit one week after (provision of exercise education), and an in-person visit 1 week after (preparation of the exercise recipe), followed by consecutive in-person visits every 6 weeks.

Exercise is considered an important component of a weight reduction program in conjunction with caloric reduction, which also yields metabolic and psychological benefits [90]. The aerobic and resistance exercises are considered beneficial for patients with obesity and related morbidities [90]. Accordingly, at least 150 min/week of moderate aerobic exercise (i.e., brisk walking) is recommended to be combined with 3 weekly sessions of resistance exercise to increase muscle strength [90]. The exercise advice must be tailored to the patient's ability and health and focus on a gradual increase to levels that are safe [90, 99]. Individualization of exercise interventions should be based not only on the personalized advice at the onset of the intervention but also on a longitudinal modification with the supervision of exercise professionals [90, 99]. This enables matching exercise to increase physical condition and keeps motivation by changing the quantity and type of training through training modalities [90, 99]. The further objectives should be to reduce sedentary behavior and increase daily activities [90].

Psychologist Visits

Psychologist visits are performed, either in-person or televisit, on a weekly basis for the first 2 months, followed by biweekly visits during the plateau phase of weight loss until the 6th month and then on a monthly basis after the 6th month.

The psychologist is responsible for assessing environmental, behavioral, cognitive, emotional, and familial variables influencing the level of adherence to the dietary prescription, consistent with a scientifically proven framework such as the cognitive behavioral framework model and educational or modified caloric intake interventions [98, 100].

Psychological support and/or treatment is an integral part of obesity management and can also be delivered in a group setting [90]. Cognitive behavioral therapy via self-monitoring techniques controlling the process of eating, stimulus control, and re-enforcement as well as cognitive and relaxation techniques is considered helpful to modify patients' insight and understanding of thoughts and beliefs concerning weight regulation, obesity, and its consequences and to directly address behaviors that require change for successful weight loss and weight loss maintenance [90].

While more frequent weekly visits are performed during active treatment phase, less frequent visits along with participation in support groups are considered for maintenance of achieved weight loss. The presence of an underlying eating disorder such as night eating/binge eating syndrome is prevalent in individuals with obesity, as associated with increased risk of weight regain [101, 102]. In addition, different obesity interventions are related to development of different eating styles, while weight loss leads to altered relationship models, and individuals successful in weight loss maintenance are considered more likely to use support from a social context [103, 104]. These factors emphasize the crucial role of psychological support and support groups particularly during the first 2 years of obesity management interventions to enable weight loss maintenance. In this regard, telemedicine

is particularly important for gaining control of impulsive/emotional eating via creating a mechanism enabling access to a supportive body system (psychologists in particular, as well as consultants or peers) [101, 103, 105].

The Principles of Televisit Sessions

Appointment scheduling should be done by the obesity management clinic along with assignment of a coordinator for the program, given the complexity of orchestrating all components across the interdisciplinary team and various levels of visit frequency [34]. Transparency is fundamental in telemedicine, and both patient and the HCP need to know each other's identity [34, 106]. Patient consent is necessary for any telemedicine consultation, and the consent can be implied (if the patient initiates the telemedicine consultation) or explicit (if HCP initiates the consultation) [30].

The HCP emphasizes that telemedicine is a voluntary service and that the patient can opt out initially or at any time during treatment, while risks and benefits are discussed prior to consent for telemedicine treatment [34, 106].

The telemedicine applications should be based on standard local regulations with documentation of the time spent, method and medical notes of audio/video visit, consents and questionnaires from the patient visit, and the final decision regarding the need for an in-person visit or a next appointment after the recommendations are given [30, 34, 73].

Among the multiple technologies that can be used to deliver telemedicine consultations, considering the situation, using his/her best judgment, an HCP may decide the best technology to use to diagnose and treat [30]. The telemedicine visits are convenient for patients previously seen and examined by the same doctor, whereas in-person visit rather than a telemedicine visit should be used for a first consult patient never seen before [30, 73, 107].

If the HCP is satisfied with the adequacy of patient information for offering a professional opinion, then they exercise their professional judgment for its suitability for management via telemedicine. If the situation is not appropriate for further telemedicine consultation, then the HCP should provide health advice or education as appropriate and/or refer for in-person consultation [30].

Legal Aspect of Telemedicine Practice

Telemedicine has the potential to dramatically improve the delivery of healthcare to a great number of individuals worldwide, especially to individuals in remote and underserved locations [19]. With this benefit, however, comes responsibility and accountability to the individual [19], while due to regulatory challenges (i.e., unclear and insufficient cross-jurisdictional licensing laws), telemedicine practice may also raise legal and ethical problems, particularly related to risks to quality, safety, and continuity of care created by exchanging health information and providing care electronically, all of which could jeopardize the patient-physician relationships [106, 107].

The physician-patient privilege, which requires courts to respect the confidentiality and privacy of the physician-patient relationship, is one of the oldest and most important safeguards that the law offers [19]. In telehealth and telemedicine as in other modes of care, patient-physician interactions give rise to differing levels of accountability for physicians [106]. For the "health-related websites," the physician has broad obligations but is not specifically accountable to any individual information seeker, while "an online health website or service," with the affiliated physician offering an individualized response directly, gives rise to greater accountability and carries greater potential for unethical behavior. During the "telemedicine consultation" (i.e., teleradiology or teledermatology), a specialist accesses images, reviews them, and offers insight in real time or asynchronously using store-and-forward technology and thus shares accountability with the treating physician in keeping with expectations for in-person consultations. Finally, in the "telemedicine visits," the physician participates directly in a patient's clinical care in real time via telecommunications and is held accountable for the care he or she provides as a treating physician [106].

Given that telemedicine has the potential to void the legal privilege should unintended third parties encounter confidential information such as an electronic medical record [19], the healthcare facility and healthcare professional are responsible for protecting the privacy and personal data of the patient during the provision of distance healthcare services [108].

Healthcare professionals reasonably will be subject to the usual legislation, licensing and registration obligations, and professional codes of conduct which are specific to their particular field, in the same way that they would be should the service be provided in a face-to-face setting [18, 108]. In this regard, the provision of Distance Health Services should be regulated through a clear legal framework consistent with clear definitions regarding the criteria for appropriate telemedicine practice in each medical specialty and the legal grounds of patient-physician interaction on telemedicine to protect both the patient and the doctor.

The initiation of telemedicine programs requires new protocols and safeguards to be initiated to protect patient confidentiality/privacy, ensure the appropriate licensure of physicians practicing across state borders, and educate patients on the use of new technological systems [19]. From a legal perspective, the safeguards and laws set up to protect

the rights of each patient, specifically privacy and confidentiality, must be examined, understood, and in some cases amended [19]. To overcome these challenges, telemedicine must be regulated by definitive and comprehensive guidelines, which are applied widely, ideally worldwide, while concurrently legislation governing confidentiality, privacy, access, and liability needs to be instituted [17, 19, 106].

Conclusions

Obesity remains an epidemic and global public health concern associated with increased risk of comorbidities, necessitating appropriate implementation of personalized care as well as life-long monitoring in accordance with the guideline-based treatments.

The participating experts consider the potential of telemedicine in addressing several barriers to effective and ongoing weight-management care, such as challenges of access to specialized care, cost, and time limitations as well as patient adherence to treatment. However, telemedicine practice should complement rather than replace the in-person visits which are unique in building rapport and offering social support, as the current gold standard format of delivery for behavioral obesity treatment. Accordingly, the participating experts recommend the use of a hybrid integrated care model in the management of obesity, with use of telemedicine, as an adjunct to in-person visits, to enable provision of suggested intensive obesity management via frequent visits by a multidisciplinary team of obesity specialists. The hybrid integrated obesity management care should prioritize the recognition of obesity as a gateway disease necessitating lifelong management, as well as the provision of individualized interventions based on good clinical care and evidence-based interventions by focusing on realistic goals, weight maintenance, and prevention of weight regain as well as reducing the risk of comorbid diseases.

The proposed expert opinion, based on the current evidence as well as available guidelines regarding the utility of telemedicine in obesity care, provides a practical guidance document with recommendations on a hybrid multidisciplinary integrated obesity care follow-up algorithm and current legislations governing telemedicine practice to assist obesity specialists in practicing the telemedicine. Further research addressing the utility of telemedicine in terms of optimal modality and duration for successful long-term obesity management outcomes is necessary to develop specific guidelines on telemedicine practice. In addition, the legislation governing the norms and protocols on confidentiality, privacy, access, and liability needs to be improved.

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Data Availability The data supporting the findings of this study are available within the article, further inquiries can be directed to the corresponding author.

Compliance with Ethical Standards

Conflict of Interest Fahri Bayram participated in clinical studies and adboard meetings conducted by Novo Nordisk, Eli Lilly, Abbott, Sanovel, Novartis, Sandoz, Bilim ilaç, Astrazeneca, Pfizer, Ali raif, Econix and Sanofi. Alper Sonmez was involved as the principal investigator in several phase 3 studies conducted by Novo Nordisk, Novartis, Sanofi, participated in adboard meetings performed by Novo Nordisk, Sanofi, AstraZeneca, Eczacıbaşı, Econix, Roche Diagnostics and took grants congress from Bilim Ilaç, Novo Nordisk and AstraZeneca. Volkan Yumuk participated in speakers' bureaus and advisory board meetings performed by Novo Nordisk. Sinem Kiyici received speaking fees paid to her Institution for Novo Nordisk, Boehringer Ingelheim, AstraZeneca, Servier, Abbott and Novartis. Other authors declare that they have no conflict of interest.

Human and Animal Rights and Informed Consent This article is a review of the published literature. This review article does not contain any studies performed with human or animal subjects by the authors.

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