eHealth in obesity care

Authors: Bukhosi Raymond Sithole, [A] Yannis Pappas[B] and Gurch Randhawa[C]

ABSTRACT

Obesity in adults is a growing health concern. Although effective, current treatment options have not been able to overcome the various factors that contribute toward rising obesity rates. eHealth might hold the capacity to improve the effectiveness, delivery and flexibility of some of these treatments. Here, we show that eHealth lifestyle change interventions delivered through smartphones (mHealth) can facilitate significant weight loss, making mHealth an attractive adjunct to clinical obesity care. However, evidence is currently limited to short-term effects, and is also lacking with regards to effectiveness based on socioeconomic status and ethnic group. This raises concerns around the potential and inadvertent widening of obesity prevalence disparities between groups as mHealth lifestyle change interventions are increasingly used in obesity care. Thus, we also describe opportunities to address these concerns and gaps in evidence.

KEYWORDS: obesity, eHealth, mHealth, telehealth, digital inclusion

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Introduction

The ever-increasing prevalence of adult obesity is well publicised.[1,2] So too is its association with various non-communicable diseases[3] and the burden it places on healthcare systems, both financially and operationally.[4]

Clinically, adult obesity is currently managed through a combination of various interventions. These can be dietary, psychotherapeutic, pharmacotherapeutic, surgical or include physical activity.[5] In the UK, these are delivered as part of a four-tiered interconnected system, where Tier 1 services are at a societal level, providing universally available community-based interventions that promote physical activity and healthy eating.[6] Tier 2 comprises lifestyle change and weight management services that are typically delivered over 12 weeks, which can be through a commercial weight management programme.[7] In Tier 3, services typically utilise a pathway lasting 12 months, and incorporate input from various clinical staff groups, including physicians, dieticians, physiotherapists, surgeons, nurses, psychotherapists and others.[7,8] Lastly, Tier 4 primarily comprises bariatric services.[9]

Although systems such as these have been shown to be effective in helping patients achieve weight loss,[10,11] they have not been able to overcome the various factors that contribute toward rising obesity rates.[12] This includes factors relating to perceptions of excess weight,[12] where, for instance, stigma associated with excess weight can hinder engagement with healthy behavior.[13] Additional information on drivers of obesity incidence can be found in the article by Masood *et al*[14] that also forms part of this *Clinical Medicine* special issue.

Rising obesity rates suggest a need to improve the effectiveness and efficacy of current obesity weight management strategies if the burden placed by obesity on individuals and on healthcare systems is to be eased.[12] One way through which medical services can be improved is via the increased adoption and utilisation of information and communication technologies (ICT),[15] where improvements might be gained in effectiveness, usability and value.[16] Utilisation of ICT in this context (ie in supporting the delivery of health services) is referred to as eHealth.[15] Illustrated in Fig 1 is a model of eHealth in obesity care, as set out in this review. Also explored here are current and recent developments in eHealth in relation to obesity care.

Interventions

eHealth products can be used as a facilitator for lifestyle change (ie in diet and/or physical activity) by individuals living with obesity.[17] These eHealth lifestyle change interventions can be delivered using various vehicles, including smartphones, personal computers, tablets or personal digital assistants.[18] However, modern offerings are typically smartphone based (ie as either smartphone apps or smartphone accessible web pages[17,19]) and, in some cases, can be supplemented by other mobile devices, such as heart rate monitors and pedometers.[20] This describes a fast-growing subcategory of eHealth termed 'mobile health' (mHealth).[21]

mHealth lifestyle change interventions seek to achieve their function by enhancing a user's motivation (eg informing them about consequences); helping them prepare and plan their activities (eg through the setting of schedules); and/or by helping users maintain persistence in their goals (eg through feedback on their performance).[22,23]

Although their mechanisms of action are specific, there is no set duration over which mHealth lifestyle change interventions are delivered. Indeed, programs can range anywhere from 9 weeks or less, to 6 or more months.[22,24] These variations could be a

Authors: [A]PhD student, Institute for Health Research, University of Bedfordshire, Luton, UK; [B]professor of public health and integrated care, Institute for Health Research, University of Bedfordshire, Luton, UK; [C]professor of diversity in public health, and director of Institute for Health Research, University of Bedfordshire, Luton, UK

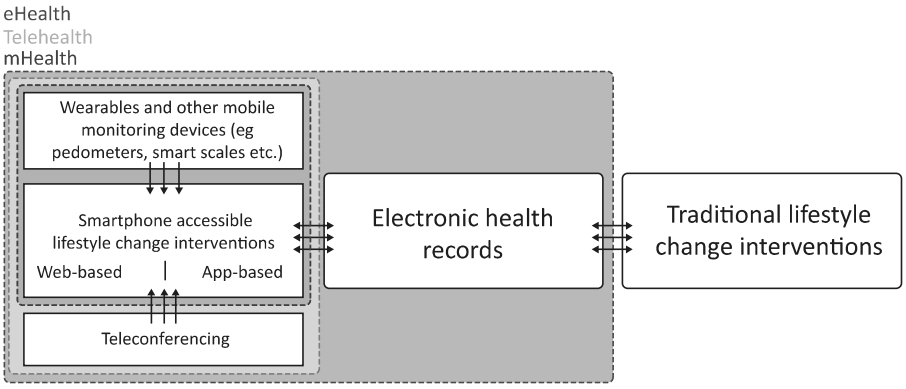

Fig 1. Model describing elements of electronic health (eHealth) as they relate to obesity care. mHealth = mobile health.

reflection of differences in the make-up of the interventions. For instance, programs might vary in their intensity and components delivered.[25]

Effectiveness

However, one area in which there is little variation is in how mHealth lifestyle change programs are evaluated. In lifestyle change intervention evaluation, outcome metrics that have been consistently used include changes in anthropometric values (eg weight), cardiometabolic risk factors (eg blood pressure or haemoglobin (Hb) A1c), and health-related quality of life (HRQoL).[26]

With regards to weight change, in the clinical management of obesity, weight loss of 5% over the duration of a programme is linked with improvements in multiple health conditions associated with obesity.[12,27,28] mHealth lifestyle change interventions have been suggested to not be able to achieve this 5% weight loss result.[20] However, this target refers to a weight-change goal relating to engagement with the broader weight management programme (of which lifestyle change interventions are a part), meaning that mHealth lifestyle change interventions might still be able to contribute toward meaningful weight loss. Indeed, mHealth lifestyle change interventions have shown that they can provide significantly higher weight loss compared with various control interventions,[9,24] as illustrated in Table 1. These effects appear to be consistent across multiple demographic groups, where weight loss facilitated by mHealth interventions has been shown to be unaffected by age or gender.[29] This is encouraging. However, although mHealth lifestyle change interventions can provide significant weight loss, evidence of this is limited to short-term results.[19,23] Furthermore, evidence is also still limited around the effectiveness of these interventions in contributing toward weight loss depending on ethnic group[30] and/or socioeconomic status.[31]

Moving on, the effectiveness of mHealth lifestyle change interventions in the management of obesity has also been studied in other areas, including cardiometabolic health, where they have been found to hold the capacity to facilitate behavioural change needed to significantly improve blood pressure and HbA1c.[32] Furthermore, in that study, improvements in HbA1c were shown to be amplifiable when participants used apps that provided them with real-time feedback from a glucometer, something that might have helped them to better control their insulin dosages.[32]

Lastly, the effectiveness of mHealth lifestyle change interventions has also been studied around HRQoL. For instance, one randomised control trial sought to investigate how effective a smartphone app lifestyle change intervention was in helping reduce chronic pain and improve mobility in older adults with obesity,[33] issues particularly associated with this subgroup of adults.[34] Findings from that study showed improvements in pain intensity as well as physical function as a result of the intervention.[33]

Attrition and adherence

The changes in anthropometrics, cardiometabolic risk factors and HRQoL described above capture a broad range of outcomes in relation to mHealth lifestyle change intervention usage. However, there is little use in an intervention that provides positive clinical outcomes if a large proportion of its users do not adequately use it or proceed to drop it entirely.

This is especially true for lifestyle change interventions. Those living with obesity have described lifestyle change as a turbulent journey, in terms of changes in mood, hope, physical state and physical abilities.[35] Therefore, the ability of an intervention to help a user manage these changes affects not only their adherence to it, but also whether they see it to completion. Indeed, qualitative research on patients' perceptions toward barriers, facilitators and motivators in lifestyle change has suggested that those living with obesity place great importance on tailored interventions that take into account various lifestyle change barriers (eg feeling unmotivated to pursue predefined goals) and facilitators (eg having correct information available to them).[36]

Additionally, adherence and attrition can also be influenced by an individual's relationship with the intervention. For instance, as a user progresses further into a weight-loss programme, the novelty of the tools available to them might wear off.[33] Research suggests that this issue is particularly true for mHealth lifestyle change interventions compared with non-mHealth counterparts.[37] Therefore, to fully capitalise on the potential clinical benefits that these mHealth lifestyle change interventions hold (as described above), only the most effective and highest quality among them should be adopted into clinical practice.

Digital therapeutics

This sentiment can be seen as part of an emerging area of eHealth that has been termed 'Digital Therapeutics' (DTx). DTx

Table 1. Weight loss responses to mobile health (mHealth)

Meta-analysis	Population	Intervention	Control	Month of weight-change measurement	Mean difference in weight change between groups (kg) [95% CI]	Test for overall effect: Z
Park *et al* (2019)[20]	Adults with overweight or obesity (n=2,131)	Mobile healthcare programmes providing health promotion services and health information through mobile phones	No treatment, counselling or provision of educational materials via mobile devices as weight loss intervention	3-4	–2.25 [–3.34 to –1.16]	4.05 (p<0.0001)
				6	–2.66 [–3.94 to –1.38]	4.06 (p<0.0001)
				9	–2.62 [–4.81 to –0.43]	2.35 (p=0.02)
				≥12	–1.23 [–2.25 to –0.21]	2.36 (p=0.02)
Khokhar *et al* (2014)[24]	Adults with overweight or obesity (n=632)	Use of one or more mobile electronic device	Usual care defined as any weight loss intervention that does not use a mobile electronic device	<6	–0.97 [–2.23, 0.30]	N/A
				>6	–1.20 [–3.34, 0.94]	N/A

describes regulated and 'evidence-based therapeutic interventions that are driven by high quality software programs to treat, manage, or prevent a disease or disorder'[38] (ie proven software being used as a medical device). To support the introduction of these therapeutics into routine practice in the UK, the National Institute for Health and Care Excellence published an evidence standards framework for health technologies in 2018, which aims, in part, to assist commissioners and purchasers of health services in evaluating DTx products.[39]

One place that commissioners might be able to identify potential DTx products of interest is the Organisation for the Review of Care and Health Apps (ORCHA) Health App Library (https://appfinder.orcha.co.uk/), through which multiple lifestyle change apps were found, at the time of writing. The ORCHA Health App Library also acts as a repository from which clinicians can make safe recommendations to patients, for both obesity treatment and prevention. The importance of this can be seen in that only 0.05% of commercially available smartphone apps for weight management are developed by officially or professionally recognised bodies and, of those, few are supported by clinical studies.[21] This raises questions about the safety and effectiveness of most of the smartphone apps that the general public have access to.[21] Therefore, in the management of obesity, patients should be directed toward clinically proven mHealth products wherever possible.

Telehealth

Similar to eHealth and mHealth, another umbrella term that is commonly used in this domain is that of 'telehealth'. This describes the virtual use of technology in health practice, including for the delivery of health information, care, as well as in preventative and monitoring activities.[40] Based on this definition, the application of telehealth in obesity care has already been described above in the form of mHealth lifestyle change interventions. However, the potential and utilisation of telehealth in obesity care extends further than that, such as a solution for addressing some of the challenges that exist in the clinical management of obesity.

Issues faced by obesity weight management services include lack of programme adherence, which could result from lack of time, or because of limitations caused by poor wellbeing, factors that might act as barriers to the usage and access to services.[41] This is something that could be partially addressed by telehealth solutions, such as through the remote delivery of lifestyle change coaching sessions,[20] routine appointments or check-ups.

This might be especially important for services in the UK. Here, there is variation in the provision of services at a local and regional level for several reasons.[7,42] Telehealth might be able to mitigate the effects of such disparity. This is supported by research involving patients receiving support from multidisciplinary obesity weight management services, where they were shown to be amenable to the remote delivery of those services.[43]

Digital exclusion

Although service users might be receptive to telehealth, caution in its adoption should be exercised to avoid potentially and inadvertently widening health disparities, because the prevalence of obesity is not the same across all groups. For example, rates of obesity have been shown to be significantly higher in individuals of lower socioeconomic status.[44] How this relates to telehealth in the management of obesity can be seen in research findings gained during the Coronavirus 2019 (COVID-19) pandemic, which saw a marked shift toward telehealth and where telehealth uptake was lower in more deprived areas.[45] Therefore, the adoption

and reliance of telehealth practices in favour of face-to-face counterparts might have the undesirable effect of widening obesity prevalence disparities that exist between different socioeconomic groups.

Furthermore, to fully utilise and realise the benefits of some telehealth vehicles, such as smartphone apps, additional devices, such as smart scales and activity trackers, might be needed.[33] The potential financial burden of purchasing these additional devices might be more easily overcome by those of a higher socioeconomic status, which could also lead to the widening of disparities in obesity prevalence.

Electronic health records

The provision of general patient care is supported by patient records, the digitisation of which is being driven by national policy,[46] and for good reason. Electronic health records (EHRs) hold the potential to improve the coordination of patient care, patient safety, care quality as well as care efficiency.[47] This was illustrated through a case study at an NHS Trust offering obesity weight management services, where EHRs were leveraged to more easily relate body mass index (BMI) to geographic location, allowing for services to be appropriately directed toward where they were most needed.[48]

Furthermore, EHRs can also contribute toward service improvement on a national level. For instance, NHS England commissioned a National Obesity Audit (NOA) to run between 2021 and 2024.[49] The purpose of the NOA is to assess adherence to national guidance, improvements in patient health, ease of patient access and referral to services, as well as weight loss achievement and maintenance.[49] The audit is informed by routinely collected data, including those found in Hospital Episode Statistics, the Community Services Dataset and the General Practice Extraction Service, which covers patient care across various care settings.[49] Although not yet complete at the time of writing, the NOA has already seen publication of some results, specifically those relating to bariatric surgical procedures.[50]

In addition to operational improvements, EHRs might also be used to facilitate the delivery of clinical research[47] and help answer pressing research questions. As previously described here, long-term evidence around the effect of mHealth lifestyle change intervention in relation to weight loss in obesity is currently lacking.[20,24] Insight into these long-term outcomes might be gleaned using the longitudinal qualities of EHR data, through which long-term effects of prescribed DTx products could be studied.

This might be feasible. However, compared with trial data, there are challenges when it comes to extracting outcome data from EHRs, because capturing of outcomes is not inherently designed into EHRs.[51] In any case, there is precedence for similar longitudinal outcome-focused research. EHR data have previously been used to understand changes in BMI in a large population group over the course of 9 years, through utilisation of longitudinal data from the UK Clinical Practice Research Datalink,[52] which are data 'representative of the general UK population health dataset'.[53]

Summary

A model of eHealth in obesity care

This review presents a model of eHealth in obesity care, illustrated in Fig 1. Here, the patient-facing element of eHealth is encapsulated by the term 'telehealth'. A major aspect of telehealth is that of digitally delivered lifestyle change interventions. These are typically smartphone accessible, forming mHealth lifestyle change interventions,[17,19] and can be supplemented by other mobile devices, such as pedometers, for increased functionality.[20] They can also be supplemented by teleconferencing, with clinicians forming an active part of the intervention, such as by delivering coaching remotely.[20] Teleconferencing can also be used independently of mHealth lifestyle change interventions, such as in the remote delivery of patient consultations.

Underlying all of this activity are EHRs, which record and hold patient information as well as outcomes relating to intervention engagement. The relationship between lifestyle change interventions and EHRs is bidirectional. EHRs can also be utilised to better inform the targeting of interventions.[48]

Conclusions

mHealth products and telehealth offer the potential to tackle challenges faced by healthcare systems involved in the management of obesity. This is supported by research demonstrating improvements across outcome measures, such as weight,[20] cardiometabolic risk factors,[32] and HRQoL.[33] Furthermore, telehealth offers the opportunity to increase service coverage.

However, caution should be taken in the wholesale adoption of mHealth and telehealth by health services in the management of obesity because of not only a lack of long-term weight-loss evidence around mHealth interventions, but also the potential that telehealth activities hold in widening already existing health disparities. Therefore, mHealth and telehealth solutions should be offered in parallel with traditional face-to-face and non-technologically based interventions.[54] This should be general practice at least until current gaps in evidence are filled.

In addressing these gaps, and as described here, EHRs hold the capacity to provide missing evidence on the long-term outcomes of mHealth lifestyle change interventions. However, these long-term data might not yet be available in their full capacity, for example, because of the relatively recent advent of mHealth lifestyle change interventions into the clinical management of obesity.

Other evidence gaps identified here relate to the effectiveness of mHealth lifestyle change interventions by socioeconomic status or ethnic group. To help address these gaps, empirical research is forthcoming from the authors of this review. The authors represent a partnership between Bedfordshire Hospitals NHS Foundation Trust, which delivers a specialist obesity weight management service; the University of Bedfordshire, an academic and research partner; and Bedfordshire Hospitals NHS Charity, which fund the research. This partnership will evaluate the implementation and effectiveness of a mHealth physical activity intervention, which has been deployed in the management of adult obesity in a socioeconomically and ethnically diverse clinical setting. ■

Key practice implications

If a service involved in the clinical management of obesity is to offer mHealth lifestyle change interventions and telehealth

solutions, face-to-face and non-technologically based alternatives should also be made available.

To combat the proliferation of non-regulated and potentially unsafe lifestyle change smartphone apps, patients accessing obesity weight management services should be directed toward trusted and clinically proven apps wherever possible.

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Address for correspondence: Mr Bukhosi Raymond Sithole, Faculty of Health and Social Science, Institute for Health Research, University of Bedfordshire, Putteridge Bury campus, Hitchin Road, Luton, LU2 8LE, UK.
Email: bukhosi.sithole@study.beds.ac.uk