

BMJ Open Adolescents' and professionals' experiences of metabolic and bariatric surgery and requirements for preoperative and postoperative support through mHealth: a qualitative study

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ABSTRACT

Objectives This study aimed to explore adolescents' and professionals' incentives and experiences of metabolic and bariatric surgery (MBS) and to explore perceived needs and requirements for preoperative and postoperative support through an mHealth intervention to improve long-term healthy lifestyle behaviour and health outcomes.

Design An inductive qualitative study using in-depth semistructured interviews.

Setting Three hospital-based specialist paediatric obesity treatment units in Sweden.

Participants A total of 18 participants (14 women and 4 men). Nine adolescents aged between 17 and 22 years who had undergone or were about to undergo surgery, and nine professionals, including researchers and clinicians working in various professional roles such as physiotherapist, dietician, nurse, psychologist, physician and pedagogue.

Results Both informant groups of participants highlighted that undergoing MBS is a complex process, and hence actions are required on several levels to optimise the positive, long-term effects of surgery. Efficient communication between the healthcare professionals and adolescents was considered crucial and a key success factor. Informants acknowledged the need for additional support that relates to psychosocial well-being and mental health in order to understand, form and accept new behaviours and identity. An mHealth intervention should be seen as complementary to physical appointments, and informants acknowledged that an app could be a way of improving access to healthcare, and a useful tool to allow for individually tailored and easily available support.

Conclusions The findings address the importance of a personal encounter and a need for additional support that relates to psychosocial well-being, mental health and healthy lifestyle behaviour. These findings should be incorporated into future research concerning mHealth interventions in MBS during adolescence.

INTRODUCTION

Obesity has emerged as one of the most serious public health concerns.^{1–3} The worldwide prevalence of overweight and obesity among children and adolescents has

STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ The inclusion of both adolescents and professionals from all centres offering metabolic and bariatric surgery in Sweden contributed to broad variation in the studied phenomena.
- ⇒ The qualitative design was valuable for achieving in-depth insights into informants' own perspectives and experiences.
- ⇒ Data were collected, analysed and presented in accordance with the steps following thematic analysis to facilitate a rigorous and systematic process to verify trustworthiness.
- ⇒ Informants were recruited purposefully, which might lead to the study sample differing from the broader population.
- ⇒ The transferability of the present results to other units may vary, depending on how the care is organised and financed, but the results are considered to be relevant and applicable to the development of mHealth interventions in similar settings.

increased dramatically over the past three decades and is now reported to affect just over 18% and 6.8% have developed obesity.¹ In Sweden, the prevalence of overweight and obesity is reported to be 20%–25%. Moreover, approximately 5%, 80 000 Swedish children, have developed obesity.^{4 5} Severe obesity in adolescence, defined by the American Academy of Pediatrics as the ages of 11–21 years,⁶ is associated with an increased risk of several non-communicable chronic diseases, mental illness, as well as psychosocial complications, impaired quality of life and reduced life expectancy.^{7–9} Moreover, attention deficit/hyperactivity disorder (ADHD) has been reported to be overrepresented in youth with obesity.^{10 11}

Lifestyle behaviour interventions are the cornerstones of treatment for adolescents with obesity,^{12 13} but are insufficient alone for



adolescents with severe obesity.^{14 15} Pharmacological therapies have proven to be effective¹⁶ but more research is needed concerning adolescents with severe obesity. Metabolic and bariatric surgery (MBS) provides effective treatment for severe obesity and related comorbid diseases, and is increasingly recommended as a treatment option.^{17 18} Surgery is, however, restricted to patients who fulfil certain criteria: age ≥ 15 years and body mass index (BMI) ≥ 35 kg/m² with comorbidities or BMI ≥ 40 kg/m² for patients without comorbidities in accordance with international guidelines.^{19 20} In Sweden, the number of MBS carried out on adolescents (between 15 and 18 years) have varied between 29 and 66 MBS/year since 2010. During the pandemic there was a decrease resulting in a decline in the numbers of MBS, however, in 2021, 33 MBS were carried out.²¹ Previous studies evaluating the effects of MBS in adolescents during the short term to medium term have shown good safety, substantial weight loss and improvements in obesity-related metabolic comorbidities, and acceptable surgical and nutritional adverse events.^{18 22 23} Studies show, however, that adolescents who have undergone MBS have insufficient postoperative adherence to lifestyle behaviour recommendations and insufficient compliance with necessary supplementation of vitamin and minerals.¹⁷ A gap has emerged between postoperative treatment guidelines and observed behaviour after surgery. This gap may confer a risk of negative outcomes such as weight regain, nutritional deficiencies, mental health problems and unhealthy lifestyle.^{17 18 24 25} Hence, there is a need for support to improve long-term outcomes after surgery for this vulnerable group of adolescents.

mHealth, defined by the WHO as the use of and capitalisation on a mobile phone's core utility of voice and short messaging service and apps,²⁶ is expanding rapidly and mobile apps are particularly useful for reaching a young population. Systematic reviews show that mHealth interventions offer exciting possibilities for promoting healthy lifestyle behaviours²⁷⁻²⁹ and mental health³⁰ among youths. Paediatric weight management using mHealth is an emerging field. However, the studies in mHealth have targeted patients that have not undergone bariatric surgery.³¹ In addition, little is known about how to best provide the necessary support and monitor the required preoperative and postoperative behaviour changes after MBS. Using qualitative methods and involving the target groups when developing apps has been acknowledged as a good strategy to improve efficacy and success.³² Understanding the patient's motives for undergoing MBS may be crucial in order to identify keys to provide support and encourage behaviour changes. Further, recognising the patient's unmet needs seem essential to motivate behaviour.^{31 33}

The objective of this study was to explore adolescents' and professionals' incentives and experiences of MBS and to explore perceived needs and requirements for preoperative and postoperative support through an mHealth intervention to improve long-term healthy lifestyle behaviour and health outcomes.

METHODS

This is an inductive qualitative study³⁴ using in-depth semistructured interviews. Transcribed data were analysed using thematic analysis. The Consolidated Criteria for Reporting Qualitative Research (COREQ) 32-item checklist³⁵ was applied.

Setting and sample

A study includes encompassing three Swedish university hospital-based specialist paediatric obesity treatment units offering MBS. The units were chosen by convenience sampling through established personal contacts. Inclusion criteria were: adolescents aged 16–21, undergoing or having recently undergone (within the last 4 years) MBS, able to communicate in Swedish and willing to participate in an interview. In addition, inclusion criteria for professionals were: experience of private, clinical practice and/or research related to MBS, able to communicate in Swedish, and willing to participate in an interview. Purposive sampling³⁴ was used to recruit adolescents who varied in age and gender, and in terms of whether they had undergone or should undergo surgery. The purpose sample of professionals was applied to obtain a variety of occupational and professional experience and expertise. Fourteen adolescents were invited to participate in interviews. In total, nine adolescents (six females and three males), agreed to participate, while five declined to take part due to a lack of time. The mean age was 19.1 years. Six adolescents had undergone surgery at the time of the interviews and three were waiting for surgery. Eleven professionals were invited. One professional declined to participate due to parental leave, and one due to other job assignments owing to the COVID-19 pandemic. In total, nine professionals, (eight women and one man) participated, including researchers and clinicians working in various professional roles such as physiotherapist, dietician, nurse, psychologist, physician and pedagogue (table 1).

Study procedure

Eligible informants were recruited by team members through telephone calls and/or oral information during meetings at the units. Informants who expressed an interest in participating registered their interest by contacting a team member, who sent eligible informants' telephone numbers or email addresses to the first author (UM). All informants were emailed an information sheet detailing the purpose of the research project. No prior relationship existed between UM and the informants before the study commence.

Patient and public involvement

Patients and professionals were deeply involved in this research through in-depths interviews which elicited informants' experiences, concerns and preferences. Their shared knowledge will contribute to this research area by the development of an mHealth intervention as a next step within this research project.

Table 1 Sample characteristics

Informant	Gender
Adolescent	F
Adolescent	M
Adolescent	M
Adolescent	M
Adolescent	F
Physiotherapist	F
Dietician	F
Nurse	F
Physician	F
Physician	M
Psychologist	F
Nurse	F
Physician	F
Pedagogue	F

F, female; M, male.

Data collection and analysis

Two interview guides targeting professionals and adolescents were developed by the authors, based on clinical experiences and relevant literature. Interview guides (online supplemental appendices 1 and 2) were framed around the following three domains: (1) obesity, health and lifestyle, (2) MBS and behaviour change and (3) support through digital solutions. Informants were given an opportunity at the end of the interview to provide additional information. The interview guides were tested in a pilot study. Minor revisions were made, and the pilot interview was not included in the analysis.

Data collection included in-depth interviews, conducted by a female researcher (UM) with a PhD degree and training and experience in qualitative methodology. All interviews were conducted between 23 March 2021 and 1 September 2021. Each informant was interviewed individually one time. Due to COVID-19 restrictions across Sweden, all interviews were performed by telephone or video call (Zoom) according to the informants' preference. At the beginning of each interview session, informants were informed about the aim of the study and the role of the moderator (UM). Informants were told that UM had previously been involved in studies in the field of mHealth interventions targeting young adults, but had limited knowledge of paediatric obesity treatment, and hence had a partial understanding of the phenomenon being studied. To ensure authenticity, informants were informed that the interviewer had no association with the clinical units. During the consent process at the start of

the interview, issues regarding anonymity and confidentiality were discussed and all informants provided written consent. A total of 13 interviews were conducted using Zoom and 5 interviews were conducted by telephone. The interviews lasted between 41 and 74 min and were audiorecorded. Field notes were taken during all interviews, and reflective notes were written immediately after each interview.

The interviews (18 in total) were professionally transcribed verbatim in an orthographic manner, omitting minor speech hesitations to facilitate readability.³⁴ Potentially identifying details were changed or removed, and all informants were given pseudonyms to ensure confidentiality and anonymity. Data were analysed using thematic analysis, as defined by Braun and Clarke.³⁶ Initially, agreement was verified between transcriptions and audio recordings. The systematic thematic analyses followed a linear, yet iterative and reflective process: (1) familiarisation with the data; (2) identifying codes; (3) searching for patterns and interconnections; (4) mapping and building themes; and (5) reviewing themes.³⁶ The first phase of the methodological process included reading the transcripts to ensure familiarity with the data, and noting overall impressions. Second, initial descriptive codes were identified during an iterative process in which transcripts were read and reread. Third, the codes were sorted into coding patterns, which allowed for the development of analytic themes from the data in the fourth step. In the fifth phase, the themes were reviewed, revised, refined and named once they were distinctive and coherent. Microsoft Excel was used to organise the data. Coding, which focused on both semantic and latent meanings, was undertaken by UM, and discussed with MÖ. Theme development was led by UM, and was reviewed by the other authors.

RESULTS

This study aimed to explore adolescents' and professionals' incentives and experiences of MBS and to explore perceived needs and requirements for preoperative and postoperative support through an mHealth intervention to improve long-term healthy lifestyle behaviour and health outcomes.

The results from the thematic analysis are presented under the following four themes: Incentives for undergoing surgery—living a normal life, Key success factors—communication and realistic expectations, Challenges and development potential—improving mental health and access to care, and mHealth in bariatric surgery treatment—opportunities and suggestions (box 1).

Representative quotations from the transcribed text are presented to illustrate the results (boxes 2–5). “//” denotes that the quotation has been shortened due to lengthy pronouncements. The designation after each quotation represents the interviewee's identification number, followed by the label ‘adolescent’ or ‘professional’.

Box 1 Themes and examples of representative quotes**Incentives for undergoing surgery: living a Normal Life**

'So I'd gradually got past this taboo [of surgery], and knew that the benefits were great and that I needed help.//Before, I thought: 'This is my fault. I should blame myself for weighing so much.' (adolescent 2)
'But I think that one driving force that we often forget, that's the experience of having a big body. This state of feeling so big all the time. Being able to walk up stairs, fitting into a car, being able to learn to drive, fitting into an airplane seat. Many adolescents have a kind of longing to be normal, I think.' (professional 8)

Key success factors: communication and realistic expectations

'The encounters, that was the most important thing, they saw me as a person, acknowledged, they understood. But mostly that they listened. It felt like a relief, yes, it was nice. I became, like, a little bit less of a failure in that respect. Yes, it meant that I was better prepared.' (adolescent 5)

'I think it's extremely important that we talk with patients in advance about expectations for the operation, that they have realistic expectations, //that the operation is a tool, but not the solution. Expectations affect how they experience the outcome from surgery.' (professional 1)

Challenges and development potential: improving mental health and access to care

'I would of course have liked that it was easier to come in contact [healthcare]' (adolescent 3)

'Yes, but that's the million-dollar question in all the work involving lifestyle habits. What is it that creates motivation?' (professional 7)

mHealth in bariatric surgery treatment: opportunities and suggestions

'Search functions or lists of contents. Yes, but the kind of common questions that you usually arise, and maybe there are answers so you don't have to call.// If I wonder about hair loss, for example, then I can search for hair loss and see all the entries about that.' (adolescent 9)

'I think it's an excellent idea, as long as it's in addition, that it doesn't replace physical appointments.//They [(adolescents)] don't have the same way as us to look for information or contacting people.//And I think it's very important that we offer these ways of getting in touch, that they're used to//it will strengthen their self-confidence, in that sense that they are capable to understand the information.' (professional 4)

Incentives for undergoing surgery: living a normal life

Both informant groups reflected on an awareness that, for many, undergoing MBS is a last resort following an insight of being unable to lose weight through other measures. This need for surgery was described as being strongly associated with feelings of failure, stigma and taboo. Adolescents described how medical knowledge about the causes of obesity has been crucial for making the decision on undergo surgery, and in particular for finally starting to let go of the shame that had been involved with obesity. Hence, the individuals' incentives for undergoing surgery were underlined as being of decisive importance.

The individuals' own driving forces appear to be particularly important in relation to behaviour changes. Both professionals and adolescents reported that a strong inner motivation is crucial in order to take responsibility for one's own situation and to follow recommendations

Box 2 Incentives for undergoing surgery: living a normal life

'So I'd gradually got past this taboo [of surgery], and knew that the benefits were great and that I needed help.//Before, I thought: 'This is my fault. I should blame myself for weighing so much.' (adolescent 2)

'If you are motivated, that is your own driving force. And then it is easier for you to do as you are advised to do, to take that responsibility to change your life, so to speak.' (adolescent 3)

'But I think that one driving force that we often forget, that's the experience of having a big body. This state of feeling so big all the time. Being able to walk up stairs, fitting into a car, being able to learn to drive, fitting into an airplane seat. Many adolescents have a kind of longing to be normal, I think.' (professional 8)

'People look at you on the bus and you don't want to swim, you don't want to go to the beach.//I look forward to buying clothes, being out and playing with my siblings, being able to exercise, tie my shoes, and bend down, being with friends at school and going shopping, but I can't do it now because I get out of breath. And I think it's embarrassing, so I prefer to stay at home.' (adolescent 9)

for dietary intake and supplements, as well as physical activity, which was stressed as being central in order to optimise the chances of achieving a long-term effect from the surgery. Other driving forces that emerge as being particularly important in the interviews with adolescents were being 'normal' in terms of being able to perform activities that are normal to others, such as walking, playing, dining and going shopping with friends.

A majority of the adolescents emphasised the importance of achieving better health and quality of life, and underscored that weight loss or enhanced appearance were incidental. Adolescents also described that a strong incentive is to avert the consequences of obesity, such as being ashamed of their own body, experiencing difficulties

Box 3 Key success factors: communication and realistic expectations

'I would say that it [the encounter] is an important success factor. That you succeed with building a genuine relationship where they connect with some of us and bond a bit, and that you stay in contact.//Being almost over-explicit with non-judgmental treatment.//So it's important to show that we know that this is hard, and that you haven't ended up in this situation because you've done something wrong.' (professional 6)

'The encounters, that was the most important thing, they saw me as a person, acknowledged, they understood. But mostly that they listened. It felt like a relief, yes, it was nice. I became, like, a little bit less of a failure in that respect. Yes, it meant that I was better prepared.' (adolescent 5)

'What works well, I think, is when they come to us continuously. And you form this alliance, that they feel that 'I'm on your side.//Then it's more 'What should we do now to ensure that this will work?' When you've got there, and you don't always get there, but if you get there then I usually think that it can be done, that they manage to make changes.' (professional 3)

'I think it's extremely important that we talk with patients in advance about expectations for the operation, that they have realistic expectations, //that the operation is a tool, but not the solution. Expectations affect how they experience the outcome of surgery.' (professional 1)

Box 4 Challenges and development potential: improving mental health and access to care

'Yes, the thing with bariatric surgery, strangely enough, is that even if you lose a lot of weight and get rid of comorbidities, diabetes and so on, the mental quality of life isn't usually as good as we had hoped. At least not if you look at it over a slightly longer period of time. Here, we need to improve our efforts.' (professional 5)

'It's the mental aspect that's the most difficult, where the vast majority need more support than I think we can offer.//They're adolescents, there's a lot going on in their lives.' (professional 3)

'Yes, but that's the million-dollar question in all the work involving life-style habits. What is it that creates motivation?' (professional 7)

'Too many young people feel that healthcare as a system feels quite incomprehensible. And hard to navigate. And, just, how do you even get in contact with them [healthcare staff], and what do you even say when you get hold of someone?//We need to improve access.' (professional 4)

'I would of course have liked that it was easier to come in contact [healthcare]' (adolescent 3)

'And [after surgery] they no longer want to define themselves as a patient, or as an obesity patient, or worse, or as someone who needs care, or in the worst case as the kind of person who needs to take their medication and attend their repeat appointments. So those are the challenges.' (professional 8)

Box 5 Mhealth in bariatric surgery treatment: opportunities and suggestions

'I think it's an excellent idea, as long as it's in addition, that it doesn't replace physical appointments.//They [adolescents] don't have the same way as us to look for information or contacting people.//And I think it's very important that we offer these ways of getting in touch, that they're used to//it will strengthen their self-confidence, in that sense that they are capable to understand the information.' (professional 4)

'Yes, I think that we have to think about the fact that we should provide information in several different ways.//There's an overrepresentation of for example neuropsychiatric disabilities, so that means that reading a body of text is quite a big challenge for many of them.//There should be different information modalities.' (professional 7)

'Search functions or lists of contents. Yes, but the kind of common questions that you usually arise, and maybe there are answers so you don't have to call.// If I wonder about hair loss, for example, then I can search for hair loss and see all the entries about that.' (adolescent 9)

'//so if you can build in a chat function I would have used it, because I know it can be a bit hard to reach on phone.//I don't think people really need to spend, like, fifteen minutes talking or, like, an hour sitting with someone. Often, it's quick things that you think of, and then it's a case of quick answers.' (adolescent 3)

'Being able to chat and being able to read about what other people have done and what's worked for them.// You have to be able to see other people's mistakes, and so you don't just believe that you're the only one who struggle.//Yes, so that you know you're not alone.' (adolescent 1)

'That you can log in and see your changes.//That you see things are moving ahead and going in the right direction. For example, that you're losing weight and you're exercising.//And motivational text that 'Things are going well for you', and 'You're doing great', and so on. It might feel a little banal that you would get that, but I think it's really important that you get some kind of credit for keeping at it and trying.' (adolescent 8)

with breathing and social isolation. Some reported that their obesity had led to anxiety, depression and suicidal ideation. As a result, they emphasised improved mental health as a driving force. The professionals claimed that young patients' incentives for surgery are not primarily better health, but are rather linked to a longing to be normal, and not being trapped in a large body (box 2).

Key success factors: communication and realistic expectations

The data highlighted that undergoing MBS is a complex process, and that actions are therefore required on several levels to optimise the positive, long-term effects of surgery. Efficient communication between healthcare professionals and adolescents was considered crucial and a key success factor. Early and continuous contact was described as being important from both informants' perspectives. Adolescents described good communication as a personal encounter in which professionals are available and they are seen as a person, not just as a patient with obesity.

Adolescents described how good experiences in encounters with professionals, such as being listened to, and being treated with respect and friendliness influenced their experiences of being acknowledged, as well as feeling confident, making them better prepared for undergoing surgery. Efficient communication also seems to be significant for reducing the feeling of continued failure and shame, which several of the adolescents explained has dominated their lives.

The professionals described how young adults tend to have a short-term perspective, and that they risk having unrealistic expectations that an operation will solve all life's difficulties and challenges. In this respect, professionals emphasised the importance of a dialogue regarding expectations about what is expected to be achieved. Some professionals claimed that the patient's preoperative expectations have an effect on the perceived self-reported postoperative outcomes. Forming an alliance including components such as genuine relationships, non-judgemental treatment, understanding and mutual trust was stressed as important by the professionals (box 3).

Challenges and development potential: improving mental health and access to care

Remaining challenges within MBS and a need for improvements were reported in all interviews. Aspects relating to medical treatment and complications were barely mentioned. Rather, both groups of informants emphasised the need to offer support that relates to psychosocial well-being, mental health and quality of life. The professionals' perspectives included preventing 'failure', which was described as a major challenge since weight gain leads to self-blame and prevents adolescents from seeking care. Adolescents acknowledged the need for additional psychosocial support to deal with the fear of weight gain, and requested more reinforcement to

understand, form and accept their new behaviours, roles and identity. Helping young patients to find the motivation to make adequate lifestyle behavioural changes, such as following recommendations for healthy eating and physical activity as well as adhering to prescribed dietary supplements to achieve the optimal effect of the surgery, was seen by the professionals as a continuous challenge. Professionals also emphasised the importance of further efforts to avoid experiences of loneliness and to facilitate access to care. Further, professionals shared their thoughts that the care system is often seen by adolescents as incomprehensible and difficult to navigate.

The results revealed that adolescents tend to have modest healthcare consumption after surgery, but low adherence to follow-up. Hence, professionals emphasised the need to improve procedures to encourage young patients to seek healthcare when needed and to attend follow-up visits. In this respect, professionals stressed that attention must be paid to this particular group of patients in order to adopt interventions according to young patients' specific needs in relation to their current life situation. Adolescents expressed a lack of clarity about how to receive postoperative support. They underlined a need for direct access to healthcare in order to receive help at the right time when they themselves feel that they need support (box 4).

mhealth in bariatric surgery treatment: opportunities and suggestions

Regarding mHealth support, both informant groups stressed that an app should be seen as complementary to physical appointments, rather than replacing them. Furthermore, in terms of the advantages, adolescents and professionals acknowledged that an app could be a way of improving access to healthcare, and a useful tool to allow for individually tailored support to be easily available when needed. Since there is a lot of information and many appointments to keep track of in relation to undergoing bariatric surgery, an app was advocated as a potential tool to ensure better access to information.

Professionals highlighted the importance of transparency and a clear and easily accessible flow of information to support patients' self-confidence. They emphasised the need to consider prevalent neuropsychiatric diagnoses when designing the app. Adolescents agreed that support should be brief and easy to understand, and that information needs to be provided in different ways, using written form, images and videos. The adolescents gave suggestions for a variety of features and content. Both informant groups proposed a structure in the form of a search function, with a bank of frequently asked questions, combined in different categories of common question areas, such as eating behaviour, eating patterns and dumping, physical activity including level and amount, concerns about hair loss and excess skin. Adolescents expressed a need for real-time physiological feedback in the form of encouragement and confirmation, as well as historical

behavioural pattern data to measure their improvement in relation to aspects such as diet and physical activity.

Opportunities to set goals, track progress and generate real time alerts were highlighted by both groups. Professionals and adolescents expressed a need for treatment guidelines and support to follow recommendations for dietary intake, alcohol and physical activity, as well as social and emotional support to help encourage and manage such behaviour changes. A chat function with healthcare staff at the treating clinic was suggested by the adolescents in order to improve access to healthcare, offer rapid support and guidance, and get answers to simple common questions quickly. Adolescents also emphasised the need to create social connectivity within the app to get in touch with others who have been in a similar situation. Both professionals and adolescents proposed a reminder function for taking dietary supplements and drinking water (box 5).

DISCUSSION

This qualitative study explores adolescents' and professionals' experiences of undergoing or providing MBS, as well as their requirements for preoperative and postoperative digital support. The main findings emphasise the importance of individualised, flexible, and accessible preoperative and postoperative care with a specific focus on the need for psychological support when required. Furthermore, the results revealed that the development of an mHealth intervention could improve the process of providing brief, easily accessible information, support and advice.

Our data show that adolescents considered living in a larger body to be limiting and related to anxiety and social isolation. A wish to be 'normal' in terms of being able to perform normal activities, such as tying shoes and going shopping, was emphasised as an incentive for undergoing surgery. This is in line with previous research, in which being normal has been found to be an important motivating factor when adolescents opt for bariatric surgery.³⁷ Furthermore, adolescents in this study underlined the postsurgical positive effects on their physical functioning. This finding was mirrored by healthcare professionals claiming that being able to do physical activities is overlooked as an important motivating factor for surgical treatment. Previous research investigating adolescents with severe obesity undergoing MBS¹⁸ shows that physical functioning improves postsurgery, which again emphasises the importance of defining the individuals' incentives for undergoing surgery. Two key success factors were efficient communication, meaning early and continuous contact, and a respectful and compassionate alliance between the responsible healthcare professionals and the patient. Furthermore, both informant groups underscored the importance of not perpetuating weight stigmatisation and a need to communicate realistic expectations prior to intervention. It is well known that weight-related discussions with adolescents can be sensitive,

and professionals should hence always use language and expressions that are less sensitive for this group of patients with obesity.^{38 39}

This study provides important insights into remaining challenges and the need for improvements in care for adolescents undergoing MBS. Informants emphasised a need for psychosocial support, especially to deal with fear of relapse, but also to form new healthy lifestyle behaviours, roles and identity. Our results underlined the necessity of providing clear information regarding the effects of bariatric surgery on mental health. There is growing evidence that symptoms of depression, anxiety and self-esteem issues improve during the first year after MBS.³⁹ However, in the study by Järholm *et al*, 14% of adolescents who had undergone MBS reported suicidal ideation and one in five reported substantial mental health problems at their 2-year follow-up.⁴⁰ Furthermore, it has been reported that 5 years postsurgery mental health was not improved when compared with baseline in adolescents who had undergone surgery, regardless of substantial weight loss. The fact that mental health problems may persist postsurgery²⁴ mandates individualised long-term treatment with access to an experienced psychologist for support when needed. In a recent Swedish study, two-thirds of adolescents with severe obesity seeking surgical weight loss treatment had mental health problems (self-reported or reported by parents) and 52% had ADHD/ASD (autism spectrum disorder) symptoms.⁴¹ Ideally, if possible, postoperative treatment should include support to handle challenges and feelings related to the behaviour change and weight loss as well as taking into account potential mental health problems already present before surgery.

A consistent finding across interviews was that informants believed that an mHealth intervention could increase their access to healthcare providers when the need arises. The possibility of a chat and new ways of sharing information were considered to improve the post-surgical therapeutic relationship by increasing contact with healthcare professionals. The informants considered that an mHealth intervention used to improve self-monitoring of behaviour and goal setting could be a possible way to improve presurgical and postsurgical treatment, including lifestyle behaviours. These findings are in accordance with previous research targeting adults with overweight and obesity when investigating the possibilities of integrating mHealth interventions to improve postsurgical follow-ups.⁴² The development of a specific mHealth intervention for adolescents undergoing MBS was perceived to support adherence to a long-term plan, especially since many patients have neuropsychiatric diagnoses.⁴¹ Our study highlights the need for adaptation to the individual patients' needs regarding how information is offered. Informants proposed an integration of brief information and easily accessible support in written form, along with images and videos. A systematic review by Jeminiwa *et al*⁴³ aiming to assess adolescents' preferred mobile app features showed similar results; that adolescents

prefer mHealth apps that are customisable and provide support and data via simplified graphs and different information routes.

A qualitative design³⁴ was valuable for achieving in-depth insights into informants' own perspectives. The inclusion of both adolescents and professionals representing different ages, genders, occupations and experiences, contributed to broad variation in the studied phenomena. Quality criteria for qualitative research are dependability, credibility and transferability, as defined by Lincoln *et al*.⁴⁴ In this study, several procedures were taken to fulfil these accepted criteria in order to verify trustworthiness. To achieve dependability, the research process was clearly described and documented. The COREQ checklist³⁵ was carefully followed to facilitate the reporting of the process and to create a clear audit trail. Data were analysed in accordance with the steps following thematic analysis³⁶ to facilitate a rigorous and systematic process, thus supporting the study's trustworthiness. Informants were recruited purposely, which might lead to the study sample differing from the broader population. Hence, a limitation of this study is the relatively small sample. The adolescent sample contained only three men, which partly reflects the gender balance of the population accessing surgery. The sample size was based on data saturation⁴⁵ and accordingly, data collection was finalised when the data reached satisfactory depth and complexity to answer the research questions with sufficient confidence. Dependability was further enhanced by the use of an interview guide and fieldnotes were taken during all interviews. The interviews were rich in data and contained a variety of both positive and negative aspects, which enhanced the credibility^{34 46} of the results. To increase credibility during analysis, reflexive notes were taken throughout the coding process, and were used as auditable verification to support the trustworthiness of the study. Moreover, researcher triangulation³⁴ was used during the latter part of the analysis. In addition, representative quotations from the transcribed texts are presented to provide transparency.⁴⁶ All quotations were accompanied by a unique identifier to demonstrate that various participants were represented across the results. The transferability³⁴ of the present results to other units in Sweden may vary, depending on how the care is organised and financed. However, we consider the results to be relevant and applicable to the development of mHealth interventions in similar settings.

CONCLUSIONS

This study presents important understandings regarding incentives for undergoing MBS, successful aspects of surgical treatment for adolescents, what can be improved and how an mHealth intervention could be developed to provide additional support. Adolescents need for surgery was strongly associated with feelings of failure, stigma and taboo. Both adolescents and professionals highlighted the value of forming an alliance including components



such as genuine relationships, non-judgemental treatment, understanding and mutual trust for reducing the feeling of failure and for being better prepared for undergoing surgery. The study highlights the importance of offering support that relates to psychosocial well-being, mental health and healthy lifestyle behaviour. Support through mHealth was acknowledged by adolescents and professionals as a way of improving access to healthcare, and as a useful tool to allow for easy access to individually tailored care when the need arises. Future research regarding mHealth interventions should take these results into account when developing digital support.

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Ethics approval This study involves human participants and was approved by the Ethical Review Agency, Sweden, dnr 2020-07247. Participants gave informed consent to participate in the study before taking part.

Provenance and peer review Not commissioned; externally peer reviewed.

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REFERENCES

- World Health Organization. Adolescent health. Available: https://www.who.int/health-topics/adolescent-health/#tab=tab_1
- NCD Risk Factor Collaboration (NCD-RisC). Worldwide trends in body-mass index, underweight, overweight, and obesity from 1975 to 2016: a pooled analysis of 2416 population-based measurement studies in 128.9 million children, adolescents, and adults. *Lancet* 2017;390:2627–42.
- Ng M, Fleming T, Robinson M, *et al*. Global, regional, and national prevalence of overweight and obesity in children and adults during 1980–2013: a systematic analysis for the global burden of disease study 2013. *Lancet* 2014;384:766–81.
- Public Health Agency of Sweden. *Overweight and obesity among school children 11–15-Year-Old continues to increase, 2020*.
- Bygdell M, Céline L, Lilja L, *et al*. Prevalence of overweight and obesity from 5 to 19 years of age in Gothenburg, Sweden. *Acta Paediatr* 2021;110:3349–55.
- Hagan JF, Shaw JS, Duncan PM, eds. *Bright futures guidelines for health supervision of infants, children, and adolescents*. 4th ed. American Academy of Pediatrics, 2017.
- Reilly JJ, Kelly J. Long-Term impact of overweight and obesity in childhood and adolescence on morbidity and premature mortality in adulthood: systematic review. *Int J Obes* 2011;35:891–8.
- Lindberg L, Danielsson P, Persson M, *et al*. Association of childhood obesity with risk of early all-cause and cause-specific mortality: a Swedish prospective cohort study. *PLoS Med* 2020;17:e1003078.
- Lindberg L, Hagman E, Danielsson P, *et al*. Anxiety and depression in children and adolescents with obesity: a nationwide study in Sweden. *BMC Med* 2020;18:30.
- Cortese S, Moreira-Maia CR, St. Fleur D, *et al*. Association between ADHD and obesity: a systematic review and meta-analysis. *AJP* 2016;173:34–43.
- Wentz E, Björk A, Dahlgren J. Neurodevelopmental disorders are highly over-represented in children with obesity: a cross-sectional study. *Obesity* 2017;25:178–84.
- Al-Khudairy L, Loveman E, Colquitt JL, *et al*. Diet, physical activity and behavioural interventions for the treatment of overweight or obese adolescents aged 12 to 17 years. *Cochrane Database Syst Rev* 2017;6:CD012691.
- Cardel MI, Jastreboff AM, Kelly AS. Treatment of adolescent obesity in 2020. *JAMA* 2019;322:1707.
- Danielsson P, Kowalski J, Ekblom Örnar, *et al*. Response of severely obese children and adolescents to behavioral treatment. *Arch Pediatr Adolesc Med* 2012;166:1103.
- Ells LJ, Rees K, Brown T, *et al*. Interventions for treating children and adolescents with overweight and obesity: an overview of Cochrane reviews. *Int J Obes* 2018;42:1823–33.
- Kelly AS, Auerbach P, Barrientos-Perez M, *et al*. A randomized, controlled trial of liraglutide for adolescents with obesity. *N Engl J Med* 2020;382:2117–28.
- Paulus GF, de Vaan LEG, Verdam FJ, *et al*. Bariatric surgery in morbidly obese adolescents: a systematic review and meta-analysis. *Obes Surg* 2015;25:860–78.
- Olbers T, Beamish AJ, Gronowitz E, *et al*. Laparoscopic Roux-en-Y gastric bypass in adolescents with severe obesity (amos): a prospective, 5-year, Swedish nationwide study. *Lancet Diabetes Endocrinol* 2017;5:174–83.
- National Institute for Health and Care Excellence. Obesity: identification, assessment and management. clinical guideline, 2014. Available: <https://www.nice.org.uk/guidance/cg189>
- Janson A, Järnholm K, Sjögren L, *et al*. Metabolic and Bariatric Surgery in adolescents - for whom, when, and how? *Horm Res Paediatr* 2022:1–11.
- Ottosson J, Stenberg E, Näslund I. Surgical statistics and early complications. SOREG Scandinavian obesity surgery registry.
- Treadwell JR, Sun F, Schoelles K. Systematic review and meta-analysis of bariatric surgery for pediatric obesity. *Ann Surg* 2008;248:763–76.
- Inge TH, Courcoulas AP, Jenkins TM, *et al*. Weight loss and health status 3 years after bariatric surgery in adolescents. *N Engl J Med Overseas Ed* 2016;374:113–23.

- 24 Järholm K, Bruze G, Peltonen M, *et al.* 5-Year mental health and eating pattern outcomes following bariatric surgery in adolescents: a prospective cohort study. *Lancet Child Adolesc Health* 2020;4:210–9.
- 25 Bergh I, Lundin Kvalem I, Rissstad H, *et al.* Preoperative predictors of adherence to dietary and physical activity recommendations and weight loss one year after surgery. *Surg Obes Relat Dis* 2016;12:910–8.
- 26 WHO. mHealth: new horizons for health through mobile technologies. Available: http://www.who.int/goe/publications/goe_mhealth_web.pdf
- 27 Badawy SM, Kuhns LM. Texting and mobile phone APP interventions for improving adherence to preventive behavior in adolescents: a systematic review. *JMIR Mhealth Uhealth* 2017;5:e50.
- 28 Loescher LJ, Rains SA, Kramer SS, *et al.* A systematic review of interventions to enhance healthy lifestyle behaviors in adolescents delivered via mobile phone text messaging. *Am J Health Promot* 2018;32:865–79.
- 29 Celik R, Toruner EK. The effect of technology-based programmes on changing health behaviours of adolescents: systematic review. *Compr Child Adolesc Nurs* 2020;43:92–110.
- 30 Donker T, Petrie K, Proudfoot J, *et al.* Smartphones for smarter delivery of mental health programs: a systematic review. *J Med Internet Res* 2013;15:e247.
- 31 Tully L, Burls A, Sorensen J, *et al.* Mobile health for pediatric weight management: systematic scoping review. *JMIR Mhealth Uhealth* 2020;8:e16214.
- 32 Abroms LC, Whittaker R, Free C, *et al.* Developing and Pretesting a text messaging program for health behavior change: recommended steps. *JMIR Mhealth Uhealth* 2015;3:e107.
- 33 Tong HL, Quiroz JC, Kocaballi AB, *et al.* Personalized mobile technologies for lifestyle behavior change: a systematic review, meta-analysis, and meta-regression. *Prev Med* 2021;148:106532.
- 34 Patton M. *Qualitative research and evaluation methods*. 3rd ed. Sage Publications, 2002.
- 35 Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. *Int J Qual Health Care* 2007;19:349–57.
- 36 Braun V, Clarke V. Using thematic analysis in psychology. *Qual Res Psychol* 2006;3:77–101.
- 37 Doyle J, Colville S, Brown P, *et al.* How adolescents decide on bariatric surgery: an interpretative phenomenological analysis. *Clin Obes* 2018;8:114–21.
- 38 Puhl RM, Himmelstein MS. Adolescent preferences for weight terminology used by health care providers. *Pediatr Obes* 2018;13:533–40.
- 39 Cardel MI, Atkinson MA, Taveras EM, *et al.* Obesity treatment among adolescents: a review of current evidence and future directions. *JAMA Pediatr* 2020;174:609–17.
- 40 Järholm K, Karlsson J, Olbers T, *et al.* Characteristics of adolescents with poor mental health after bariatric surgery. *Surg Obes Relat Dis* 2016;12:882–90.
- 41 Björk A, Dahlgren J, Gronowitz E, *et al.* High prevalence of neurodevelopmental problems in adolescents eligible for bariatric surgery for severe obesity. *Acta Paediatr* 2021;110:1534–40.
- 42 Samdal GB, Eide GE, Barth T, *et al.* Effective behaviour change techniques for physical activity and healthy eating in overweight and obese adults; systematic review and meta-regression analyses. *Int J Behav Nutr Phys Act* 2017;14:42.
- 43 Jeminiwa RN, Hohmann NS, Fox BI. Developing a theoretical framework for evaluating the quality of mHealth Apps for adolescent users: a systematic review. *J Pediatr Pharmacol Ther* 2019;24:254–69.
- 44 Lincoln YS, Guba EG, Pilotta JJ. *Naturalistic inquiry*. . Sage Publications, 1985: 9. 438–9.
- 45 Saunders B, Sim J, Kingstone T, *et al.* Saturation in qualitative research: exploring its conceptualization and operationalization. *Qual Quant* 2018;52:1893–907.
- 46 Korstjens I, Moser A. Series: practical guidance to qualitative research. Part 4: Trustworthiness and publishing. *Eur J Gen Pract* 2018;24:120–4.

Introduction

Information about the research project.

Overall aim, length, and structure of the interview.

Ethical aspects: confidential processing and presentation of data, opportunity to end participation, informed consent etc.

Introductory question: Have you had an operation, or will you have an operation?

Interview themes:

I. Obesity, health, and lifestyle

What is your perception of how your obesity has affected your health?

Please tell me about your driving forces for undergoing bariatric surgery.

Describe our lifestyle, and the lifestyle changes you needed to make before and (if possible to answer) after surgery.

I. Bariatric surgery and behavior change

Please describe how you perceived the process when undergoing bariatric surgery. Tell me about your story.

Explain how you perceived the support and information before, (if possible to answer) during, and after your bariatric surgery.

Please describe your thoughts and experiences regarding surgery and behavior change.

III. Support through digital solutions

Which aspects do you believe would be useful to include in an app to promote good health before and after the operation? Please share your thoughts about how the structure and content regarding the intervention could be designed.

Explain if, and in what way you think you would benefit from getting support from an app before and after the operation. Discuss the advantages and disadvantages of an app compared with other methods (such as meeting a professional).

I. Other

Is there anything else you would like to add that we haven't talked about?

Introduction

Information about the research project.

Overall aim, length, and structure of the interview.

Ethical aspects: confidential processing and presentation of data, opportunity to end participation, informed consent etc.

Introductory question: Describe your job and your role in the work with overweight adolescents.

Interview themes:

I. Bariatric surgery and behavior change

Please reflect upon your experiences of clinical practice or research work within bariatric surgery. What aspects are important to highlight and discuss from your point of view?

Describe your view of what currently does and doesn't work when working with overweight adolescents. What is needed in order to improve the long-term results of the operation?

Please describe your thoughts and experiences regarding surgery and behavior change.

I. Obesity, health, and lifestyle

Please describe your perception of how your patients/study participants feel and your thoughts regarding their health and life situation.

Tell me about your patients' opportunities and barriers in terms of making lifestyle changes in relation to their situation.

Please reflect about the opportunities and driving forces that you feel your patients have for undergoing bariatric surgery and behaviour changes?

II. Support through digital solutions

Which aspects do you believe would be useful to include in an mHealth intervention to promote healthy lifestyle habits among your patients? Please share your thoughts about how the structure and content regarding the intervention could be designed.

Explain if, and in what way you think you would benefit from getting support from an app before and after the operation. Consider the advantages and disadvantages of an app compared with other methods (such as meeting a professional).

III. Other

Is there anything else you would like to add that we haven't talked about?