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Health provider identified barriers and facilitators to weight management for individuals with spinal cord injury

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Abstract

Study design Qualitative descriptive study using semi-structured interviews

Objective The purpose of this study was to examine the barriers and facilitators of weight management in individuals with spinal cord injury (SCI) from the perspective of SCI health care providers.

Setting Veterans Health Administration and Midwest Regional SCI Care Systems.

Methods Health care providers ($n = 25$) who care for individuals with SCI completed semi-structured interviews. Thematic analysis methodology was used to identify emergent themes around barriers and facilitators to weight management in SCI.

Results Sixteen subthemes emerged for barriers and seven subthemes emerged for facilitators for weight management in SCI. Barriers included individual-level factors (e.g., physical ability/mobility limitations, lack of interest, psychological obstacles, lack of knowledge, poor dietary strategies), socio-environmental factors (e.g., challenges with family support, lack of access to weight management resources, dependency on others, difficulties obtaining weight measurement), and organizational factors (e.g., lack of integration/inconsistent weight management support from healthcare systems, pushing calorie intake early post-injury). Facilitators included individual-level factors (e.g., motivation, education/knowledge, participation in exercise and physical activity) and socio-environmental factors (e.g., positive support network, access to/use of healthy dietary strategies, access to exercise facilities/adaptive equipment, participating in weight management with others).

Conclusions Healthcare providers identified individual-level, socio-environmental, and organizational barriers and facilitators that influence weight management efforts in individuals with SCI. Future weight management resources and programs should consider addressing common barriers identified by healthcare providers, individuals with SCI, and their caregivers, and develop strategies to promote facilitators to enhance weight management in this population.

Introduction

Overweight/obesity are prevalent conditions among individuals with spinal cord injury (SCI) with ~60% meeting criteria for either overweight or obesity [1]. Following injury, many individuals will continue to gain weight and their body mass index will likely increase over time [1, 2]. Collectively, SCI and overweight/obesity can lead to consequences such as cardiometabolic or metabolic syndrome [3], heart disease [4, 5], and diabetes [4, 6].

Recommendations among the general population for behavioral weight loss, which can reduce the consequences of excess weight, include the use of behavioral strategies to reduce caloric intake and increase physical activity levels [7]; however, individuals with mobility impairments, including SCI, may face unique challenges when attempting to modify diet and physical activity behaviors. Common barriers to physical activity and sport participation among

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individuals with SCI include a lack of information, financial and accessibility limitations, psychological challenges, and lack of support of others to aid with the activity [8–12]. Less is known about barriers individuals with SCI face relating to maintaining a healthy diet or weight management. While physical activity plays a role in weight management, it is only a proportion of the energy balance equation. In order to develop effective weight management programs for individuals with SCI, it is necessary to better understand all of the behaviors and factors influencing weight management.

Individuals with SCI have more contacts with the healthcare system compared to the general population [13]; thus, healthcare providers have a unique perspective on the factors that help or hinder weight management among those with SCI. Even though healthcare visits may not be focused on weight management, many providers who care for individuals with SCI are likely aware of obesity-related consequences and may see unique challenges individuals face. Therefore, the purpose of this study was to examine the barriers and facilitators of weight management in individuals with SCI from health care providers' perspectives. Given the lack of research on the factors that influence weight management in individuals with SCI, a qualitative approach was needed to explore factors that help or interfere with weight management behaviors from the provider perspective. This study will serve as the first step in gaining a comprehensive understanding of the factors that influence weight management in individuals with SCI.

Methods

Health care providers who care for individuals with SCI were recruited from the Veterans Health Administration (VHA) and the Shirley Ryan AbilityLab (SRALab) SCI Model Systems facilities. The VHA SCI/D System of Care includes 24 regional SCI/D Centers, which provides comprehensive, coordinated, lifelong care delivered by interdisciplinary teams to individuals with SCI. The SRALab within the Midwest Regional SCI Care System is one of 14 SCI Model System Centers across the USA and includes comprehensive medical, vocational, and other rehabilitation services for individuals with SCI. Providers who were involved in SCI weight management care were recruited via referrals from SCI leadership or via SCI provider-specific listservs. The study was approved by the Hines VA and Northwestern University Institutional Review Boards.

Semi-structured interviews were conducted with participants by trained interviewers with previous interview experience (KJ, LB). An interview guide was used that was developed based on a literature review to explore and

elicit healthcare providers' perspectives of the barriers, facilitators, and preferences for weight management that individuals with SCI face. Interviews were audio-recorded and lasted about 60 min. For this current paper, the primary focus is on the results relating to the barriers and facilitators of weight management. Among the interview questions for this study, participants were specifically asked: (1a) What do you think are the biggest barriers to weight management in persons with SCI? (1b) Describe what you think would be the best way to overcome these barriers. (2a) What do you think are the biggest facilitators to weight management in persons with SCI? (2b) Describe how you think these facilitators could be integrated into health care management.

Qualitative analysis

Interviews were deidentified, transcribed verbatim, and verified by an external professional transcription service. Using thematic analysis methodology [14, 15], three research team members with experience in qualitative methodology (CAP, LB, SLL) and backgrounds in exercise physiology, nursing, and public health independently coded several transcripts. Open coding was used, which allowed for codes to emerge based on each coders interpretation of the data, and our work emphasized content quality rather than quantity [14]. Collectively, the coders then met to discuss the codes that emerged, resolve any discrepancies, and develop an initial codebook. Transcripts were then independently coded by all three research team members. The group met to review and compare coding for each transcript, discuss discrepancies until consensus and agreement was met, and modify the codebook based on additional codes that emerged until saturation occurred [16]. The group then reviewed all themes and subthemes that emerged. NVivo qualitative analysis software version 12 was used to organize and manage data (QSR International, version 12 NVivo, 2018, Doncaster, Victoria, Australia).

Results

A total of 25 VHA or Model Systems SCI healthcare provider participants participated (Table 1). Participants were primarily female (88%), 60% were between the ages of 26–49, and provided care for individuals with SCI for an average of 10 years (range: 1–29 years). Participants included physicians, nurses, therapists, social workers, psychologists, and dietitians.

Participants discussed barriers and facilitators to weight management faced by individuals with SCI. Based on the interview discussions, 16 unique subthemes emerged for barriers to weight management and seven subthemes

emerged for facilitators for weight management in SCI (Table 2). Barrier and facilitator subthemes were classified into the following categories: individual-level factors, socio-environmental factors, and organizational factors. Participant sample quotations by subtheme for barriers and

facilitators are presented in Tables 3 and 4, respectively. Participants are identified by ID and provider type.

Barriers to weight management in SCI

Individual-level barriers

Physical ability and mobility limitations The most frequently discussed barriers related to physical ability and mobility limitations. Participants discussed how most patients with SCI have fewer opportunities to participate in exercise due to mobility limitations and how physical ability could limit healthy eating.

“Unfortunately for patients with higher injuries, so cervical level injuries, their opportunities for exercise are really limited.” [HP01, Occupational therapist]

Lack of interest in wellness and healthy lifestyle Participants indicated that many patients had a lack of interest in wellness before the injury, which hindered weight management efforts post-injury. They noted that some patients are not interested or motivated to participate in weight management efforts and education.

“I mean there’s no point pursuing weight management goals if the SCI person is not willing to do it or not

Table 1 Healthcare provider participant characteristics.

Characteristic	Participants (<i>n</i> = 25)
Sex, <i>n</i> (%)	
Male	3 (12%)
Female	22 (88%)
Age	
26–49 years	15 (60%)
50–64 years	9 (36%)
65 years or older	1 (4%)
Healthcare setting	
Veterans Health Administration	15 (60%)
Midwest Regional SCI Care Systems	10 (40%)
Profession	
Physical or occupational therapist	7 (28%)
Nurse	7 (28%)
Physician or physician assistant	4 (16%)
Social Worker	2 (8%)
Psychologist	2 (8%)
Other (Dietician, speech pathologist)	3 (12%)
Number of years providing SCI care, years, mean ± sd	9.6 ± 7.3

Table 2 Barriers and facilitators for weight management in individuals with spinal cord injury.

General classification	Barriers	Facilitators
Individual-level factors	<ul style="list-style-type: none"> - Physical ability and mobility limitations - Lack of interest in wellness and healthy lifestyle - Psychological barriers - Lack of knowledge on weight management - Poor dietary strategies - Barriers related to aging, comorbidities, and SCI-related conditions - Altered body composition and decreased metabolism - Limited time and effort for weight management behaviors 	<ul style="list-style-type: none"> - Motivation - Education and knowledge pre/post-injury about weight management - Exercise and physical activity
Socio-environmental factors	<ul style="list-style-type: none"> - Challenges with family support for weight management - Lack of access to weight management resources - Dependency on support from others to help with weight management - Difficulties obtaining weight measurement - Financial limitations - Lack of transportation 	<ul style="list-style-type: none"> - Positive support network - Access to and use of healthy dietary strategies - Access to exercise facilities and adaptive equipment - Participating in weight management with others
Organizational factors	<ul style="list-style-type: none"> - Lack of integration or inconsistent weight management support in the healthcare system - Pushing calorie intake early post-injury 	

Table 3 Barriers for weight management in individuals with spinal cord injury and related quotations.

Weight management barriers	Provider quotations
Individual-level subthemes	
Physical ability and mobility limitations	<p>“For some patients, depending on the level of their injury or their level of physical function, I think a big factor is the difficulties in achieving enough physical activity to maintain a healthy weight. Being able to get enough physical activity and to do enough exercise to have a calorie deficit and lose weight.” [HP03, Physical therapist]</p> <p>“... maybe the cutting boards, chopping things up, the manual dexterity, and the hand strength and fine motor functions that some of them may be lacking that they need to.” [HP18, Nurse practitioner]</p> <p>“They’re already overusing their arms. sometimes in certain SCI when they have different types of lesions where there’s just nothing going on in the legs, it’s much more difficult for them to burn calories once you take out the leg muscles. You’re then having to burn the calories with your upper body. You’re exercising with your upper body.” [HP20, Psychologist]</p>
Lack of interest in wellness and healthy lifestyle	<p>“I think another barrier is motivation in general, so apart from the psychological aspect of it, but just motivation. If they are somebody who didn’t really care about their health before, who is to say they’re going to care about it now.” [HP05, Speech pathologist]</p> <p>“Patients not wanting to do weight management, that is the only biggest barrier that we see with our patients. That’s the biggest problem is our population doesn’t always like to be told. We may give them the most nutritious food, but some of them who can get up in their wheelchairs and go out like to the canteen or something, they could be eating out there, and we don’t have a clue they’re eating.” [HP25, Physician]</p>
Psychological barriers	<p>“Emotion. I think that is a big, big barrier in that somebody’s ability to adjust to something so traumatic in their life that’s happened.” [HP05, Speech pathologist]</p> <p>“A fair number of people [with SCI] adopt this kind of resignation that... I’m stuck in the wheelchair.” [HP12, Psychologist]</p> <p>“Depression has a huge, plays a pretty big role in our patient population, and that becomes a typical factor that they use to cope with their injury.” [HP17, Nurse]</p>
Lack of knowledge on weight management	<p>“Some patients with SCI, they lack a simple understanding of what daily intake should be and what it is about you would be surprised how little people sometimes know about basic things like that.” [HP09, Nurse]</p> <p>“The combination of knowing [not] what to do in terms of diet but also then implementing.” [HP15, Social worker]</p> <p>“Lack of education. A lot of patients, they don’t know how to manage their diet. They don’t know what a serving is of meat or a serving of vegetables.” [HP21, Kinesiotherapist]</p>
Poor dietary strategies	<p>“Diet is huge, and I think that’s lacking. You still have the people that unfortunately have bad habits such as picking the wrong things to eat.” [HP18, Nurse practitioner]</p> <p>“A lot of patients use food as their only form of pleasure because they’ve lost other forms of pleasure and sensation of their body. Even us as human beings that don’t have something that traumatic, we turn to food as a comfort. Food is so much more than just nutrition. There’s so many more things involved, so when that’s something that you get instant gratification from when so many other things have gone bad in your life, I think that’s a big barrier.” [HP05, Speech pathologist]</p>
Barriers related to aging, comorbidities and SCI-related conditions	<p>“As soon as their injury has occurred, because from that point on, their aging process gets kicked into high gear. Our 20-year-old injuries may eventually, within a year, start acting like somebody who is in their 40 s.” [HP25, Physician]</p> <p>“The medications. A lot of our Veterans have diabetes, and they’re on medications that can lower the metabolic rate, and pain killers like gabapentin, et cetera.” [HP16, Social worker]</p> <p>“Weight management ultimately is going to affect their bowel program too. So if they’re eating items that are high in fat or will make them constipated, then that’s only going to make other elements of managing their care harder.” [HP17, Nurse]</p>
Altered body composition and decreased metabolism	<p>“With spinal cord injury, those patients usually have a decreased energy expenditure just due to loss of muscle mass and denervated tissue and things like that.” [HP10, Registered dietician]</p> <p>“Putting on the weight and then having that basically adipose, that fat, instead of having muscle. When you have excess fat, then it creates this cascade of problems from there.” [HP20, Psychologist]</p>
Limited time and effort for weight management behaviors	<p>“The barriers that some of our SCI patients would have, especially for somebody that’s living alone, is that providing a healthy diet usually is not as easy as grabbing a quick meal or something out of the freezer that is perhaps not as healthy conscious. I mean making a salad takes work, and a lot of other healthy foods are not the easiest or the cheapest to get. So sometimes having a healthy diet is not a real easy thing. A lot of our SCI patients live alone and try to manage everything about their life, and having a healthy diet is not the easiest thing for them to do.” [HP24, Nurse]</p>
Socio-environmental subthemes	
Challenges with family support for weight management	<p>“Often find that families are reluctant or ineffective in the way that they’re trying to address weight management with patients. One of the big dynamics is kind of a, ‘they’ve had so much happen to them, they’ve lost so much, I feel like I don’t really have a right to then turn around and talk to them about losing weight too’. Sometimes the caregivers are uncomfortable bringing weight management up, feeling like it’s sort of a proxy for their own burden and not wanting to express that they’re feeling burdened.” [HP12, Psychologist]</p> <p>“Particularly when it’s caregivers who don’t live in the home. So if the caregiver has two hours to get the person up and dressed and make breakfast and ready for the day, oftentimes the options for making breakfast are going to be the less healthy, faster options as opposed to something that’s a little bit healthier</p>

Table 3 (continued)

Weight management barriers	Provider quotations
Lack of access to weight management resources	<p>and maybe more time consuming to prepare. It's a challenge if one of them is not as interested in buying into the picture, particularly if the person has a higher-level injury. If they're dependent on their caregiver for getting out and exercising and the caregiver just doesn't want to take the time to make that exercise happen, the person is left not being able to do that. Similarly, with the meal prep." [HP22, Physician]</p> <p>"They're not able to go out to a grocery store and like do their own grocery shopping, so they're doing microwave meals or whatever is convenient for them. A lot of times those more convenient options aren't healthy." [HP08, Occupational therapist]</p> <p>"I mean if you look out into the community and general health programs, they're not truly inclusive of people with spinal cord injury. While there are some special organizations that help with that, you really usually only find that in big metropolitan areas, and just the program availability is pretty slim when you look at the general population versus what's available and adaptable for them." [HP17, Nurse]</p>
Dependency on support from others to help with weight management	<p>"The inability to get the foods that they need in and out of their house, access to the foods, access to the kitchen, the stove, and other things than the microwave." [HP18, Nurse practitioner]</p> <p>"Depending on their injury level, they might not be able to just go exercise by themselves, so having another person that can help with that." [HP02, Physical therapist]</p> <p>"SCI patients may or may not be able to learn how to cook for themselves. The majority of them need caregivers to do that. Patients tend not to go grocery shopping by themselves, at least in the first several years." [HP25, Physician]</p>
Difficulties obtaining weight measurement	<p>"A problem for the spinal cord population is not a lot of places [have a] wheelchair scale, they can just go somewhere and be weighed. Even a lot of primary care, unless they deal with disabled patients, don't have the proper scales where they can actually be lifted out of the chair and the chair weighed and stuff. It does depend on having the proper scales that can weigh disability patients. Some of the patients come here and say, well, I haven't been weighed since the last time here because there's nowhere that can weigh me." [HP06, Nurse]</p> <p>"Some of the wheelchairs don't fit on some of the scales we have, so sometimes we're left with less than ideal information because we can't even get a weight. If the wheelchair scale does not work, then it's a decision of how important is it to get that weight. If somebody appears to be the same, stable from what we saw the last time, and we don't think we're real concerned, we probably would not get the weight at that point." [HP24, Nurse]</p>
Financial limitations	<p>"If they don't have the time or they don't have the money, it's going to be difficult I think because, like I said, if it's easier and cheaper to go through McDonald's and buy a dollar cheeseburger than to go and spend twenty dollars on fruits and vegetables, and they're strapped for cash, they're going to go do the dollar cheeseburger." [HP11, Nurse]</p> <p>"Depending on funding, availability of cash funding, money funding. Availability of such services that I mentioned beforehand, having a company that come out to their home and cook, or maybe even cook at their facility." [HP18, Nurse practitioner]</p>
Lack of transportation	<p>"If the person with the spinal cord injury is not able to move or do things on their own or get from point A to point B, the transportation piece and those sorts of things that a lot of our individuals just don't have the means for. The fitness center is downtown, and not everybody can come down here regularly." [HP02, Physical therapist]</p>
Organizational subthemes	<p>Lack of integration or inconsistent weight management support in the healthcare system</p> <p>"It's just that like the more people you get involved, the more steps that get involved, the less chance it is to have a follow-through." [HP05, Speech pathologist]</p> <p>"Always a tough one, but we health providers will get patients who come in, and if their list of pressing medical concerns gets too large, weight management falls off the table much of the time." [HP12, Psychologist]</p>
Pushing calorie intake early post-injury	<p>"If an individual with SCI is on a regular diet, doctors just say just eat and drink whatever you can, everything, even if that means like eat your whole breakfast and drink an entire meal replacement, Ensure. It's just get calories, calories, calories, calories, calories, because usually they've lost so much weight. The problem is they've lost a lot of muscle, and they're not educated on that. So, they lost a ton of muscle. They probably lost also fat, but their body is not moving, lost a lot of muscle, and then we just tell them eat, eat, eat, eat, eat, eat, and they're not using energy and not building muscle. So it's a fine line. I get it. But at the same time, I've seen too many patients then go and flip, and they just start eating everything, and then all of a sudden they like don't fit into their power chair when they go to leave, or they come back and they need a new chair because they've gained 50 pounds." [HP05, Speech pathologist]</p>

interested in doing it...their lack of interest, [HP11, Nurse Practitioner]

adjustment to their injury, feelings of stress and depression around their injury, body image concerns, and ineffective coping strategies.

Psychological barriers Providers discussed psychological obstacles to managing weight, such as early emotional

"Another factor too that I think plays into it really is depression as well and just coping, and sometimes

Table 4 Facilitators to weight management in individuals with spinal cord injury and related quotations.

Weight management facilitators	Provider Quotations
Individual-level subthemes	
Motivation	<p>“Motivation can also be a really big facilitator because if someone is wanting to be more independent and they like, ‘I know that this transfer is going to be a lot easier if this happens. It’s going to be easier for me to do my bowel program by myself’.” [HP08, Occupational therapist]</p> <p>“The motivation to do it too. So there’s that mental health aspect too that I think you have to throw that in too. ... good self-esteem and motivation to keep going [working out].” [HP18, Nurse practitioner]</p>
Education and knowledge pre/post-injury about weight management	<p>“Making sure that they’re aware of proper diet and nutrition. A lot of the spinal cord injury patients are young, so it takes teaching.... Knowing how lack of mobility affects them, but how there are things they can do to help with that as well. Knowledge, knowing what’s available and what can help and what to do. So knowledge that there are things they can do.” [HP06, Nurse]</p> <p>“Education first and foremost so that they understand. Education in addition to how they can manage it. So whether that’s diet, whether that’s different kinds of exercise, cardiovascular, whatever they’re capable of, just so that people are aware.” [HP04, Occupational/physical therapist]</p>
Exercise and physical activity	<p>“Exercise. staying active, participating in like the wheelchair games and things like that. Anything that keeps activity up is certainly helpful.” [HP23, Physician]</p> <p>“An exercise program that’s more modern and trendy, so yoga is huge and CrossFit is huge, so if individuals with SCI can be involved in like adaptive CrossFit or if they’re able to do chair yoga, then I think that’s a trendy, well-known, and talked about a lot type of fitness and exercise. I always think that those ones are really successful for people because they’re pretty popular.” [HP13, Recreation therapist]</p>
Socio-environmental subthemes	
Positive support network	<p>“If they [caregiver] can go to the workout classes with their spouse or with the person that they’re providing care for, or go to the yoga classes with them or the nutrition classes or whatever they might be doing to help their weight loss, that’s so huge to have that support and have somebody there who is hearing the same information and can help them remember and help keep them on track.” [HP13, Recreation therapist]</p> <p>“There are some like independent lifestyles, some community organizations that help folks with either physical or psychological disabilities to be more engaged in the community.” [HP15, Social worker]</p> <p>“Support...the community. You need that village... to help support their goals, not only to obtain them but then to also maintain them.” [HP18, Nurse practitioner]</p> <p>“Providers being comfortable talking about it. Having more individuals who are comfortable and trained in working with SCI population to provide that one-on-one care would be great.” [HP22, Physician]</p>
Access to and use of healthy dietary strategies	<p>“Any kind of support or programs that don’t involve leaving the house or that have, I think some of those like meal delivery services now probably could be pretty promising for anybody with a disability, not just spinal cord injury.” [HP03, Physical therapist]</p> <p>“Trying to follow a reasonable diet.” [HP23, Physician]</p>
Access to exercise facilities and adaptive equipment	<p>“Access to physical fitness facilities.” [HP03, Physical therapist]</p> <p>“Whole gym is set up for adaptive training, adaptive fitness.” [HP13, Recreation therapist]</p> <p>“Not only the accessibility to the gym and the workout plan that will work for you and your specific abilities and disabilities.” [HP18, Nurse practitioner]</p>
Participating in weight management with others	<p>“Group fitness classes and gyms and that social aspect of it and the encouragement from other people...With a community of other people and you’re with supportive peers, a supportive community of like-minded and similar disabilities of people.” [HP13, Recreation therapist]</p>

eating can become a coping mechanism for a lot of newly injured spinal cord injury patients. You can see sometimes like a dramatic weight gain in the first year of spinal cord injury because that’s how they cope.” [HP17, Nurse]

Lack of knowledge on weight management Participants highlighted how individuals with SCI and their caregivers may lack knowledge to properly manage weight, may be overwhelmed with information, or may not want to participate in SCI weight management education offered.

“Lack of education. A lot of patients, they don’t know how to manage their diet. They don’t know what a serving is of meat or a serving of vegetables.” [HP21, Kinesiotherapist]

Poor dietary strategies Provider participants identified poor diet and lack of healthy dietary strategies as barriers. Individuals with SCI may not have a well-balanced diet and have several unhealthy dietary habits. Some providers indicated that food may be one of the last things that is enjoyable and pleasurable for individuals following injury, which leads to eating unhealthy food options.

“Lack of a well-balanced diet I think is a big factor or, if the [individual with SCI] can’t stand up, they may be more prone to eating convenience food that have much higher caloric value.” [HP16, Social worker]

Barriers related to aging, comorbidities and SCI-related conditions Participants discussed how individuals with SCI may have medical conditions that affect their ability to participate in certain physical activities or may be on medications that have side effects that influence fluid retention and/or may cause weight gain.

“A spinal cord injury patient may be a perfect candidate to swim; however, bowel and bladder issues could get in the way of that, so I think that’s a big factor.” [HP16, Social worker]

Altered body composition and decreased metabolism - Providers highlighted the barrier of loss of muscle mass and muscle atrophy post-injury. As a result, individuals with SCI experience a lower metabolic rate and overall lower energy expenditure and may not be able to expend a sufficient number of calories through “effective exercise” to properly manage their weight.

“Loss of lean body mass with a spinal cord injury can lead to a lower metabolic rate. I think that’s a big factor too.” [HP16, Social worker]

Limited time and effort for weight management behaviors Providers noted that individuals with SCI may have limited time to engage in healthy eating and exercise weight management strategies due to the time needed to perform basic activities of daily living.

“Getting out and exercising with someone who has a spinal cord injury takes more effort than just getting up off a sofa and walking down the street with your partner. Similarly, the meal prep is oftentimes more time consuming.” [HP22, Physician]

Socio-environmental barriers

Challenges with family support for weight management - Family members may experience burden and lack time to help with weight management. Participants also discussed challenges in how much caregivers enable unhealthy behaviors or push healthy behaviors so much that it causes stress.

“Someone who wants to be supportive of you, but they’re doing it in a way that has a negative impact. For example, if someone needs to cut calories, and you have a family member who is constantly on them or riding them to a point where it creates anxiety or stress, it’s just not productive to what that person is actually trying to do, even though that person means well.” [HP10, Registered Dietician]

Lack of access to weight management resources Providers identified a lack of access to community resources (e.g., fitness facilities, healthy food) tailored to meet the needs of individuals with SCI as a barrier. Participants also identified challenges preparing healthy food or finding adaptive equipment for use by individuals with SCI.

“They don’t have the correct resources, or if they get resources, they’re not specific to SCI.” [HP13, Recreation therapist]

Dependency on support from others to help with weight management Another barrier is that individuals with SCI may not be able to exercise on their own or may need assistance in setting up exercise equipment. Participants also noted a lack of help in acquiring healthy foods or preparing healthy meals.

“Without that surrounding support structure, it’s hard to achieve the things you want with diet and weight goals.” [HP10, Registered Dietician]

Difficulties obtaining weight measurement Participants discussed patients being unable to regularly measure body

weight measure and are often limited to only being weighed by a healthcare provider.

“It’s hard to weigh patients. They can’t weigh themselves at home for the most part” [HP18, Nurse practitioner].

Financial limitations Participants discussed that patients may not be able to afford healthy foods and may resort to unhealthy foods, such as fast food, as it cheaper and easily available. Individuals with SCI might not have the financial means to pay for continuous physical therapy, gym memberships, or community weight management programs.

“They can’t see a physical therapist for life. No one has money for that.” [HP02, Physical therapist].

Lack of transportation Participants noted that if individuals with SCI are unable to independently use transportation or do not have the means for other forms of transportation, it may be extremely challenging to get to an exercise facility, therapy session, grocery store, or community-based weight management program.

“Transportation is always an issue.” [HP19, Physical therapist]

Organizational-level barriers

Lack of integration or inconsistent weight management support in the healthcare system Participants stated that weight management is not consistently integrated within or discussed during healthcare appointments. Some mentioned there were not enough dietician referrals or that patients receive contradicting weight management information from providers.

“Sometimes what I have seen is that their dietician is telling them one thing, and then they go to their SCI provider, and they’re told kind of contradicted information.” [HP13, Recreation therapist]

Pushing calorie intake early post-injury During the acute phase of injury, it is common for providers to increase patients’ calorie and protein intake to facilitate healing. The barrier occurs when there is not an end point or provider recommendation to stop the excess caloric intake, leading to unnecessary weight gain and challenges trying to reverse their new eating habits.

“I think we have the tendency to tell them that they need to get enough protein and start increasing their calories because their body is burning so many calories with the process they’re going through. Then that just abruptly tailors off, and that’s when you see the weight gain.” [HP01, Occupational therapist]

Facilitators to weight management in SCI

Individual-level facilitators

Motivation Participants believed that it is helpful for individuals with SCI to have the internal motivation to change behaviors. They discussed the importance of having reasons to manage weight, such as to make transfers easier, live longer, and decrease risk of health concerns (e.g., chronic diseases and pressure injuries).

“The person needs to have the internal motivation to want to do weight management themselves. [HP02, Physical therapist]

Education and knowledge pre/post-injury about weight management Providers discussed how baseline education and knowledge about weight management behaviors (e.g., diet, exercise) that patients and caregivers have before as well as after the injury can serve as facilitators for patients with SCI diet and activity efforts.

“Knowledge of what is safe, what they can do, what they shouldn’t be doing...an understanding of how diet and exercise relate and how different your body kind of handles things after SCI.” [HP04, Occupational/physical therapist]

Exercise and physical activity Participants stated that regular participation in any type of activity that helps individuals stay active, whether that is organized or competitive sports, or exercises like yoga or CrossFit, is a weight management facilitator.

“Exercise would be a good strategy...exercise if doable in some form is very important.” [HP16, Social worker]

Socio-environmental facilitators

Positive support network Providers highlighted that having a good support network was helpful toward weight

management efforts. A support system can include informal caregivers, family members, health care teams, and advocacy and community groups.

“Family and social support is a big factor, especially for patients who aren’t independent. Having somebody, whether that’s somebody that can help them exercise or get them to where they can exercise or can help them prepare healthy food.” [HP03, Physical therapist]

Access to and use of healthy dietary strategies Participants discussed the importance of access to nutritional foods and a healthy diet. Participants identified access to fruits and vegetables and meal delivery or prep services as weight management facilitators.

“There’s niches out there that will come to your house and fix a week’s worth of food.” [HP18, Nurse practitioner]

Access to exercise facilities and adaptive equipment Participants identified having a gym membership or access to fitness facilities as helpful for weight management. Having access to modified/special equipment or individualized workout plans for SCI also facilitates weight management.

“Accessible pieces of equipment to enable people to go out and do it out in the environment. Increasing accessibility in the environment.” [HP22, Physician]

Participating in weight management with others Provider participants identified group weight loss or activity programs as facilitator’s to weight management. Organized activities, such as wheelchair games or other sports activities, create healthy competition and fun among peers.

“Staying active, participating in like the wheelchair games and things like that. Anything that keeps activity up is certainly helpful.” [HP23, Physician]

Discussion

This study was one of the first to explore the barriers and facilitators to weight management among individuals with SCI from the perspectives of SCI healthcare providers. Broadly, providers identified a plethora of individual-level, socio-environmental, and organizational barriers. Some of

the barriers included physical ability/mobility limitations, challenges interfering with family or support for weight management, and lack of interest in wellness by the individual with SCI. Healthcare providers also mentioned individual-level and socio-environmental social facilitators that helped individuals with weight management. Some of the specific facilitators mentioned included having a positive support network, being motivated, and having knowledge on weight management.

It is not surprising that healthcare providers commonly mentioned physical limitations and altered body composition as barriers to weight management, particularly as these have been previously identified as barriers to exercise in SCI [10, 11]. Following SCI, individuals experience changes in their level of function based on the level of injury, and as a result, reductions in muscle mass [17] and decreased resting energy expenditure [18]. Participants also highlighted that as a result of the injury and subsequent bodily changes, these individuals have fewer opportunities to participate in leisure physical activities or exercise and more challenges in shopping and preparing meals. Similarly, among wheelchair users, function impairments, and unadjusted kitchens were found to influence dietary behaviors [19], suggesting that the inability to prepare a healthy meal, due to either physical ability or not having an accessible kitchen, may lead this population to resort to unhealthier options. Future weight management studies may want to focus on identifying strategies to address the negative impacts that physical ability and mobility limitations have on both exercise and healthy eating.

The influence of others on weight management participation among individuals with SCI is apparent from this study, as provider accounts of support (or lack of support) from others emerged as both an important barrier and facilitator to weight management. Family and paid caregivers may experience competing responsibilities, lack of time, and exhaustion that contribute to choosing easier unhealthier food options and an inability to help the individual with SCI participate in exercise. This is consistent with barriers identified in the exercise literature [10, 11]. Among individuals with SCI, social support is positively linked to better health and functioning [20], and was identified as a facilitator for weight management by health care providers in the current study. More research is needed to identify ways to enhance social support or improve healthy family dynamics for those with SCI.

Access to weight management resources was described as important for weight management behaviors in SCI. Current research indicates having access to exercise facilities and adaptive equipment aids with participation in leisure time physical activity in individuals with SCI [12]. Likewise, difficulties accessing or going grocery shopping is a common barrier among people with physical

disabilities [21]; however, grocery and meal delivery services are becoming more available and have shown positive effects on the home food environment [22], dietary intake [23], and well-being [23] in other populations. This potential resource may not be available in certain areas (e.g., food deserts, rural locations) nor financially feasible, as financial constraints is a known barrier in the literature [11] and was found in the current study. However, healthy meal delivery services may be able to help increase access to healthy foods among individuals with SCI.

Motivation and interest in weight management also emerged as both a barrier and facilitator for weight management in SCI. Healthcare providers noted that the individual with SCI should be motivated to want to manage their weight and that lack of interest in their health and wellness, may hinder their interest and ability to manage their weight. A lack of motivation is a common barrier for lifestyle change noted in the general population [24], as well as among those with SCI for diet [25] and exercise [8, 12] Future programs may need to explore options to incorporate such factors to increase and maintain motivation for weight management among individuals with SCI.

This is one of the first studies to explore barriers and facilitators to weight management in SCI from the viewpoint of the health care providers, however, some limitations exist. The healthcare providers who participated in this study only represent a small proportion of healthcare professions that provide care for individuals with SCI, which limits generalizability. Similarly, the SCI patient population that these healthcare provider participants care for may differ from the SCI population, including differences in age, income, insurance, and access to weight management resources, also limiting generalizability to other SCI provider practices, locations, or healthcare professionals.

In conclusion, healthcare provider participants identified individual-level, socio-environmental, and organizational barriers and facilitators that individuals with SCI face in weight management. Future studies should examine weight management efforts from the individual with SCI's perspective, as well as from the caregivers. Finally, future weight management programs and resources should aim to target identified barriers and promote strategies to increase facilitators to improve weight management in this population.

Data availability

The datasets generated and/or analyzed during the current study are available from the corresponding author on reasonable request under institutional restrictions.

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Author contributions CAP assisted with the coding of the data, interpretation of the results, and drafted the manuscript. LB and KJ assisted with the data collection, coding of the data, interpretation of the results, and/or critical revision of the manuscript. SLL conceived the research idea and assisted with the acquisition of data, coding of the data, interpretation of results, and critical revision of the manuscript.

Compliance with ethical standards

Conflict of interest The authors declare no competing interests.

Ethical approval We certify that all applicable institutional and governmental regulations concerning the ethical use of human volunteers were followed during the course of this research.

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References

- Hatchett PE, Mulroy SJ, Eberly VJ, Haubert LL, Requejo PS. Body mass index changes over 3 years and effect of obesity on community mobility for persons with chronic spinal cord injury. *J Spinal Cord Med.* 2016;39:421–32.
- de Groot S, Post MWM, Postma K, Sluis TA, van der Woude LHV. Prospective analysis of body mass index during and up to 5 years after discharge from inpatient spinal cord injury rehabilitation. *J Rehabil Med.* 2010;42:922–8.
- Gater DR, Farkas GJ, Berg AS, Castillo C. Prevalence of metabolic syndrome in veterans with spinal cord injury. *J Spinal Cord Med.* 2019;42:86–93.
- Selassie A, Snipe L, Focht KL, Welldaregay W. Baseline prevalence of heart diseases, hypertension, diabetes, and obesity in persons with acute traumatic spinal cord injury: potential threats in the recovery trajectory. *Top Spinal Cord Inj Rehabil.* 2013;19:172–82.
- Cragg JJ, Noonan VK, Krassioukov A, Borisoff J. Cardiovascular disease and spinal cord injury: Results from a national population health survey. *Neurology* 2013;81:723–8.
- Banerjee R, Sambamoorthi U, Weaver F, Maney M, Pogach LM, Findley T. Risk of stroke, heart attack, and diabetes complications among veterans with spinal cord injury. *Arch Phys Med Rehabil.* 2008;89:1448–53.
- Expert panel report: guidelines (2013) for the management of overweight and obesity in adults. *Obesity.* 2014;22:S41–410. <https://doi.org/10.1002/oby.20660>.
- Vissers M, van den Berg-Emons R, Sluis T, Bergen M, Stam H, Bussmann H. Barriers to and facilitators of everyday physical activity in persons with a spinal cord injury after discharge from the rehabilitation centre. *J Rehabil Med.* 2008;40:461–7.
- Scelza WM, Kalpakjian CZ, Zemper ED, Tate DG. Perceived barriers to exercise in people with spinal cord injury. *Am J Phys Med Rehabil.* 2005;84:576–83.

10. Kehn M, Kroll T. Staying physically active after spinal cord injury: a qualitative exploration of barriers and facilitators to exercise participation. *BMC Public Health*. 2009;9:168.
11. Stephens C, Neil R, Smith P. The perceived benefits and barriers of sport in spinal cord injured individuals: a qualitative study. *Disabil Rehabil*. 2012;34:2061–70.
12. Williams TL, Smith B, Papathomas A. The barriers, benefits and facilitators of leisure time physical activity among people with spinal cord injury: a meta-synthesis of qualitative findings. *Health Psychol Rev*. 2014;8:404–25.
13. Dryden DM, Saunders LD, Rowe BH, May LA, Yiannakoulis N, Svenson LW, et al. Utilization of health services following spinal cord injury: a 6-year follow-up study. *Spinal Cord*. 2004;42:513–25.
14. Miles AM, Huberman AM, Saldana J. *Qualitative data analysis: a methods sourcebook*. 3rd ed. Thousand Oaks, CA: SAGE Publications; 2013.
15. Braun V, Clarke V. Using thematic analysis in psychology. *Qual Res Psychol*. 2006;3:77–101.
16. Roberts K, Dowell A, Nie J-B. Attempting rigour and replicability in thematic analysis of qualitative research data: a case study of codebook development. *BMC Med Res Methodol*. 2019;19:66.
17. Castro MJ, Apple DF, Staron RS, Campos GE, Dudley GA. Influence of complete spinal cord injury on skeletal muscle within 6 mo of injury. *J Appl Physiol Bethesda Md*. 1985;1999:350–8.
18. Shea JR, Shay BL, Leiter J, Crowley, KC. Energy expenditure as a function of activity level after spinal cord injury: the need for tetraplegia-specific energy balance guidelines. *Front Physiol*. 2018;9. <https://www.frontiersin.org/articles/10.3389/fphys.2018.01286/full>.
19. Holla JFM, Akker LE, van den, Dadema T, Groot S, Tieland M, Weijs PJM, et al. Determinants of dietary behaviour in wheelchair users with spinal cord injury or lower limb amputation: perspectives of rehabilitation professionals and wheelchair users. *PLoS ONE*. 2020;15:e0228465.
20. Müller R, Peter C, Cieza A, Geyh S. The role of social support and social skills in people with spinal cord injury—a systematic review of the literature. *Spinal Cord*. 2012;50:94–106.
21. Hall L, Colantonio A, Yoshida K. Barriers to nutrition as a health promotion practice for women with disabilities. *Int J Rehabil Res*. 2003;26:245–7.
22. Gorin AA, Raynor HA, Niemeier HM, Wing RR. Home grocery delivery improves the household food environments of behavioral weight loss participants: results of an 8-week pilot study. *Int J Behav Nutr Phys Act*. 2007;4:58.
23. Wright L, Vance L, Sudduth C, Epps JB. The impact of a home-delivered meal program on nutritional risk, dietary intake, food security, loneliness, and social well-being. *J Nutr Gerontol Geriatr*. 2015;34:218–27.
24. Munt AE, Partridge SR, Allman-Farinelli M. The barriers and enablers of healthy eating among young adults: a missing piece of the obesity puzzle: a scoping review. *Obes Rev*. 2017;18:1–17.
25. Bailey K, Lenz K, Allison D, Ditor, D. Barriers and facilitators to adhering to an anti-inflammatory diet for individuals with spinal cord injuries. *Health Psychol Open*. 2018;5:1–11.