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A Qualitative Exploration of Social and Environmental Factors Affecting Diet and Activity in Knee Replacement Patients

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Abstract

Aims and objectives: This study examined perceived social and environmental barriers and facilitators for healthy eating and activity before and after knee replacement.

Background: Many patients undergoing knee replacement surgery are overweight or obese. While obesity treatment guidelines encourage diet and activity modifications, gaps exist in understanding social and environmental determinants of these behaviors for knee replacement patients. Identifying these determinants is critical for treatment, as they are likely amplified due to patients' mobility limitations, the nature of surgery, and reliance on others during recovery.

Design: This qualitative study utilized semi-structured interviews.

Methods: Twenty patients (M= 64.7±9.8 years, 45% female, 90% Caucasian, BMI 30.8±5.5 kg/m²) who were scheduled for or had recently undergone knee replacement were interviewed. Participants were asked to identify social and environmental factors that made it easier or harder to engage in healthy eating or physical activity. Deidentified transcripts were analyzed via constant comparative analysis to identify barriers and facilitators to healthy eating and activity. This paper was written in accordance with COnsolidated criteria for REporting Qualitative research standards.

Results: Identified social and environmental healthy eating barriers included availability of unhealthy food and attending social gatherings; facilitators included availability of healthy food, keeping unhealthy options 'out of sight,' and social support. Weather was the primary activity barrier, while facilitators included access to physical activity opportunities and social support.

Conclusions: Results provide salient factors for consideration by clinicians and behavioral programs targeting diet, activity, and weight management, and patient variables to consider when tailoring interventions.

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Relevance to clinical practice: Practitioners treating knee replacement patients would be aided by an understanding of patients' perceived social and environmental factors that impede or facilitate surgical progress. Particularly for those directly interacting with patients, like nurses, physiotherapists, or other professionals, support from health professionals appears to be a strong facilitator of adherence to diet and increased activity.

Keywords

knee replacement; health psychology; exercise intervention; eating; qualitative study

Introduction

Knee replacement is a surgical procedure to alleviate pain and stiffness and improve quality of life and physical function among adults with arthritis (Hawker et al., 1998; Dusat et al., 2015). Knee replacement utilization is increasing (Losina, Thornhill, Rome, Wright, & Katz, 2012), with 2010 estimates indicating nearly 4.7 million individuals in the United States had knee replacement (Maradit Kremers et al., 2015). In the United Kingdom, the lifetime risk of having knee replacement surgery in 2006 was approximately 8.1% for men and 10.8% for women, although this rate has increased over time (Culliford et al., 2012). In Canada, the number of knee replacement surgeries remains high and has increased by 15.5% over the past five years (Canadian Institute for Health Information, 2018).

Prior to surgery, most patients are overweight or obese and report concerns about pain and function from knee osteoarthritis (Fehring, Odum, Griffin, Mason, & McCoy 2007). Following surgery, many patients gain additional weight, despite documented improvements in pain and function (Fehring et al., 2007; Riddle, Singh, Harmsen, Schleck, & Lewallen, 2013). One estimate suggests nearly 66% of knee replacement patients gained weight (average 14 lbs.) in two years following surgery (Zeni & Snyder-Mackler, 2010). Such continued weight gain heightens risk for development of chronic conditions (e.g., cardiovascular disease) and the need for reoperation or joint revision (Saydah et al., 2012; Wagner, Kamath, Fruth, Harmsen, & Berry, 2016; Kerkhoffs et al., 2012).

Background

Two modifiable risk factors likely affecting patients' pre- and post-operative weight are inactivity and poor diet. Patients with knee osteoarthritis report lower levels of activity due to pain and functional limitations (Tonelli, Rakel, Cooper, Angstrom, & Sluka, 2011; Harding, Holland, Delany, & Hinman, 2014). Following surgery, when most patients have lowered pain and improved function, activity remains low, and is often unchanged from before surgery (Nilsson, Toksvig-Larsen, & Roos, 2009; Arnold, Walters, & Ferrar, 2016). This continued inactivity likely contributes to weight gain observed post-surgery. Fewer studies have evaluated the diet of knee replacement patients; however, a higher intake of total and saturated fats was associated with increased progression of knee osteoarthritis in one study (Lu et al., 2016). There may be a potential relationship between patients who progress to knee replacement and weight gain due to high dietary fat intake. Therefore,

understanding factors that influence diet and activity before and after knee replacement could help with long-term weight management.

The ecological model of health behavior, which postulates that behaviors are shaped by multiple levels of influence, may be useful for identifying and understanding these factors (McLeroy, Bibeau, Steckler, & Glanz, 1988; Sallis & Owen, 2015). Levels of influence include intrapersonal (e.g., attitudes), interpersonal (e.g., peers), institutional, community, and policy (McLeroy et al., 1988; Sallis & Owen, 2015). Identified intrapersonal barriers and facilitators influencing diet and activity among a sample of knee replacement patients included motivation levels, pain and physical limitations (Pellegrini, Ledford, Chang, & Cameron, 2017). However, it should be acknowledged that post-operative recovery is lengthy and involves multiple caregivers and interactions with the healthcare system. Therefore, factors in the ecological model outside the individual are also likely to influence diet and physical activity. The influence of social and environmental barriers and facilitators (which could be interpersonal, institutional, community or policy level) on diet and activity behaviors in the knee replacement population remains unknown.

Among those with knee osteoarthritis, both the social network and physical environment influence physical activity, through factors like social support and ideal weather (Stubbs, Hurley, & Smith, 2015). These factors may be exacerbated among knee replacement patients, as they experience mobility limitations and increased reliance on others to assist with activities of daily living before and after surgery (Johnson, Horwood, & Gooberman-Hill, 2016). For example, following surgery, approximately 34% of patients are discharged to a skilled nursing or inpatient rehabilitation facility before returning home (Schairer, Vail, & Bozic, 2014). While at a rehabilitation facility, patients may be limited to meals and physical activity opportunities provided there. Likewise, patients who return home immediately after surgery may rely on others for assistance in getting around or cooking until they regain sufficient function and mobility to engage in these activities.

As part of a larger study designed to investigate patient motivations for knee replacement, multi-level factors that influence health behaviors, and preferences for a weight loss program, we specifically sought to examine social and environmental barriers and facilitators to healthy eating and activity among this population. Collectively, these results will help to inform a future weight management intervention that will be created for a knee replacement population. Identifying potential barriers and facilitators for diet and activity will assist in pinpointing possible factors that could be targeted in future weight management interventions for knee replacement patients.

Methods

Design

We designed a qualitative study to explore patient-reported factors that influenced healthy eating and activity behaviors pre- and post-knee replacement. Individual semi-structured interviews, using an interview guide developed using an interpretivist research paradigm, allowed us to explore patient perceptions derived from their own previous experiences

(Bunniss & Kelly, 2010). The interview guide included probes specific to multiple levels of influence, including social and environmental factors.

Ethical Consideration

Eligible participants provided informed consent prior to undergoing study procedures, which were approved by the Northwestern University Institutional Review Board.

Data Collection

Patients between the ages of 40–79 who were scheduled for (next three months) or who had recently (within last three months) undergone knee replacement were recruited using several strategies. First, staff, nurses, and surgeons partnering on the study identified potential participants from two orthopaedic centers and two orthopaedic rehabilitation centers located in the Midwest region of the United States. Participants who expressed interest were provided with recruitment postcards or were contacted via phone or email by study staff. Second, participants were recruited using social media and posting recruitment materials on websites for knee replacement patients. There were no exclusion criteria; thus, patients who met the eligibility criteria (e.g., age 40–79 years and scheduled/completed knee replacement within 3 months) were invited to participate in an interview to learn more about the patient experience of knee replacement before and after surgery to assist in building future interventions to target both diet and physical activity in this patient population. All participants provided written informed consent.

Demographic information was obtained via a paper or online survey. Following survey completion, semi-structured interviews were conducted in-person or via telephone, based on participant preference and location. One interview was completed with each participant. Interviews were digitally audio recorded for analysis, and lasted approximately 40–60 minutes. Two female team members (GL & CP), trained in qualitative methods conducted the interviews. A semi-structured interview guide was developed which included target and probing questions. This analysis focuses on when participants were asked to identify *social and environmental factors* that made it easier or harder to engage in healthy eating or physical activity. Healthy eating and physical activity were not defined to participants and they were instructed to use their own interpretation when responding to subsequent questions. This approach was taken to try not to influence participants' responses to what they believed was healthy related to eating and physical activity behaviors. For example, participants were asked: "Who, if anyone, has had an effect on your ability to engage in [participant definition of physical activity]?" with relevant probes to ask about social barriers and facilitators to physical activity, and "If at all, how does your environment (i.e., home) make it easier for you to engage in [participant definition of physical activity]?" to ask about environmental barriers and facilitators. Pre-surgery participants were asked to reflect on their current perceived barriers and facilitators to healthy eating and activity, while post-surgery participants were asked about these perceptions following surgery.

Analysis

All interviews were digitally recorded, deidentified, and transcribed. Coding was completed using the constant comparative method of analysis (Lincoln & Guba, 1985; Seidman, 2006);

coded transcripts were entered into Dedoose (version 6.2.7) to organize identified barriers and facilitators. Three members of the study team (GL, KC, & CP) independently reviewed two transcripts and identified initial codes. The group met to review identified barriers and facilitators to healthy eating and physical activity, initially categorizing emerging codes modified but guided by the ecological model for health promotion (McLeroy et al., 1988) and ecological model for active living (Pellegrini et al., 2017; Sallis & Owen, 2015). Next, three team members (SH, GL, & CP) reviewed remaining transcripts, specifically coding identified barriers and facilitators identified as either social or environmental until consensus was reached. This paper was written in accordance with the COnsolidated criteria for REporting Qualitative research (COREQ) checklist (Tong, Sainsbury, & Craig, 2007).

Results

Twenty participants were approached and ($M=64.7\pm9.8$ years, 45% female, 90% Caucasian, Non-Hispanic (100%), BMI 30.8 ± 5.5 kg/m²) completed interviews. Approximately half (55%) were scheduled for surgery in the next three months; 45% completed surgery within the past three months (Table 1). Upon analysis, several social and environmental barriers and facilitators for healthy eating and physical activity emerged.

Barriers to healthy eating

Participants reported numerous factors that they perceived to interfere with their ability to eat healthy both before and after knee replacement. Environmental barriers, included factors such as the physical setting and surroundings of the individual, whereas social barriers to healthy eating comprised those relevant to interaction with others, such as family and friends.

Environmental level.—The most common environmental barrier was the availability of unhealthy food. Specifically, participants indicated difficulty when tempting foods were available in restaurants, work, and rehabilitation facilities. One participant reported: ‘...at [facility], they have a cart that comes around in the middle of the afternoon...they have these [brand] cookies...I can’t resist’ (#004, post-op, female). Another participant who struggled at work indicated: ‘...we have candy dishes everywhere [at work] and everybody’s got food in the lounge. And there are always bad foods available. So that makes it really hard’ (#016, pre-op, female).

Social level.—Identified social barriers to healthy eating included gatherings and group norms (e.g., family habits). As one participant described, ‘Wherever you go there’s always alcohol involved or barbeque. So what are you gonna say, I am not gonna have that hamburger you’re grilling today, where’s the salad?’ (#002, pre-op, male). Others referenced family dynamics around food: ‘My mom will send over...milk chocolate and then on Paczki Day she had to get like a dozen paczkis [Polish pastries]...’ (#015, post-op, female). Spousal dynamics were also discussed: ‘My husband loves to cook, and he does pretty well, but he doesn’t cook the way I would cook...So sometimes there will be things that I would not have normally eaten’ (#019, pre-op, female).

Facilitators for healthy eating

Participants, both before and after knee replacement, reflected on various factors that helped them eat healthier foods and avoid unhealthy items. Many identified facilitators were again relevant either to the environment or physical context and setting, or social interactions and experiences.

Environmental level.—At the environmental level, the most common facilitator for healthy eating was availability of healthy food within participants' main surroundings (e.g., home). One participant reflected:

Since the knee replacement, I've probably been eating even more healthfully because I've been home too much. The temptations for bad eating seems to me to be like fast food for lunch or out to breakfast where I might have eggs, potatoes and some bacon or something. But since I've been home so much, I'm eating more healthfully (#007, post-op, male).

Those who proceeded to a rehab facility after surgery discussed structured dietary choices that facilitated better eating: 'When I don't see anything that's interesting on the menu, I can just write in a side salad. Their side salads are a good size and very nutritious' (#004, post-op, female). Participants also referenced the concept of 'out of sight, out of mind,' describing the decision to not buy unhealthy foods to prevent temptation: 'It's the sweets ... and as long as they're not in my house I don't eat 'em' (#001, pre-op, male).

Social level.—Support from others was mentioned by the majority of participants as a facilitator for healthy eating. One participant reported spousal support through a shared commitment to a healthy lifestyle: 'My wife and I are very much encouraging one another... she's eating the same, to support me...helping me stay on track...not influencing me to make the wrong choices...we're working together' (#005, post-op, male). In other cases, while still noted as helpful, spousal supports were directive: 'My wife is always telling me I should eat more fruit and vegetables, stop eating hot dogs' (#003, post-op, male). Other participants highlighted support for eating healthy from healthcare professionals: 'Actually, one of the home health nurses said eat small meals throughout the day. Now, whether it be crackers or string cheese, just little things, and making sure that I have enough protein during the day, too; because that will help speed my recovery' (#013, post-op, female).

Barriers to physical activity

Overall, participants did not identify significant and consistent environmental barriers to physical activity. In addition, we did not identify specific or consistent social barriers that participants perceived hindered their ability to be physically active either before or after knee replacement.

Environmental level.—Although identified environmental factors were mentioned less consistently than environmental barriers to healthy eating, one environmental barrier to physical activity mentioned by multiple participants was weather: 'The hardest thing I found was transitioning from summer, spring, summer and fall to winter...to find something that you could do in the middle of the winter that was going to give you the same kind of mental

joy that the walking did' (#009, pre-op, female). The few other environmental barriers mentioned were fairly individualized, including dislike of gyms, concern of walking on hardwood floors, or change of environment and priorities while traveling: 'When you travel...you're on a different routine...you don't go to London to go to work out' (#008, pre-op, male).

Facilitators to physical activity

Whereas only environmental factors emerged as barriers to physical activity, participants identified both social and environmental factors that helped them engage in physical activity before or after surgery.

Environmental level.—The majority of participants discussed increased access to indoor and outdoor physical activity opportunities as environmental facilitators: 'I have a fairly big piece of property here and I enjoy working outside...Mowing lawns, digging holes, watering, taking care of the garden' (#017, pre-op, male). Within the home, access to exercise equipment helped facilitate activity: 'I do have some exercise equipment here at home...I do have my bicycle in my bedroom. I am actually using that even now during the early stages of my recovery' (#012, post-op, female). For some, the home arrangement also facilitated movement: 'With probably 20 stairs going up and down from upstairs and I could go up and down those stairs maybe ten times a day especially on the weekends.' (#002, pre-op, male).

Social level.—Supportive healthcare professionals were identified across the continuum of care as a central social facilitator for physical activity, including personal trainers, therapists, and surgeons. One participant discussed the influence of a healthcare professional's recommendation on her understanding of why physical activity is important: '...the [physical] therapist recommends that I do get up periodically, walk, stretch and do a little exercise. That's the one thing that has influenced me...I try to do that every hour, get up, walk around, moving. I don't want to get atrophied' (#012, post-op, female).

Support from other non-healthcare professionals was also a common physical activity facilitator. One participant mentioned spousal participation in workouts: 'My husband encourages me...He goes with me over there [gym]...he'll do the half hour right next to me with me and then do the machines with me' (#016, pre-op, female). Another participant mentioned his family's collective effort to provide reminders for activity: 'making sure...I don't sit too long, tell me to get up, walk around, or...just to do something – you know, do some of my exercises' (#006, post-op, male).

Discussion

Study results confirm barriers and facilitators for healthy eating and physical activity exist in knee replacement patients at multiple levels of the social ecological model, in particular in both environmental and social contexts. Primary barriers to healthy eating included availability of unhealthy foods and attending social gatherings, whereas facilitators included having healthy foods available, keeping unhealthy foods 'out of sight,' and social support. Though fewer participants identified barriers to physical activity, the most commonly

identified environmental barrier was weather; access and social support emerged as physical activity facilitators. Identifying these factors is crucial for developing strategically tailored interventions for weight management for knee replacement patients.

Regarding the environment, availability and access emerged as critical determinants. Participants consistently described that access to healthy food facilitated healthy eating, whereas the opposite created barriers. Similarly, participants reported having access to indoor and outdoor opportunities made being active easier, both before and after surgery. These findings are consistent with previous literature highlighting strong associations between availability and accessibility with physical activity or eating behaviors in the general population (Humpel, Owen, & Leslie, 2002; French, Story, & Jeffery, 2001; Hill & Peters, 1998).

Of interest, when asked to specifically identify environmental barriers to physical activity, fewer participants provided examples of environmental versus social challenges. For those participants who identified environmental barriers for physical activity, weather was one of the few that emerged. This response was not surprising, as most participants lived in the Midwest region of the United States and interviews were conducted in fall and winter. Poor weather conditions (e.g., ice) have been associated with decreased exercise in the general population (Merrill, Shields, White, & Druce, 2005; Tucker & Gilliland, 2007). Furthermore, among older adults, colder temperatures are linked with lower levels of physical activity (Witham et al., 2014; Timmermans et al., 2016). Knee replacement patients, who might have additional barriers and functional limitations (e.g., poor balance, assistive devices), may need to explore indoor alternatives to activity during inclement weather.

Perceived social support from peers and professionals emerged as a facilitator for healthy eating and physical activity. This outcome is consistent with data from many populations, wherein higher levels of social support lead to increased physical activity and healthy eating behaviors (Troost, Owen, Bauman, Sallis, & Brown, 2002; Wang, Pbert, & Lemon, 2014; Coleman, Berg, & Thompson, 2014). Further, both directive (i.e., the supporter takes an active role in facilitating behavior) and non-directive (i.e., the supporter responds to the expressed need and responds accordingly) styles of support from others were mentioned by participants during interviews (Everard, Lach, Fisher, & Baum, 2000; Ware, Kosinski, & Keller, 1996). While these styles of support differ, they can both be conceptualized as “socially supportive” interactions; in fact, participants perceived both styles as helpful (Everard et al., 2000; Ware et al., 1996).

Although directive support from professionals (e.g., physiotherapists) may at first seem to fall under the conceptualization of “clinical care” as opposed to “social support,” these interactions were still consistently mentioned as supportive by patients in response to questions about social factors, and were therefore included in the analysis. To our knowledge, we are unaware of any literature highlighting social support from healthcare professionals among patients after knee replacement, but healthcare professionals have been shown to provide social support to other patient populations and their families (Lovatt et al., 2015; Herber & Johnston, 2013; Akey & Rintamaki, 2014).

Conversely, social interactions and gatherings interfered with healthy eating, a barrier previously identified among non-knee replacement patients (James, 2004; Garcia, Sykes, Matthews, Martin, & Leipert, 2010). Encouraging patients to bring healthy foods to events, redirecting focus of gatherings away from unhealthy foods, and talking to others about eating and activity-related goals may be effective strategies for these patients (Hill & Peters, 1998).

Unlike healthy eating, participants did not report any consistent social factors that interfered with physical activity either before or after knee replacement. Rather, social factors were more commonly identified as facilitating activity, especially professional support from healthcare workers. This finding suggests future interventions for this population should involve targeted appeals to healthcare teams to promote physical activity among their patients. For patients past the recovery period, additional strategies could be explored, such as encouraging patients' family or friends to be supportive of physical activity. Furthermore, targeting ways to increase social support from non-professionals could have implications for healthcare costs. Waimann et al. (2016) recently observed associations between BMI, anxiety, and healthcare costs and predicted knee replacement patients with obesity, low support, and high anxiety would have double the healthcare costs of patients with a BMI < 30 kg/m², high support, and no anxiety. In this way, reducing weight via a weight management program and improving social support may help to lower knee replacement costs.

To our knowledge, this is the first study to qualitatively examine social and environmental barriers and facilitators to healthy eating and physical activity in patients pre- and post-knee replacement. The semi-structured interview allowed for probing specific to social and environmental barriers and facilitators. This led to identification of factors perceived to influence health behaviors in this population beyond the intrapersonal barriers, such as pain, which have already been discussed elsewhere (Pellegrini et al., 2017). Limitations of the study include that the majority of participants lived in an urban location in the Midwest of the United States, were predominantly Caucasian, and were highly educated. These results may differ from a more diverse sample, particularly as there is evidence that non-Caucasian individuals may have lower levels of social support, which could differently affect functional outcomes (Vina et al. 2013). Further, we do not have any information regarding participants' marital or living status. Participants were also recruited from a large urban city with multiple modes of public transportation, which might explain the lack of environmental barriers discussed. Additionally, participants were within 3 months of surgery; thus, it is likely that participants may not have resumed their typical routines yet, either waiting to do so until after their surgery or not yet resuming activity as they were still in the recovery process. The results may not be generalizable to patients who had the surgery past 3 months ago or with individuals with other disabilities. Lastly, participants were able to use their own definition of healthy eating and physical activity and it is likely that some of the results may differ if specific definitions were provided.

Relevance to Clinical Practice

Researchers and healthcare professionals may consider assessing identified barriers and facilitators among their knee replacement patients to allow for tailoring of behavioral interventions and discussions regarding promotion of healthy behavior changes.

Conclusion

Study results provide an overview of social and environmental barriers and facilitators to healthy eating and physical activity as identified by knee replacement patients. Encouraging positive changes to patients' environments and finding opportunities to increase social support could help patients adopt healthy eating and physical activity behaviours, which may lead to better long-term functional outcomes following knee replacement.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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What does this paper contribute to the wider global clinical community?

- Social and environmental barriers and facilitators to diet and physical activity have not yet been examined in patients pre- and post- knee replacement.
- This study provides an understanding of the perceived social and environmental barriers and facilitators to healthy eating and physical activity among patients either before or after undergoing total knee replacement.
- Practitioners should be aware of patients' identified social and environmental factors that influence diet and activity, as they may play an important role with the patients' recovery following total knee replacement.

Table 1.

Participant characteristics

	Pre-Surgery (n=11)	Post-Surgery (n=9)	Overall (n=20)
Age, no. (%)			
< 65 years	4 (36.4%)	4 (44.4%)	8 (55%)
65 years	7 (63.6%)	5 (55.6%)	12 (45%)
Body Mass Index, no. (%)			
Normal (18.5–24.9 kg/m ²)	1 (9.1%)	2 (22.2%)	3 (15%)
Overweight (25–29.9 kg/m ²)	3 (27.3%)	3 (33.3%)	6 (30%)
Obese (25–29.9 kg/m ²)	7 (63.6%)	4 (44.4%)	11 (55%)
Sex, no. (%)			
Male	6 (54.5%)	5 (55.6%)	11 (55%)
Female	5 (45.5%)	4 (44.4%)	9 (45%)
Race, no. (%)			
White	10 (90.9%)	8 (88.9%)	18 (90%)
Black	1 (9.1%)	1 (11.1%)	2 (10%)
Education, no. (%)			
High school	0 (0%)	1 (11.1%)	1 (5%)
Vocational training	0 (0%)	1 (11.1%)	1 (5%)
Some College	2 (18.2%)	2 (22.2%)	3 (15%)
College/University degree	0 (0%)	2 (22.2%)	4 (20%)
Graduate or professional degree	8 (72.7%)	3 (33.3%)	11 (55%)
Current Employment Status, no. (%)			
Yes	7 (63.6%)	4 (44.4%)	11 (55%)
No	4 (36.4%)	5 (55.6%)	9 (45%)
Self-Reported Medical Conditions, no. (%)			
Cardiovascular disease	2 (18.2%)	3 (33.3%)	5 (25%)
Hypertension	2 (18.2%)	0 (0%)	2 (10%)
Diabetes	0 (0%)	2 (22.2%)	2 (10%)
Gastroesophageal reflux disease	1 (11.1%)	1 (11.1%)	2 (10%)