









Formulating Knee Osteoarthritis Management Plans Taking Type 2 Diabetes Into Account: Qualitative Study of Arthritis Therapists Using Theoretical Domains Framework

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ABSTRACT. *Objective.* Delivering person-centered care in individuals with knee osteoarthritis (OA) necessitates consideration of other chronic conditions that frequently co-occur. We sought to understand the extent to which arthritis therapists consider type 2 diabetes mellitus (T2DM) when treating persons with knee OA and concomitant T2DM, and barriers to doing so.

Methods. We conducted 18 semistructured telephone interviews with arthritis therapists working within a provincially funded arthritis care program (Arthritis Society Canada) in Ontario, Canada. We first analyzed interviews deductively using the Theoretical Domains Framework (TDF) to comprehensively identify barriers and enablers to health behaviors. Then, within TDF domains, we inductively developed themes.

Results. We identified 5 TDF domains as prominently influencing the behavior of arthritis therapists considering concomitant T2DM when developing a knee OA management plan. These were as follows: therapists' perceived lack of specific knowledge around comorbidities including diabetes; the lack of breadth in skills in behavioral change techniques to help patients set and reach their goals, particularly when it came to physical activity; variable intention to factor a patient's comorbidity profile to influence their treatment recommendations; the perception of their professional role and identity as joint focused; and the environmental context with lack of formalized follow-up structure of the current Arthritis Society Canada program that limited sufficient patient monitoring and follow-up.

Conclusion. Within the context of a Canadian arthritis program, we identified several barriers to arthritis therapists considering T2DM in their management plan for persons with knee OA and T2DM. These results can help inform strategies to improve person-centered OA care and overall health outcomes.

Key Indexing Terms: comorbidity, knee osteoarthritis, physical activity, physical therapy, qualitative, type 2 diabetes

Community osteoarthritis (OA) care in Canada is delivered in a number of settings and by different health care providers. In Ontario, the Arthritis Society Canada Arthritis Rehabilitation and Education Program (AREP) provides provincially funded

services delivered by a team of trained physical therapists (PTs) and occupational therapists (OTs), with cross-disciplinary training in arthritis care, at no cost to patients.¹ These arthritis therapists care for approximately 6000 individuals with OA each

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year through 1-on-1 assessments, with many more attending group classes. The program focuses on enabling self-management through education, therapeutic exercise, and physical activity advice, in addition to other treatments individualized to patient needs. Given the high and rapidly rising prevalence of this chronic painful and disabling condition,² and lack of universal healthcare coverage for allied health services such as physical therapy and occupational therapy in Canada, AREP provides important and accessible OA care.

An increasing number of Canadians are living with multimorbidity,³ defined as the presence of 2 or more chronic conditions. Because of shared risk factors, more than three-quarters have at least one other chronic condition that significantly affects their life.^{4,5} Given that OA rarely occurs in isolation, it behooves the arthritis community to consider comorbidity as part of the delivery of person-centered OA care. For example, type 2 diabetes mellitus (T2DM) co-occurs in 14% of people with OA,⁶ and pain and mobility limitations secondary to OA may challenge the ability of a person with T2DM to engage in physical activity for diabetes self-management.⁷ Behavioral modification and physical activity are prioritized as first-line management strategies for both conditions. Given that knee OA treatment guidelines strongly recommend physical activity/exercise for OA management,⁸ prescribing physical activity for OA that also aligns with fulfilling diabetes recommendations is a parsimonious, person-centered approach to optimizing overall health.^{9,10} Diabetes Canada recommends at least 150 minutes of moderate-to-vigorous-intensity aerobic exercise each week and resistance exercises 2 to 3 times a week,¹¹ although there is no minimum level of physical activity required to achieve health benefits.^{12,13}

The current study sought to understand the extent to which Arthritis Society Canada arthritis therapists consider T2DM when completing an assessment and formulating a knee OA treatment plan for persons with knee OA and concomitant T2DM, and to understand any barriers to doing so using the lens of the Theoretical Domains Framework (TDF).^{14,15} Our study focused on the comorbidity of T2DM, given that it is a complex chronic disease that frequently coexists in persons with knee OA.⁶

METHODS

Design. This study was informed by the methodology of qualitative description.¹⁶ We conducted semistructured interviews with Arthritis Society Canada arthritis therapists between September and December 2020. We followed guidance by Atkins et al¹⁵ on the collection and analysis of qualitative data using the TDF, an implementation science framework that incorporates a range of theoretical constructs to comprehensively identify determinants of behavior (Supplementary Table S1, available with the online version of this article).¹⁴ This includes incorporating TDF domains in the interview guide, data coding to TDF domains, generating themes within each domain relevant to the behavior of interest, and presenting findings through the TDF lens. We conducted this qualitative study within the first phase of developing a complex intervention¹⁷ to improve diagnosis and treatment of knee OA in persons with T2DM, and alongside interviews with other stakeholder groups (patients with knee OA and T2DM, T2DM healthcare providers) that will be published separately.

This study was approved by research ethics boards at the Women's College

Hospital (2019-0170-E) and the University of Toronto (#00039525). We followed the Consolidated Criteria for Reporting Qualitative Studies guidelines for reporting qualitative research.¹⁸

Study setting. The healthcare system in Ontario is publicly funded and privately administered. The Ontario Health Insurance Plan provides coverage for most medical and emergency services provided in Ontario. However, it does not provide universal financial coverage. For example, physiotherapy for those who are not on social assistance and/or aged < 65 years are paid for out-of-pocket by patients.

Arthritis Society Canada is a not-for-profit, nongovernmental organization in Canada that seeks to elevate arthritis awareness, education, and research. Within the province of Ontario, Arthritis Society Canada is directly involved in the provision of arthritis care through AREP. Persons with arthritis can receive a physician referral or self-refer to access a range of arthritis services. AREP is delivered by PTs and/or OTs who receive additional arthritis training; both disciplines function as primary arthritis therapists.¹⁹ The program also includes social work services that can be accessed as needed.

Sampling. We recruited participants through email invitations sent to arthritis therapists across Ontario. We aimed to interview arthritis therapists from across Ontario and with different levels of experience. We stopped data collection when additional interviews provided no new insights into our research question. Prior to conducting each interview, participants provided verbal and written informed consent.

Data collection. The behavior of interest for the current study was considering concomitant T2DM when formulating a knee OA treatment plan. This was defined as any consideration of T2DM in patient assessment or delivery of care. We also asked more broadly for participants' perspectives on integrating comorbidity with OA management. We focused on the management of knee OA because of its epidemiologic links with T2DM outcomes^{20,21} and as knee OA accounts for most OA-related disability.²² Participants were asked their age range, gender, professional discipline (OT/PT), and years in clinical practice. Our interview guide is shown in Supplementary Table S2 (available with the online version of this article).

One member of the research team conducted all semistructured telephone interviews (EJW, PT and OA researcher). The interviewer was not known to the participants. Interviews lasted 30 to 45 minutes, were audio-recorded, and the recordings were professionally transcribed verbatim and anonymized prior to analysis. Data were organized using NVivo 12 software (QSR International Pty Ltd).

Data analysis. Interview transcripts were analyzed using content analysis,²³ applying TDF domains in a deductive manner and considering all domains.¹² All members of the analytic team (LKK, EJW, IS, GAH) initially coded the same 2 transcripts and met to compare and discuss coding decisions. When coding disagreement occurred, areas of difference were resolved through discussion and review of the original transcripts. Once there was agreement on how to apply codes, the remainder of the transcripts were divided among the analytic team to code separately.

We then conducted thematic analysis²⁴ of data coded within each TDF domain to inductively develop themes.¹² Themes reflected prominent behavioral determinant(s) that we identified across multiple interviews within each domain. Themes were developed by 1 researcher (LKK) and reviewed with the rest of the analytic team and alternative interpretations were explored. In addition to following guidance by Atkins et al,¹⁵ rigor was enhanced using multiple analysts, analytic memos, and a research audit trail.²⁵

RESULTS

We interviewed 18 arthritis therapists (10 PTs, 8 OTs), of whom all were women, 8 (44.4%) were aged < 50 years, 5 (27.8%) had fewer than 10 years in clinical practice, with practice locations distributed across urban, suburban, and rural settings (Table 1).

Table 1. Characteristics of arthritis therapists (n = 18).

	n (%)
Gender, woman	18 (100)
Age, yrs	
20-29	1 (5.5)
30-39	4 (22.2)
40-49	3 (16.7)
50-59	5 (27.7)
60-69	3 (16.7)
70-79	2 (11.1)
Designation	
PT	10 (55.6)
OT	8 (44.4)
Yrs in practice	
0-9	5 (27.8)
10-19	2 (11.1)
20-29	2 (11.1)
≥ 30	9 (50)
Practice location	
Urban	8 (44.4)
Suburban	6 (33.3)
Rural	4 (22.2)

OT: occupational therapist; PT: physical therapist.

We identified 5 TDF domains as relevant to arthritis therapists considering concomitant T2DM when formulating a knee OA treatment plan. We present inductively developed themes within each of the relevant domains below, with illustrative quotes. Additional quotes are presented in Table 2.

Domain: Knowledge.

Theme: Lack of specific knowledge limits greater consideration of comorbidities.

All arthritis therapists recognized the high prevalence of comorbidities in their patients with knee OA. T2DM and other cardiometabolic diseases were noted by many to be the rule rather than the exception. Many perceived that this posed a greater challenge for OA management.

“Yeah, because it’s [osteoarthritis is] not as simple as someone coming in and they have a rotator cuff strain... I think the patients are a bit more complex in terms of their comorbidities, and almost all of them have several chronic health issues.” (ID 11)

Despite frequently seeing T2DM in their patients with OA, most arthritis therapists did not feel they had sufficient knowledge to provide guidance about how OA treatment might best integrate with T2DM management. Most had a general understanding about the importance of physical activity and weight management to T2DM, but without depth of knowledge,

Table 2. Relevant TDF domains with inductive themes and additional illustrative quotes.

TDF Domain	Theme	Illustrative Quote
Knowledge	Lack of specific knowledge limits greater consideration of comorbidities	Then, if we’re looking at somebody [with diabetes] that’s inactive currently, I advise them to speak to their family physician before they start any new activity-based program. That’s to kind of cover my butt, because I’m not comfortable with the management of it. It’s just sort of like, I don’t want to throw everything out of whack in your sugars if you’re used to not doing any activity. So, just check. (ID 05) I find that people that are overweight have other issues. I can’t go open that can of worms because I don’t know what to do with it. (ID 17)
Skills	Lack of breadth of skills in behavioral change techniques to sufficiently tackle the added challenge of comorbidity	Not really, because I’ve never done them [behavior change techniques], so I would say not familiar. Whether I learned them at some point in my undergrad 15 years ago, but I don’t use them, so I would say I’m not familiar with them (ID 11) Yeah, we have definitely done some stuff around that. I definitely try to do some of that. To be perfectly honest, there are probably people in the group that maybe are better at it than me, but I do make an effort. (ID 01)
Professional role and identity	Perceived role focused on joint health	I guess it goes hand in hand [OA and diabetes]. We’re dealing with people with age-related changes, OA, they may be overweight. Yeah, I do think we have a role. We talk about weight loss. I certainly bring in healthy eating too and refer them on to dieticians if necessary. Yeah, I do think we have a role, but I guess our focus is primarily the arthritis, right, whereas the doctors are focusing on the diabetes. (ID 14)
Intention	Variable intention to factor comorbidity into OA management plan	I don’t think it [diabetes] maybe majorly changes the way I would recommend activity. Of course, it would be in consideration, but in terms of my knee OA management, I must say I don’t think it would make a huge difference in terms of recommendations. (ID 07) I think I absolutely take that [comorbidities] into consideration because there’s a lot of various conditions that people with diabetes will have, that can get mixed up in arthritis. (ID 12)
Environmental context and resources	Existing AREP program limits provision of longitudinal OA care	But probably on average I would see a normal OA case twice. (ID 13) I think it just gives you more credibility and makes them more accountable if they know that someone is checking in on them. (ID 18)

AREP: Arthritis Rehabilitation and Education Program; OA: osteoarthritis; TDF: Theoretical Domains Framework.

many stepped away from integrating comorbidity into management plans. Some arthritis therapists described how this lack of knowledge led to concerns they might inadvertently cause the patient harm.

“If I understood that a bit better, then I might be able to communicate that [importance of weight management] to them better. That would be useful, and I guess I would probably need some information on whether or not I’m supposed to be modifying the physical activity, depending on whether or not they have diabetes, because I don’t think I really have up until now.” (ID 01)

“So what’s challenging for me is I don’t want to say or do the wrong thing....” (ID 18)

Arthritis therapists spoke about potential benefits of increasing their knowledge to integrate patients’ comorbidity into how they formulate their management plan.

“I would definitely feel more comfortable having more education around how diabetes in general is managed and the different medications and that sort of thing, as well as the impacts of exercise on that.” (ID 05)

Domain: Skills.

Theme: Lack of breadth of skills in behavioral change techniques to sufficiently tackle the added challenge of comorbidity.

Although AREP does not provide formal training in behavioral change techniques (BCTs), all arthritis therapists understood the concept of BCTs and saw their potential to enhance OA care, particularly for those patients with other complex chronic conditions that were perceived to make engaging in exercise/physical activity more challenging. All arthritis therapists described providing individualized action planning and goal setting, incorporating these specific BCTs whether intentionally or not. For most arthritis therapists, few other BCTs were used. Several arthritis therapists described unfamiliarity and lack of confidence with use of a breadth of BCTs.

“It’s probably more something that I’ve heard of as opposed to used.” (ID 05)

A few arthritis therapists described using a more expansive repertoire of BCTs, which they had picked up through prior work experiences and/or self-directed learning.

“I do have my Bachelor of Education, so I think that probably helps in terms of creating goals, etc. In physio school, it’s somewhat talked about, for sure, but I think a lot of that, for me, has come more from my BEd.” (ID 07)

“I actually use health coaching, I’ve spent a fair bit of time in my latter career, really, learning that cool technique of health coaching. I ask them, I try and get them to identify what they think they should do, and get it down to something that’s manageable, that they feel they can succeed at, if that makes sense.” (ID 12)

Those without substantive existing skills in BCTs saw further training in this area as an opportunity to enhance provision of OA care.

“I was just talking with my director recently about how I want to take a course on this [behavioral change strategies]. Because I think it’s so important, and, you know, it’s an

important skill in working with these patients. So, I don’t feel mine is great and I definitely want to work towards that.” (ID 03)

Domain: Professional role and identity.

Theme: Perceived role focused on joint health.

Few arthritis therapists saw their role as optimizing patients’ overall health. Most arthritis therapists identified their role as knee joint–centered; they did not feel that it was within their scope of care to consider patients’ comorbidities and have those influence their treatment recommendations.

“I would say probably I would ... especially in this particular job, I don’t think that it would be my role [to optimize concomitant diabetes in patients with OA].” (ID 12)

“...You have to remember as a physio myself my strength is biomechanics and how people move.” (ID 02)

Even those who recognized the clear influence of patients’ multiple conditions on one another did not see themselves as having a role in integrating patient comorbidities into their recommendations, limiting attention to whole person health.

“So we talk about it [comorbidities such as diabetes] a little bit, we don’t, you know, that’s not my area of expertise so I don’t go into great detail, but that is something that we talk about.” (ID 03)

Domain: Intention.

Theme: Variable intention to factor comorbidity into OA management plan.

All arthritis therapists described conducting comprehensive intake assessments with their patients in which coexisting conditions and medications were assessed. However, arthritis therapists described variability in how this information on comorbidities was used. Some arthritis therapists described no intention for comorbidities to factor into treatment recommendations. This was linked to perceived low expertise in other conditions such as T2DM, and not feeling like they were in a position to address overall health.

“I think I currently just ignore that piece [comorbidity]. If they tell me they’ve got diabetes, I just write it in their medical history part and I don’t address it, or have it influence any of my recommendations, really. So, if I were to need anything, probably it would be education, if there are ways that knowing they have diabetes should be influencing my recommendations, because I just wouldn’t even know.” (ID 13)

Others intended to make their provision of OA education relevant to patients’ other chronic conditions. Although comorbidities would not factor into specific OA recommendations, comorbidities such as T2DM would be used to frame their recommendations.

“I think, yes, in the sense that I can tell them that exercise would help manage their diabetes, and a lot of the things that go with that, so let’s say their high cholesterol or something like that. Yes, from an education piece, yes.” (ID 11)

By contrast, a few arthritis therapists did intend their OA recommendations to align with patients’ chronic conditions,

describing a holistic approach to OA care that sought to optimize overall health and well-being.

“If it’s [diabetes] really not under control, then I would probably try to spend a little bit of time explaining how blood sugar, the insulin response and the effect of sugar on the body, is known to cause some of that increased inflammation and joint pain, so trying to make them understand the link in-between joint pain and their diabetes.” (ID 01)

Domain: Environmental context and resources.

Theme: Existing AREP program limits provision of longitudinal OA care.

Arthritis therapists described the current mandate of the AREP program as self-management and education. They would see individuals with OA in a 1-on-1 consultation typically once or twice, and this limited involvement in care precluded therapeutic investment toward optimizing long-term health outcomes. Arthritis therapists typically provided a self-management plan but did not monitor, adjust, or titrate recommendations. Without a formal directive regarding the number of patient follow-up visits, arthritis therapists tended to limit the number of times patients would be seen.

“Or when it’s coming to exercises or increasing exercise, I say, what do you think is a realistic starting point for completing these exercises, what can you see yourself realistically doing, to try to get them more involved. And so, we set something specific, and then I remind them that at our follow-up call I will be asking about it. But I don’t think we’re well-suited for long-term accountability. It works for our first follow-up, but I’m not going to book another follow-up just for accountability.” (ID 13)

The focus of the AREP program did not align with what most arthritis therapists saw as the care that should be delivered to individuals with OA and T2DM. The program was not structured in such a way to develop a long-term patient relationship and support individuals in a lifestyle change.

“I’m not sure [that current model of education and self-management is sufficient] because we don’t [follow-up] ... because our mandate is to educate, self-management. We don’t follow them after that. I don’t really know what happens with that. I hope and think that it does kind of contribute to a lot of management, but I’m not sure.” (ID 17)

Most arthritis therapists saw benefits to providing follow-up to enhance their role in optimizing both OA care and overall health. This would also provide opportunities to closely monitor those with complex chronic disease and allow them to gradually build their physical activity in a supported fashion.

“I am probably a little more cautious because of possible cardiovascular risk factors. Because I’m not in the position to measure or observe some of the risk factors that they might be able to be monitored on if they were at a cardiac rehab prevention program, like those programs where they’re taught.” (ID 06)

DISCUSSION

This qualitative study describes the barriers of arthritis therapists

to considering and incorporating comorbidity when assessing patients with knee OA and formulating their OA management plan. The current study focuses on T2DM, a common chronic condition in persons with knee OA where symptomatic knee OA has been linked to worse diabetes self-management⁷ and outcomes.²⁰ We identified barriers representing several domains of the TDF. Arthritis therapists described insufficient knowledge to feel comfortable addressing questions about T2DM and integrating OA recommendations into the context of also having T2DM. Many arthritis therapists described lacking necessary skills in BCTs needed to optimize OA treatment in the context of other complex conditions, such as T2DM, that made OA management more challenging. The professional role and identity of arthritis therapists was situated around optimizing joint health rather than whole person health. While comorbidities were routinely assessed, there was variability of intention regarding how this information would factor into OA management recommendations, if at all. Finally, providing comprehensive OA care with view to integrating comorbidities and maximizing overall health outcomes was limited by insufficient patient monitoring and follow-up in the existing AREP program. The management of persons with knee OA who also have comorbidities such as T2DM ideally involves a longitudinal relationship so that care can be provided, monitored, and adjusted over time, and requires understanding how a person’s multiple conditions influence their health, including how they interact with OA. Given the rising prevalence of multimorbidity^{3,26,27} and that assessing comorbidities and factoring their presence into OA management decisions are recommended as part of OA care,²⁸ these findings underscore a need to consider ways to evolve the role of arthritis therapists with a view to optimizing whole person health.

In this study, we focused on individuals with T2DM and knee OA. The complexity of T2DM care is well described.²⁹ Arthritis therapists described insufficient knowledge to meaningfully integrate OA recommendations with those of T2DM. Although it may not be feasible for arthritis therapists to develop an expansive knowledge base, training programs and continuing education for OA providers should consider broadening the scope of education to reflect the increasing complexity of patients with OA, as well as emphasizing benefits of OA care to not only improve joint pain and mobility but overall health and well-being as well. This may empower providers, like arthritis therapists, to build on how they see their professional role and lead to a shift in their intentions. There was evidence within our participants of an evolution already in place, as some described an interest in providing whole person care, where their treatment recommendations incorporated a multitude of factors, including comorbidity. Others chose to frame the impact of symptomatic OA in the context of comorbidity outcomes, and associated the importance of OA treatment, including physical activity, as part of their disease education to bolster motivation to engage in the relevance of OA care.

Physical activity and therapeutic exercise are core treatments for knee OA^{8,28} and many other chronic conditions,³⁰ and both are important in patient care. However, a focus on quadriceps

strengthening alone in a person with knee OA and T2DM may be less beneficial than a walking or bicycling program if overall health is considered. Enabling this person-centered care requires shifting not only the knowledge, skills, intentions, and professional identity of individual care providers, such as arthritis therapists, but also the models of care adopted by OA management programs. Chronic disease management, particularly when delivering treatments that require a lifestyle change, demands a focus on behavior change including long-term support, monitoring and titration, and accountability.³¹ An “injury” model applied to OA care is insufficient. An interdisciplinary team-based approach may be best suited to address these challenges, by maximizing the toolkit of BCTs beyond that typically employed by arthritis therapists³² and incorporating frequent follow-up and coaching to support change in behavior. Despite the importance of delivering OA care in a way to optimally improve whole person health, there are no detailed recommendations that exist currently in Canada, nor internationally, about how exactly comorbidities should influence OA care.

Strengths of our study include the use of the TDF to comprehensively assess determinants of behavior through a well-developed theoretical underpinning and common language. This will facilitate evidence-based links to behavior change techniques³³ in the next phase of our implementation work. Our sample size was similar to other studies that have assessed other healthcare professional behaviors using the TDF.³⁴⁻³⁶ Study limitations include less specificity of target behavior (“considering T2DM”) than in other TDF studies; thus, some important nuances to the topic have been missed. Arthritis therapists’ approach to incorporating comorbidities may be different to arthritis health professionals in other clinical settings, affecting the transferability of findings. All our participants were women, but this reflected the gender predominance for both OTs and PTs in Canada.³⁷

In conclusion, this study identified the extent to which Arthritis Society Canada arthritis therapists currently consider and integrate history of T2DM when formulating a knee OA treatment plan in persons with knee OA and concomitant T2DM, and potentially modifiable barriers to an increasingly more holistic approach.

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ONLINE SUPPLEMENT

Supplementary material accompanies the online version of this article.

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