

Colorectal cancer patients' experiences with supervised exercise during adjuvant chemotherapy—A qualitative study

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Background: Colorectal cancer (CRC) is a common cancer worldwide, with increasing numbers surviving and living with long-term side effects from treatment. Physical exercise during or after treatment may have several beneficial effects, but knowledge of CRC patients' reflections on exercising during adjuvant therapy is limited. The aim of this study was to explore the experiences of CRC patients participating in a supervised exercise program during adjuvant chemotherapy.

Methods: This study included CRC patients participating in two intervention studies with individually tailored and supervised combinations of endurance, resistance, and balance exercises during adjuvant chemotherapy. Semi-structured interviews performed at the beginning, during, and immediately after the intervention period from 15 participants were analyzed using thematic analysis.

Results: Four main themes identified were "structuring life with cancer," "motivation to exercise," "training experiences," and "effects of exercise." Scheduled appointments gave structure to daily life and served as an external motivational factor. The individual adjustments of exercise gave a sense of security and helped improving adherence, especially when feeling depressed or fatigued. Common expectations were improvement of endurance and strength and counteracting negative effects of chemotherapy. Experienced positive effects from exercising, both mentally and physically, contributed to inner motivation and inspired continued exercising after the study period.

Conclusion: This study offers important insights into CRC patients' experiences of participating in a physical exercise program during adjuvant chemotherapy. Based on our findings, we recommend supervised and individually tailored physical exercise during adjuvant chemotherapy to this patient group.

KEYWORDS

adjuvant chemotherapy, colorectal cancer, physical exercise, qualitative study, supervised exercise

1 | INTRODUCTION

Colorectal cancer (CRC) is a growing health burden worldwide, as the incidence rates are expected to increase 60% by 2030.¹ During recent years, modern treatment principles for CRC have become more complex with improved surgical techniques, radiotherapy, and systemic therapies, and thus, more people are surviving their cancer.² However, such comprehensive toxic regimens are followed by complications and long-term side effects. Fatigue and chemotherapy-induced peripheral neuropathy are common side effects of oxaliplatin-based chemotherapy used in adjuvant treatment for CRC. These and other side effects have major negative impact on patients' quality of life.³⁻⁵

Physical activity (PA) is associated with reduced risk of developing colon cancer and improved survival from CRC.^{6,7} Furthermore, it has been demonstrated beneficial effects of physical exercise both during and after cancer treatment on cancer-related health outcomes, but this has mainly been studied in breast- and prostate cancer.⁸ Since the first randomized controlled trial (RCT) studying the effects of physical exercise on quality of life in CRC survivors was published in 2003,⁹ only a few studies have included patients with CRC receiving adjuvant chemotherapy in physical exercise interventions.^{10,11} Recruiting patients with CRC to PA seems difficult,^{12,13} and information about CRC patients' expectations and reflections of undergoing a physical exercise program during adjuvant chemotherapy is limited.^{14,15} The aim of this study was to explore the experiences of patients with CRC participating in an individually tailored and supervised exercise program during adjuvant chemotherapy.

2 | MATERIAL AND METHODS

2.1 | Study design

This was an explorative qualitative study using individual, semi-structured interviews at different time-points during adjuvant chemotherapy among CRC patients who participated in physical exercise interventions during treatment.

2.2 | Participants

Fifteen participants were recruited from our non-randomized feasibility study and our ongoing RCT, "Physically Active during Cancer Treatment".^{16,17}

The major eligibility criteria were radical resection for stage II-IV CRC and scheduled for adjuvant chemotherapy

(resection for synchronous metastases was allowed.), age 18-80 years, ability to conduct the intervention based on the treating physician's assessment, and ability to understand Norwegian language. Exclusion criteria were medical conditions contraindicating physical exercise and treatment for other invasive cancers during the five past years.

All CRC patients referred to adjuvant chemotherapy were screened for eligibility by the consulting oncologists. At the first consultation, the treating oncologist provided oral and written information to the patient, and a study coordinator obtained written informed consent the following days. Information about the qualitative study was repeated before starting the interviews. The study was approved by the Regional Committee for Medical and Health Research Ethics of Northern Norway (Record no. 2015/1050/REK nord).

2.3 | Physical exercise intervention

The intervention started when commencing adjuvant chemotherapy and lasted throughout the treatment period (ie, 12-24 weeks). It consisted of an individually tailored combination of supervised and home-based aerobic endurance, resistance, and balance exercises built on results from exercise tests and earlier experience with physical exercise. The resistance exercises were supervised, while the endurance- and balance exercises were both supervised and unsupervised. Choice of exercises and dosage was individually adjusted based on progression. A detailed description of the intervention can be found in our previous work.¹⁶

The participants met with a physiotherapist at the hospital the same week or the week after starting the first course of chemotherapy and were introduced to the exercise program. Written information with illustrations of the exercises to be performed at home was handed out. Participants in the RCT were equipped with a heart rate monitor to guide the intensity and duration of the aerobic endurance exercise. A physiotherapist, located either at a specialized outpatient training facility for cancer patients, or in the municipal health service, supervised the participants twice a week through the whole intervention period.

To assess self-reported PA level, a questionnaire for patient-reported PA developed for use in the North Trondelag Health Study (HUNT) was used.¹⁸ This is a three-item questionnaire on leisure-time PA regarding frequency, intensity, and duration (three-five alternatives) giving rise to a PA index, placing the participants in three different levels of activity, from low to high¹⁸ (Table 1).

TABLE 1 Patient characteristics

No. of patients	15
Age, years, median [range]	65 [43–80]
Males	8
Females	7
Stoma	
Yes	2
No	13
Type of surgery	
Laparoscopy	7
Open	8
Stage ^a	
III	13
IV	2
Adjuvant treatment planned	
3 months oxaliplatin-capecitabine	4
6 months oxaliplatin-capecitabine	8
6 months capecitabine	3
Marital status	
Living alone	7
Married/partner	8
Employment	
Working	7
Partly working/partly disabled	2
Retired	6
Education	
Elementary or high school	6
College/university	9
Self-reported physical activity	
Low level of activity	7
Medium level of activity	4
High level of activity	4

^aStage according to TNM Classification of Malignant Tumours, 8th edition.

2.4 | Adjuvant chemotherapy

Adjuvant chemotherapy consisted of oral capecitabine alone or in combination with intravenous oxaliplatin, depending on patients' age, and with start 4–8 weeks post-operatively. Duration of adjuvant treatment was 24 weeks for monotherapy and 12–24 weeks for combination chemotherapy.¹⁹

2.5 | Data collection

Interviews took place at study start ($n = 13$) and after 12 ($n = 10$) and 24 ($n = 6$) weeks. Participants only receiving 12 weeks of intervention were not interviewed

at 24 weeks, participants dropping out of the intervention had only baseline interviews, and those entering the qualitative study later did not have baseline interviews. The interviews were scheduled in concordance with the patients' other appointments and held in a private room at the hospital.

Semi-structured interviews were used to explore participants' expectations to and experiences with participation in the physical exercise program, based on interview guides (Table 2). The interviews lasted 20–45 min, were audio recorded, and transcribed verbatim. Three researchers conducted the interviews. One physiotherapist having long experience with cancer patients (SAS), one oncologist (IH), and one being an experienced qualitative researcher (JAS). JAS supervised the two other interviewers, considered as novices in the field of qualitative research. None of the interviewers were involved in supervising the exercise intervention or the medical treatment.

From January 2018 to October 2020, 29 interviews distributed among 15 participants at St. Olav's University

TABLE 2 Interview guide

At baseline
What is your previous experience with exercise?
What do you think this can give you in terms of advantages and/or disadvantages in the future?
What is your impression on how people experience chemotherapy?
Can you say something about how you think this affects you in the phase you are in now?
What do you wish to achieve with the exercise?
What do you think about exercising even if you have ailments, symptoms, and/or side effects?
Do you have any thoughts on how to deal with these possible challenges?
What do you think about the practicalities of participating? Time, place, etc.

At 12 and 24 weeks

What has been your motivation for participating in the exercise until now? /during the treatment period?
Has the motivation to participate changed since the start? / along the way? Possibly how?
What experiences have you had in relation to exercising with any ailments, symptoms, and side effects that have occurred?
If side effects have been present, what has been your strategy for exercising anyway?
What do you think about the training (so far)?
Is there anything about the exercise program you think should be different in order to be 100% satisfied?
How has the practicality of the training worked for you in terms of time, place, etc.?

Hospital, Trondheim ($n = 14$) and Aalesund Hospital ($n = 1$) were performed. Patient characteristics are summarized in Table 1. Five patients from the feasibility study dropped out shortly after inclusion due to medical ($n = 2$) and administrative ($n = 1$) reasons or their changed minds ($n = 2$). Five patients from the feasibility study and five from the RCT followed the intervention and provided interviews at 12 and 24 weeks.

2.6 | Analytical methods

Thematic analysis with an inductive approach, as described by Braun and Clarke, was used.²⁰ It consists of six phases: 1. Familiarizing yourself with your data, 2. Generating initial codes, 3. Searching for themes, 4. Reviewing themes, 5. Defining and naming themes, and 6. Producing the report. All authors read all the interviews. In addition, the first author listened through all the interviews at least once. All authors contributed in phase 1–3. In phase 4–6, the first and second authors were mainly involved, all authors took part in discussions regarding the analysis, read through, and approved the final report. Codes and themes were generated during the research process, in line with the explorative nature of the study. Although the initial design was to explore relevant themes in a pre-post fashion, the prolonged therapeutic period for a minority of the participants also allowed for elements of a longitudinal analysis, as described by Saldaña.²¹ Inclusion was stopped after 15 participants, based on the research group's agreement that information redundancy had been achieved, and no new codes were generated through continued interviewing.

3 | RESULTS

Patients with CRC experienced that an individually tailored and supervised exercise program during adjuvant chemotherapy provided structure to life with cancer, motivation to exercise, training experiences, and effects of exercise.

3.1 | Structuring life with cancer

Overall, the patients saw inclusion in the study as being offered a number of benefits. In addition to hoping for positive effects of physical exercise, study participation represented an opportunity to structure their lives as cancer patients through scheduled appointments and commitments to themselves and other people.

“But I'm pretty sure that if you're a little down, and you might be that when you get a serious

diagnosis, then I think it's so important to have regular appointments, in that way you have to do things.” (Female, 65)

Being on sick leave, the need to and importance of filling the days was recognized.

“If I'm not going to work I need something to fill the days. It's been OK during the Olympics, but that won't last. ...Otherwise I think it will be a bit dismal to sit and wait for the rest of the people to return at four or five.” (Male, 57)

Similar statements were emphasized repeatedly throughout the study. It helped them to structure their day and gave them something to look forward to. To become isolated was a concern, and signing up for the study represented a good opportunity to avoid this. Advantages from getting out instead of sitting indoors doing nothing was another benefit.

“The fine thing is that you are getting out of the house no matter how bad you feel.” (Female, 65)

Having appointments helped them to get up and out when feeling depressed or tired. This was acknowledged as critical at times when exercising by themselves was found challenging and was particularly important toward the end of the treatment period.

“In particular now towards the end, if I hadn't had this commitment it would have been heavier to get this done on my own. As I say it is difficult to get out of the chair and get started, and in this way it is important to have a steady appointment.” (Male, 78)

Getting the chance to participate in the study led to feelings of gratitude, accompanied by a wish that more patients would be offered the same opportunity.

“Well, it's the total package, and I'm grateful for that, to be part of this.....No, it has been positive [to participate in the study], it has. If I hadn't, I would probably just sit at home, and probably been in a lot more pain than I am now.” (Male, 67)

3.2 | Motivation to exercise

Although all participants demonstrated a motivation for exercise by joining the study, both skepticism and insecurity toward participation were revealed initially. There

was skepticism as to whether the program was too oriented and focused on disease, hence serving as a reminder of the diagnosis, whether the body could handle it if one exercised too much, but also having to meet with a physiotherapist. The insecurity was about not knowing how one would react to the treatment and whether daily commitments would be manageable.

“So I was a little skeptical having to show up and see a physiotherapist, but I clearly see the need to exercise your muscles after an operation and during such a serious treatment course.” (Male, 62)

To exercise intuitively made sense, as a realization of the necessity of keeping both body strength and flexibility. The threat of losing strength during the treatment period gave a motivation to potentially rebuild what was lost. Exercise was also a way to counteract the anticipated breakdown of the body due to chemotherapy.

“But I see that exercising might be good for your body while you break it down, because it’s kind of breaking down the body to heal, isn’t it? And if you exercise, you then manage to weigh up a bit of that, the breakdown, I think.” (Male, 71)

Faith in exercise was expressed, as being good for both physical and mental health, including a hope that exercise may increase the efficacy of chemotherapy.

“It is as if I have this picture that exercise and chemotherapy...it is important to get the chemotherapy into action” (Female, 61)

Exercise motivation came from both external and internal sources, and there were factors bolstering motivation while others threatened it. An inner motivation was demonstrated through a strong desire to exercise and not skip out when tired.

“I’ve felt very strongly that I should do the training. Skipping the training because I’ve been tired was not relevant for me.” (Male, 68)

A crucial external motivation for exercising both regularly and efficiently came through the appointments with the physiotherapist. It made the participants feel obliged to attend even when feeling sick and weak from chemotherapy.

“It must be some of the best things that has happened, it’s kind of something that has kept me going... towards...you know? I am, I think I’m pretty good at structuring myself, but when you

get tired and lazy, it’s okay to have someone outside yourself, who sort of is with you and, yes...” (Female, 53)

If an exercise session was canceled for some reason, and participants were supposed to exercise by themselves, postponing or skipping parts of the program presented a temptation that not all were able to resist.

“There was one time when the physiotherapist was absent, so I had to do the exercises by myself. It then came right away: It started with me feeling out of shape, thinking like – Maybe I’ll rather do it tomorrow....” (Female, 61)

Motivation was also threatened by exercises they did not like or found boring, and when they felt fatigued. An inner struggle between going to the gym and the desire to rest was experienced, especially at times when even simple activities of daily living was a struggle.

“Yes, resistance exercising is really boring. It can’t be denied, but it kind of has to be done. I’m still doing it. I feel it does me good, but it is not fun.” (Female, 61)

It could take a huge effort to get to the gym, but a motivation in such instances would be earlier experience of symptoms decreasing during and after exercise. Knowing that they could rest with a clear conscience afterward bolstered motivation further.

«...and the feeling that you’re actually getting weaker and weaker, and things are getting heavier and heavier, it’s a bit hard. At the same time, physically, I see that I have progress in my exercises, I’m actually getting stronger, the balance actually gets a little better, and it gives a positive experience...but I think maybe I’m sitting more in my recliner, but with a better conscience in a way.” (Male, 57)

Supervision by a physiotherapist provided motivation to perform a little extra, and to complete all the exercises, even the boring ones. Guidance from a physiotherapist to adjust the exercising according to variations in their physical function also gave a sense of security.

“I think it’s important there are professionals who have..., you feel confident in what they instruct, and..., do not push me a lot, but I feel that they help me exert more than I might do on my own.” (Female, 58)

A desire to contribute to research, to prove that exercise works, was a motivational factor for one.

«...and I say to M [the physiotherapist] that now, M, I'm not only running for me, I'm running for your project, so you get more means [laughing], so people can realize that this works.” (Female, 53)

With time, an ambition to continue exercising without supervision after the study period also emerged reflecting a change from outer to inner motivation.

“One day when one of the instructors were ill, I noticed that I was really lazy, so it is important for me that there is somebody there. (Female, 53, week 12)

“But the last time she was absent I did it all by myself... I realized that in June she is not going to be there anymore, so I was starting to realize that I have to this on my own.” (Female, 53, week 24)

3.3 | Training experiences

Previous experience with physical exercise varied among participants from training at a fitness center several times a week, to hardly having done any physical activity except sporadic outdoor walks. Training intensity varied across the lifespan; often originating in organized sports in childhood, while family life and work took time away from training in adulthood. A common feature was their appreciation of walking outdoors, to and from the workplace, or in the nature in their leisure time.

“I've always been in activity. Do a lot of walking in the country side...Used to do aerobics three times a week, and climbing hilltops, and I had a dog I used to walk twice a day....” (Female, 71)

“I have exercised very little, exercised a bit in the 90's, but otherwise it has been some walks and stuff.” (Male, 68)

Variations in both physical fitness and in how they responded to exercise were observed regularly, in and between individuals. After recovering from surgery,

chemotherapy could give a setback. Their physical fitness could also vary within each chemotherapy cycle, as an activity mastered with ease one day felt impossible another. Generally, exercising felt harder toward the end of the treatment period.

“So I didn't realize, that the Monday after [the last tablet], I didn't realize it was then I was most tired, and the next Friday I could climb the ceiling, if you know what I mean.” (Female, 53)

Participants exercised regularly, as prescribed. Concerns for health-related obstacles to exercise, as well as non-health-related obstacles like family logistics or slippery ground during wintertime, were mentioned prior to commencing the study, but did to little extent influence the exercising. The only major obstacle to turning up for a training session was intercurrent illness with infection. A factor contributing to this high exercise fulfillment was individual adjustments made by the staff to accommodate orthopedic complaints or when a participant was not feeling well.

“Yes, they certainly did [adjust the exercise according to variations in shape]. They were very sensitive to that. It was facilitated, and I tried, of course, to stretch myself a bit, as far as possible, but they were considerate.” (Female, 58)

Use of a heart rate monitor was introduced as a motivational factor for exercise, with varied success. Experiences differed from sporadic use of the watch and just learning the basics (start, stop, and monitoring heart rate) to carefully monitoring each exercise session and going through them on the smart phone afterward. In one case, it also inspired one participant to exercise beyond what was considered beneficial under the circumstances.

“I have gotten a lot out of it [the heart rate monitor]. I have an app on my smart phone, so every time I exercise, I read the results from the app, because there is some motivation in it...Sometimes I have been too eager and trained too hard. I am pleased there and then, but the day after I have a minor backlash.” (Male, 62)

3.4 | Effects of exercise

Prior to entering the program, participants hoped that the exercise would improve their endurance and strength, and to regain their pre-cancerous physical status. Being able to resume activities they had been capable of before, and to

be able to return to work after the treatment period, were also among their hopes. These hopes were paired with a belief that staying in good shape would make the treatment more tolerable, and possibly reduce long-term side effects from the chemotherapy.

“I’m actually in the situation that I look forward to this, because I’ve felt that my shape has gotten worse when I have done nothing, so I will try to roughly get back in shape, even though I’ve had cancer, because I think that’s possible if you believe in it.” (Male, 64)

Despite the fluctuant setbacks described above, continued improvements were a common effect from the program. Feelings of increased energy, and of being in better shape right after a workout than before, were often described. Still, for others, insecurity persisted as to whether endurance had improved. Tiredness was a regular experience after a training session, but most often in terms of feeling tired in a good way. Toward the end of the study period, the perceived physical fitness diverged, ranging from feeling in better shape than for a long time, to feeling major fatigued.

“I then noticed that when I started exercising, I got better. I felt better when I left, in a way.” (Female, 58)

Being physically active and exercising affected the participants’ mental health positively. Reported effects ranged from reducing symptoms of depression to a feeling of joy or happiness during and after exercise. Losing weight while engaging in the exercise program was described as a bonus by a participant considering himself as overweight.

“To be honest, I think it helps you mentally as well. It definitely does. Because getting out and being in movement; that helps a lot.” (Female, 65)

Symptoms from peripheral sensory neuropathy often diminished after commencing exercise and getting warm, and this could last for several hours after the session. Increased muscle strength was experienced both through being able to increase the load during strength exercise, and the feeling of regaining lost muscle mass. Being able to keep in shape and keeping their strength, despite receiving chemotherapy, led to feelings of satisfaction.

“It’s like I get paid for it when I finish the intervals, feels like I’ve gotten something out, it doesn’t tingle so much anymore, and the burning in my hands can suddenly completely disappear,…” (Male, 57)

4 | DISCUSSION

This study offers important insights into CRC patients’ experiences of participating in an individually tailored and supervised physical exercise program during adjuvant chemotherapy. Scheduled appointments with a physiotherapist gave an opportunity to structure life with cancer and served as an important external motivational factor. Furthermore, participants perceived positive effects from exercising, as improved muscle strength, reduction in sensory neuropathic symptoms, and improvement in mental health. Common expectations and hopes were improvement of endurance and strength, to achieve better tolerance and efficacy, and counteract negative effects of chemotherapy.

Structuring of life with cancer aligns with previous research, exploring women’s experiences engaging in supervised exercise during treatment for early-stage breast cancer.^{22,23} Commitment to scheduled appointments, serving as an external motivational factor, is also described as part of palliative cancer patients’ experiences of participation in a physical exercise program.²⁴

To have supervised exercise with regular appointments was crucial, as the participants could not see how they would have been able to perform the same amount of exercise without this arrangement, which is in accordance with Backman et al.²³ The preference for supervised exercise with individual attention from exercise staff was also found among CRC survivors participating in an exercise rehabilitation program performed after chemotherapy, and among physically inactive breast and colon cancer patients initiating PA while undergoing adjuvant chemotherapy.^{15,25}

Our participants experienced several positive effects from exercising during adjuvant chemotherapy, both physically and mentally. This has been demonstrated in other studies, but mainly in breast cancer.^{15,22,23,26,27} There are noticeable differences between these two patient groups, however, as median age at diagnosis is approximately 10 years higher in CRC,²⁸ and the surgical and adjuvant treatments are different. Our findings thus indicate that positive effects can be achieved in older patient groups as well.

Generally, the participants were positive toward exercise. This might not be surprising, as they chose to participate in the study. We did not explore the experience of those declining participation, but Wart et al. found a more negative attitude toward exercise among patients declining participation in a physical exercise study among colon cancer patients receiving adjuvant chemotherapy.¹³ It has been reported that adjuvant chemotherapy is a major barrier to PA among CRC patients.²⁹ In the present study, barriers were related to side effects from chemotherapy,

but these were overcome through the scheduled sessions, individual adjustments, and by an inner motivation developing from positive experiences participating in the exercise intervention.

A strength of our study was that the interviews were performed both at the beginning, during and right after the intervention, allowing to explore both expectations to and experiences with the exercise intervention, and to evaluate potential individual changes over time in a longitudinal manner.²¹ Performing the interviews while participants still were under intervention, reduced the risk of recall bias.³⁰ Contributions by the whole research team doing initial coding and participating in regular meetings discussing themes have strengthened the quality of our data analysis.

Given the explorative nature of this study, no theoretical framework was applied to guide our analysis, which was more data-driven. The participants were given the opportunity to tell about their experiences in their own words, providing insights to the experiences of performing physical exercise after major surgery and receiving toxic chemotherapy. Social cognitive theory-based PA behavior change interventions seem promising in improving PA level among cancer survivors, but that was beyond the scope of the present study.³¹

The inclusion of participants both willing and unwilling to engage in physical exercise during adjuvant chemotherapy would have broadened the scope of our study. An expansion of this scope, to also encompass patients refraining from training, should be encouraged in the future research. Though we would argue that our study population represents a wide variety regarding age, sex, marital-, employment-, and educational status, levels of PA, and former experience with PA, and hence, most likely our results are representative for patients with CRC commencing adjuvant chemotherapy and being willing to engage in supervised exercise.

5 | PERSPECTIVES

The literature is scarce on effects of exercise during treatment for patients with CRC.¹¹ In our previous work, we have demonstrated the feasibility of an exercise intervention during adjuvant treatment for CRC.¹⁶ To our knowledge, this is the first qualitative study reporting CRC patients' experiences participating in an individually tailored combination of supervised and home-based aerobic endurance, resistance, and balance exercises during adjuvant chemotherapy.

Based on our findings, we recommend supervised and individually tailored physical exercise when prescribing exercise to this patient group during adjuvant

chemotherapy. This is also supported by a meta-analysis demonstrating that the effects on quality of life and physical function were significantly larger for supervised than unsupervised exercise.³²

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AUTHOR CONTRIBUTIONS

All authors contributed to the study conception and design. SAS, JAS, and IH did the interviews. During data analysis, all authors contributed in phase 1–3. JAS and IH were mainly involved in phase 4–6. All authors took part in discussions regarding the analysis, read through, and approved the final analysis. IH wrote the first draft of the manuscript. All authors commented on previous versions of the manuscript, and read and approved the final manuscript.

ETHICS APPROVAL

This study was approved by the Regional Committee for Medical and Health Research Ethics of Northern Norway (Record no. 2015/1050/REK nord) and was performed in accordance with the ethical standards as laid down in the 1964 Declaration of Helsinki and its later amendments. Informed consent was obtained from all individual participants included in the study.

DISCLOSURE OF POTENTIAL CONFLICTS OF INTEREST

The authors declare that they have no conflicting interests.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

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