2021-12-13

FACE TO FACE OR DIGITALLY? A COMPARISON OF FIRST-LINE INTERVENTIONS DELIVERY FOR PEOPLE WITH HIP OR KNEE OSTEOARTHRITIS (NCT04836988)

Background

Osteoarthritis (OA) is among the leading causes of disability worldwide and due to its raising prevalence, the identification of appropriate care and care delivery modalities is a priority for the health care systems [1, 2]. Exercise and education constitute the first-line intervention for people with knee and hip OA and have been shown to be effective regardless of symptoms and disease severity [3, 4]. Unfortunately, there is a discrepancy between recommended treatment and what patients receive. Less than 40% of people with OA seeking care seem to receive recommended first line management internationally [5]. To implement those guidelines, the Better Management of Patients with OsteoArthritis (BOA), a face-to-face concept including education and an option to exercise, has been developed and are offered at primary care clinics in Sweden since 2008 [6]. However, traditional face to face interventions present barriers, such as limited access and lack of flexibility, which may limit the patients' adherence with the interventions [7]. Digital delivery of the management program may be one way of overcoming such barriers [8, 9]. In light of the current Covid-19 pandemic, digitally delivered treatments may gain even further awareness as a feasible treatment option. Both delivery methods have been reported to reduce OA symptoms in patients with hip and/or knee OA [10, 11], but little is known whether the results of digital interventions are comparable with traditional face-to-face rehabilitation programs.

Aim

To compare the outcomes (average treatment effect) of two different modalities of first-line treatment delivery (face-to-face vs. digitally) after 3 months of program participation.

Hypothesis

There will be no difference in the average treatment effect of the main outcome between the two delivery methods.

Methods

This is a retrospective observational registry-based study comparing outcomes of a face-to-face and a digital OA management program.

The study was approved by the regional ethics committee of the Swedish Ethical Review Authority (Dnr 2019-06288, decision date 2020-02-11 and is pre-registered at ClinicalTrials.gov (NCT04836988). Participants were informed that data generated from the register may be used for research purposes at registration (BOA) or provided digital informed consent for the same purpose at registration (JA). The study adheres to the STROBE guidelines for observational studies.

Data sources

BOA (face-to-face): The BOA registry was started in 2008 and currently includes more than 100,000 individuals with OA who have registered for an evidence-based self-management program, including education, exercise and weigh management if needed at a primary care clinic.

Joint Academy (digital program): The digital self-management program started in 2014 and was originally inspired by the Swedish evidence based face-to-face BOA self-management treatment program [9]. The associated registry currently includes more than 30 000 individuals with OA. The intervention consists of a digital OA self-management program (Joint Academy®) [11, 12] comprising text lectures on OA with accompanying quizzes, physical activity and self-management in OA. The participant also receives exercises aiming at improving strength and neuromuscular control of various levels based on each individuals' progression in the program.

Data extractions and linkages

All data extracted from the digital self-management program (JA) and BOA registries. Criteria for inclusion in the data extraction are:

- Clinical diagnosis of OA, with knee or hip OA as their index (most symptomatic) joint
- Enrolled in either of the two programs between April 1, 2018 and December 31, 2019
- Provided 3-month follow-up data for the main outcome on or before March 31, 2020
- Program adherence of 80% or higher.

The data from the two registers will be linked using personal identity numbers to identify individuals that may have participated in both programs during the specific time window. Patients that participated in both programs will be excluded from further analysis.

The JA participants will be matched 1:1 to participants in the BOA register using the propensity scoring approach described below.

Main exposures and outcomes

Exposures

Three months of first-line OA treatment delivered either face-to-face or digitally with a program adherence of 80% or higher. The choice of this cut-off was based on recommendations in the Swedish Guidelines for management of knee and hip osteoarthritis by the National Board of

Health and Welfare. Adherence defined as ≥ 80% completed education videos, exercises and questionnaires offered in the digital program and participation in two out of three educational lessons and at least 10 of the 12 supervised group exercise sessions offered in the BOA program.

Main outcome

Main outcome will be self-reported change in pain on the NRS-scale between baseline and three months follow-up. The NRS comprises an 11-point scale where 0 indicates no pain and 10 indicates the worst possible pain [13] (Table 1).

Secondary outcomes

Secondary outcomes will be change in self-reported walking difficulties (dichotomous reply, yes/no), willingness for joint surgery (dichotomous reply, yes/no) and health-related quality of life, assessed with the EuroQol – 5 dimension descriptive system (EQ-5D-3L)[14] between baseline and three months follow-up (Table 1).

Sample size

As this study aims at estimating treatment effects, the important issue to assess is not power (related to a hypothesis), but precision – i.e. the width of the confidence interval. To illustrate this, consider the example of an RCT to compare mean joint pain after exercise intervention for OA, between persons that receive the treatment in different modalities. The minimum clinically important difference is typically considered one unit on a 0-10 NRS scale. To obtain a 95% confidence interval for the between-group difference with a width of at most 0.5 units (i.e. very precise) in a sample with a typical standard deviation of 1.5, with 99% probability, we will need ~630 patients in total. Considering our cohort size of >2000 persons who underwent the intervention, we will be able to estimate between-group differences also in subgroups, by sex, BMI, etc.

Statistical analysis

In this study we will use observational data to emulate an equivalence trial comparing the effect on joint pain of a digitally delivered first-line intervention and of an in-person delivered first line intervention for people with OA of the hip or knee.

Main outcome analysis

The main outcome will be analyzed using a propensity score matching approach [17]. We will estimate the propensity score using a logistic regression model, in which we will regress the treatment status on the observed baseline characteristics of the participants. The characteristics to include in the propensity score will be selected using the disjunctive cause

criteria [16], including factors in the analysis identified as causes of treatment allocation(exposure) and/or the pain change (outcome) (Table 2). We will use nearest neighbor matching to select controls (BOA participants) whose propensity score is closest to that of the treated subject. Furthermore, we will use an optimal matching strategy to minimize the total within-pair difference of the propensity score. Within-pair differences in main outcome will be analysed using a paired t-test. Finally, we will adjust the analysis for baseline pain using linear regression in order to increase the precision of the estimates and minimize the regression to the mean effect [17, 18].

Assessing propensity score balance

Balance of baseline variables between treated and control subjects in the matched study population will be assessed using standardized difference [19].

Equivalence bounds

In order to establish equivalence between the interventions the pain change after the intervention should differ of less than 1-point on a 0-10 NRS pain scale. This cut off was selected based on previous work identifying 1-point change as the MCID in people with OA [20].

Sensitivity analysis

In order to evaluate and contrast the influence of choice of analysis method on study results, linear regression analysis based on the same adjustment set used for the propensity score, representing the causal effect studied, will be applied and both adjusted and unadjusted estimates will be presented, discussed and contrasted against results from the propensity score matched analysis.

Missing data

Data on study drop-outs will be summarized by treatment group using frequency counts to assess any imbalance. If the fraction of missing study data is non-ignorable (i.e. 5% or more with missing data in either outcome and/or any adjustment variable), then multiple imputation techniques, such as MICE [21] will be applied to the analysis of the primary outcome. The analysis method will also be altered to a linear regression approach, as opposed to that of propensity score matching, in order to facilitate incorporation of missing data methods in the analysis procedure. However, when the fraction of missing data is small (i.e. 5% or more with missing data in either outcome and/or any adjustment variable), the primary analysis will be performed using a complete case approach.

References

1. Cross M, Smith E, Hoy D, Nolte S, Ackerman I, Fransen M, et al. The global burden of hip and knee osteoarthritis: estimates from the global burden of disease 2010 study. Ann Rheum Dis 2014; 73: 1323-1330.
2. Salmon JH, Rat AC, Sellam J, Michel M, Eschard JP, Guillemin F, et al. Economic impact of lower-limb osteoarthritis worldwide: a systematic review of cost-of-illness studies. Osteoarthritis Cartilage 2016; 24: 1500-1508.
3. Juhl C, Christensen R, Roos EM, Zhang W, Lund H. Impact of exercise type and dose on pain and disability in knee osteoarthritis: a systematic review and meta-regression analysis of randomized controlled trials. Arthritis Rheumatol 2014; 66: 622-636.
4. Bannuru RR, Osani MC, Vaysbrot EE, Arden NK, Bennell K, Bierma-Zeinstra SMA, et al. OARSI guidelines for the non-surgical management of knee, hip, and polyarticular osteoarthritis. Osteoarthritis Cartilage 2019.
5. Hagen KB, Smedslund G, Osteras N, Jamtvedt G. Quality of Community-Based Osteoarthritis Care: A Systematic Review and Meta-Analysis. Arthritis Care Res (Hoboken) 2016; 68: 1443-1452.
6. Thorstensson CA, Garellick G, Rystedt H, Dahlberg LE. Better Management of Patients with Osteoarthritis: Development and Nationwide Implementation of an Evidence-Based Supported Osteoarthritis Self-Management Programme. Musculoskeletal Care 2015; 13: 67-75.
7. Dobson F, Bennell KL, French SD, Nicolson PJ, Klaasman RN, Holden MA, et al. Barriers and Facilitators to Exercise Participation in People with Hip and/or Knee Osteoarthritis: Synthesis of the Literature Using Behavior Change Theory. Am J Phys Med Rehabil 2016; 95: 372-389.
8. Cronstrom A, Dahlberg LE, Nero H, Ericson J, Hammarlund CS. 'I would never have done it if it hadn't been digital': a qualitative study on patients' experiences of a digital management programme for hip and knee osteoarthritis in Sweden. BMJ Open 2019; 9: e028388.
9. Verhoeks C, Teunissen D, van der Stelt-Steenbergen A, Lagro-Janssen A. Women's expectations and experiences regarding e-health treatment: A systematic review. Health Informatics J 2017: 1460458217720394.
10. Jonsson T, Ekvall Hansson E, Thorstensson CA, Eek F, Bergman P, Dahlberg LE. The effect of education and supervised exercise on physical activity, pain, quality of life and self-efficacy - an intervention study with a reference group. BMC Musculoskelet Disord 2018; 19: 198.
11. Nero H, Dahlberg J, Dahlberg LE. A 6-Week Web-Based Osteoarthritis Treatment Program: Observational Quasi-Experimental Study. J Med Internet Res 2017; 19: e422.
12. Nero H, Dahlberg J, Dahlberg LE. Joint academy – a six-week online treatment program for osteoarthritis. Osteoarthritis and Cartilage 2018; 26: S315-S315.
13. Williamson A, Hoggart B. Pain: a review of three commonly used pain rating scales. J Clin Nurs 2005; 14: 798-804.
14. Payakachat N, Ali MM, Tilford JM. Can The EQ-5D Detect Meaningful Change? A Systematic Review. Pharmacoeconomics 2015; 33: 1137-1154.
15. Austin PC. An Introduction to Propensity Score Methods for Reducing the Effects of Confounding in Observational Studies. Multivariate Behav Res 2011; 46: 399-424.
16. VanderWeele TJ. Principles of confounder selection. Eur J Epidemiol 2019; 34: 211-219.
17. Barnett AG, van der Pols JC, Dobson AJ. Regression to the mean: what it is and how to deal with it. Int J Epidemiol 2005; 34: 215-220.
18. Stuart EA. Matching methods for causal inference: A review and a look forward. Stat Sci 2010; 25: 1-21.

19. Austin PC. Balance diagnostics for comparing the distribution of baseline covariates between treatment groups in propensity-score matched samples. Stat Med 2009; 28: 3083-3107.
20. Salaffi F, Stancati A, Silvestri CA, Ciapetti A, Grassi W. Minimal clinically important changes in chronic musculoskeletal pain intensity measured on a numerical rating scale. Eur J Pain 2004; 8: 283-291.
21. van Buuren S. Multiple imputation of discrete and continuous data by fully conditional specification. Stat Methods Med Res 2007; 16: 219-242.

Table 1. Variables in BOA and Joint Academy registers

Variable	**Role**	**Used for matching**
Age	Confounder	Yes
Sex	Confounder	yes
Weight	Confounder	yes
Height	Confounder	yes
Education level	Confounder	yes
Working status	Confounder	yes
Most affected Joint	Confounder	yes
Other affected joints	Confounder	Yes (used as number of joints)
On Waiting list for surgery	Confounder	No (very rare)
Wish for surgery	Secondary outcome	yes
Physical activity (training)	Confounder	yes
Physical activity (every-day exercise)	Confounder	yes
Overall health	Confounder	yes
Walking difficulties	Secondary outcome	yes
Pain	Outcome	Yes (baseline pain)
EQ-5D	Outcome	
Fear of movement	Confounder	yes
Compliance with the intervention	Inclusion criteria	No
Previous surgery index joint	Confounder	No