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Title:
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Date:
2023-01-01

Citation:
Lawford, B. J., Bennell, K. L., Hall, M., Egerton, T., McManus, F., Lamb, K. E. & Hinman, R. S. (2023). Effect of Information Content and General Practitioner Recommendation to Exercise on Treatment Beliefs and Intentions for Knee Osteoarthritis: An Online Multi-Arm Randomized Controlled Trial. ACR OPEN RHEUMATOLOGY, 5 (1), pp.17-27. https://doi.org/10.1002/acr2.11513.

Persistent Link:
https://hdl.handle.net/11343/335652

ACR Open Rheumatology
Vol. 5, No. 1, January 2023, pp 17–27
DOI 10.1002/acr2.11513

American College of Rheumatology
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Effect of Information Content and General Practitioner Recommendation to Exercise on Treatment Beliefs and Intentions for Knee Osteoarthritis: An Online Multi-Arm Randomized Controlled Trial

Belinda J. Lawford, Kim L. Bennell, Michelle Hall, Thorlene Egerton, Fiona McManus, Karen E. Lamb, and Rana S. Hinman

Objective. To evaluate effects of general osteoarthritis (OA) information in addition to a treatment option grid and general practitioner (GP) recommendation to exercise on treatment beliefs and intentions.

Methods. An online randomized trial of 735 people 45 years old or older without OA who were recruited from a consumer survey network. Participants read a hypothetical scenario about visiting their GP for knee problems and were randomized to the following: i) 'general information', ii) 'option grid' (general information plus option grid), or iii) 'option grid plus recommendation' (general information plus option grid plus GP exercise recommendation). The primary outcome was an agreement that exercise is the best management option (0-10 numeric rating scale; higher scores indicating higher agreement that exercise is best). The secondary outcomes were beliefs about other management options and management intentions. Linear regression models estimated the mean (95% confidence interval [CI]) between-group difference in postintervention scores, adjusted for baseline.

Results. Option grid plus recommendation led to higher agreement that exercise is the best management by a mean of 0.4 units (95% CI: 0.1-0.6) compared with general information. There were no other between-group differences for the primary outcome. Option grid led to higher agreement that surgery was best, and x-rays were necessary, compared with general information (mean between-group differences: 0.7 [CI: 0.2-1.1] and 0.5 [CI: 0.1-1.0], respectively) and option grid plus recommendation (0.5 [CI: 0.1-0.9] and 0.9 [CI: 0.4-1.3]).

Conclusion. Addition of an option grid and GP exercise recommendation to general OA information led to more favorable views that exercise was best for the hypothetical knee problem. However, differences were small and of unclear clinical importance.

INTRODUCTION

Education, exercise, and weight loss (if necessary) are recommended by clinical guidelines as first-line management of knee osteoarthritis (OA) before other treatments like medications or injections (1–4). Arthroplasty is advocated for people with severe symptomatic OA who do not maintain satisfactory function and quality of life through nonsurgical approaches. General practitioners (GPs) play a central role in managing people with knee OA and are often the first point of contact for those affected (4,5). Unfortunately, uptake of education, exercise, and weight loss for knee OA in primary care is inadequate, particularly compared with use of imaging, medications, and surgery referral (6,7). Given the rising rates of, and costs associated with, arthroplasty in developed countries (8,9), there is an urgent need for strategies that can increase uptake of core recommended interventions by those who present to their GP with knee pain for the first time.

Knowledge about OA and its management options may influence patient beliefs and treatment intentions (10–12).

Supported by the National Health and Medical Research Council (NHMRC) Centre of Research Excellence (APP1079078). Dr. Hinman is supported by an NHMRC Fellowship (1154217), Dr. Bennell is supported by an NHMRC Investigator Grant (1174431), and Dr. Hall is supported by an NHMRC Investigator Grant Emerging Leader 1 (1172928).

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Author disclosures are available at https://onlinelibrary.wiley.com/action/downloadSupplement?doi=10.1002%2Facr2.11513&file=acr211513-sup-0001-Disclosureform.pdf.

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Submitted for publication June 8, 2022; accepted in revised form October 12, 2022.

Given the limited time available in a standard GP consultation, doctors have highlighted the need for tools and resources to help patients make treatment choices (11,13). Paper or digital pamphlets are a simple scalable way of providing information to patients about their condition. However, the quality and content of patient information about OA varies widely. Information often fails to meet recommended reading levels for health education (14), may provide only a "fair" level of information quality (15,16), and can deliver inconsistent messages about medications, exercise, and the need to seek health care (17).

It is not clear what content and types of educational material positively impact treatment beliefs and intentions in people with knee OA (2), particularly when they first develop pain and seek information and advice for the first time. Decision aids are one type of educational tool that use the best available evidence to outline the benefits and harms of different treatment options (18,19). A Cochrane review found that decision aids (via pamphlets, videos, or web-based tools), across a variety of health conditions, lead to increased uptake of conservative treatments over major invasive surgery and increased patient knowledge about—and accuracy of—risk perceptions, compared with usual care or generic written information (19). Only three of the 105 trials included in that review involved people with OA (20–22). Collectively, they found that a decision aid increased both decisional and arthritis self-efficacy, as well as feelings of being prepared to make a treatment decision (20,21), though it made no difference in rates of surgery (20) or surgery wait times (22) when compared with standard information alone. However, none of those studies used a decision aid that incorporated nonpharmacological and nonsurgical treatment options.

Although there is some evidence that decision aids have benefits, they often require a high level of health literacy, can be time-consuming for patients to read through, and can be costly to develop (23,24). To overcome these challenges, "option grids" have been developed as a briefer and more accessible alternative to a formal decision aid (23–25). Option grids facilitate patient comprehension via a table format that displays alternative treatments side by side for comparison, alongside patients' frequently asked questions. There is some evidence that an option grid used by physiotherapists for patients with knee OA improved shared decision making (26), but, to our knowledge, no previous studies have examined the effects of OA option grids on treatment beliefs and intentions among those first presenting to their GP with knee pain (27).

Health care provider recommendations also have an influence on patient treatment choices. Among people with OA, advice from health care providers has been identified as a key facilitator of patient choice for different treatment modalities (28). Similarly, guidance from doctors facilitates the use of nonsurgical treatments in people with OA (29,30). However, it is not currently clear whether a GP recommendation to exercise has any added benefit to the provision of written information or option grids. In particular, it is not clear what impact this may have on people who have recently developed pain, and therefore have no or limited prior knowledge of OA, and who are seeking care and advice from their GP for the first time. Given that it can be difficult to identify and recruit such a sample at the point of first presenting to care for knee pain, another methodological approach is to recruit people without knee pain or OA and ask them to consider a hypothetical scenario in which they are asked to imagine that they had recently developed knee pain and were seeking care from their GP for the first time.

The primary aim of this study was to evaluate whether the addition (to general information) of an OA treatment option grid and GP recommendation to exercise positively impacts exercise beliefs. Secondary aims were to evaluate effects of these additions on beliefs about the role of weight loss, surgery, medications, injections, and x-rays in the management of knee OA as well as hypothetical management intentions. We hypothesized that participants who received an OA treatment option grid and GP recommendation to exercise would have higher beliefs about exercise being the best management option for OA, compared with those who received option grid and/or general information only.

PARTICPANTS AND METHODS

Study design. This was an online three-arm superiority randomized controlled trial (RCT) using a hypothetical scenario. The trial was prospectively registered at ClinicalTrials.gov (NCT04698655). The Institutional Human Ethics Committee approved the study, and participants provided informed consent.

Participants. Based on similar studies that have used hypothetical scenarios to evaluate how different medical terminology impacts patient management preferences (31), we recruited a sample of community members who were not diagnosed with the condition of interest. A population of people without OA was targeted to imitate the situation of someone who does not have the lived experience of OA presenting to their GP for the first time with chronic knee pain. Compared with those with lived experience of OA, this sample are less likely to have knowledge about OA and its treatment options and therefore most likely to benefit from provision of an information pamphlet. Participants were recruited from a consumer network for digital survey-based research (Cint Pty Ltd). Cint comprises prerecruited groups of people who have self-nominated to participate in research surveys. Participants receive a small financial incentive (approximately $2.55 AUD for completion of a 15- to 20-minute survey) from Cint to compensate them for their time and participation. Incentives are only provided after completing the entire survey to the end.

Participants were eligible if they i) lived in Australia, ii) were aged 45 years or older, iii) did not have OA in any joint in the body diagnosed by a health professional, iv) had not experienced any knee pain during the prior 3 months, v) had not had a hip or knee joint replacement, and vi) did not have any health condition that

made them unable to exercise (self-reported yes or no in response to the question "Do you have any health condition that prevents you from exercising?").

Overview of procedures. Study methods were adapted from an RCT evaluating the effect of information format on intentions and beliefs about diagnostic imaging in low back pain (32). Our trial was delivered via online survey software (Qualtrics, Provo, UT). Participant flow through the trial survey is shown in Figure 1.

Randomization and blinding. Participants were randomized to one of three groups (1:1:1) using the randomizer function in Qualtrics set to "evenly present elements." Limited disclosure was used to blind participants, who were also the assessors (as outcomes were self-reported). Participants were informed that the trial compared different types of educational information. We did not disclose intervention components or the hypotheses of the study. The biostatistician who performed the data analysis was blinded.

Interventions. *General information.* This group was presented with a digital information pamphlet developed by the research team titled "Understanding knee osteoarthritis" (Appendix 1). This included information about what knee OA is (described as an "active process of your body responding to small injuries to your joints"), how knee OA is clinically diagnosed (including a statement that x-rays are usually not required for diagnosis or to determine which treatments are most beneficial), what causes knee OA (ie, more common in older age and people with

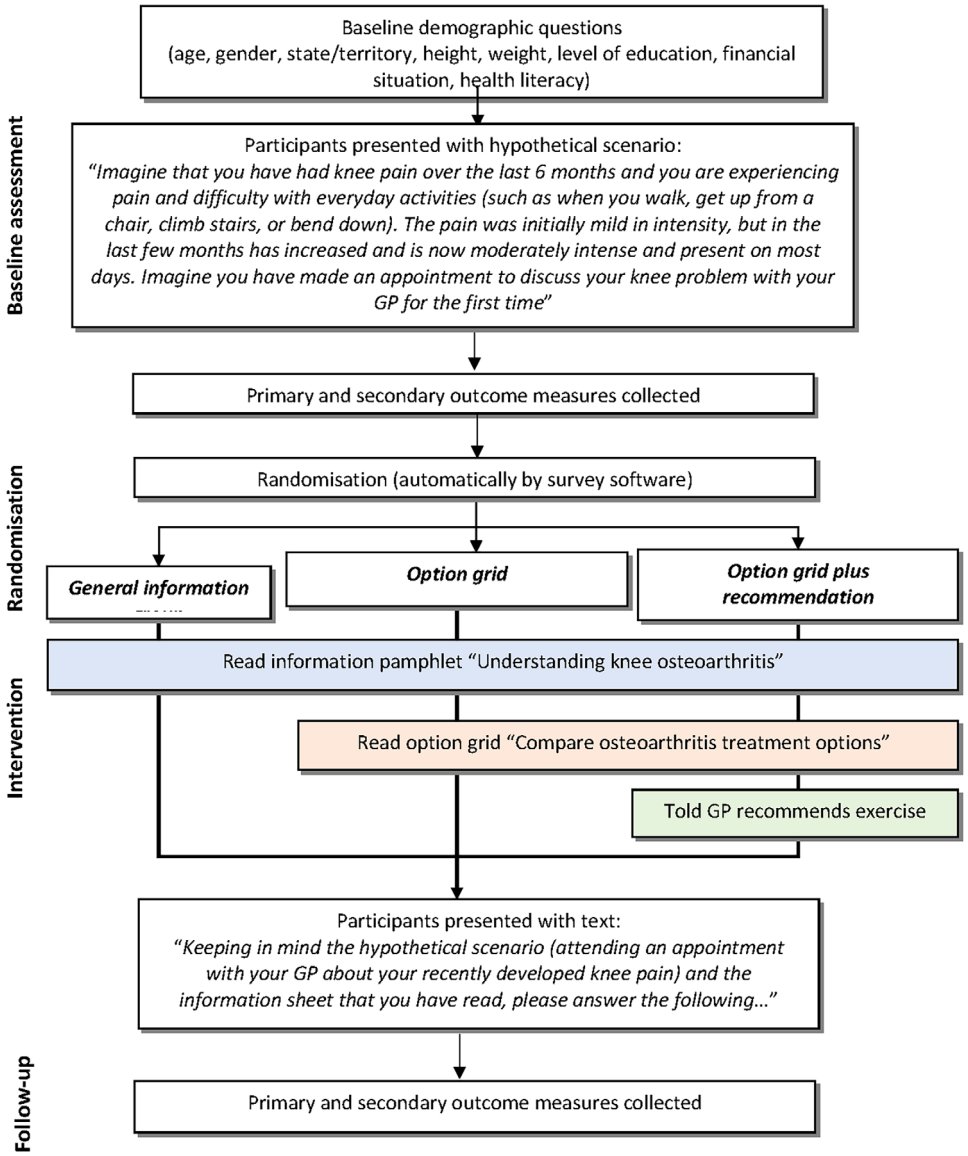

Figure 1. Overview of flow through the trial survey. GP, general practitioner.

overweight), prognosis (eg, inactivity and weight gain can make pain worse, most will not need a joint replacement), and correcting common misinformation about OA (debunking myths regarding wearing down of cartilage, exercise damaging the joint, and joint replacement surgery always being needed). Participants were required to confirm (via checkbox) that they had read the information pamphlet before then completing postintervention outcomes.

Option grid. This group was presented with two digital pamphlets: the same pamphlet as the general information group plus an additional pamphlet containing an option grid (titled "Compare osteoarthritis treatment options," Appendix 2). This was developed by the research team and aligns with the 10 steps described by Marrin et al (25), involving development of a list of frequently asked questions (eg, "What are the potential risks/benefits of this treatment?"), review of existing evidence, and user testing and feedback.

The option grid was initially developed in 2018 by first reviewing existing OA decision support tools (33–35). From this, four frequently asked questions were developed (What would I have to do? What are the benefits of this treatment? Are there any risks to this treatment? How long will it take me to feel better after this treatment?), and four OA treatment options were chosen (exercise and physical activity, weight loss, medications, and injections) to be included in the grid. The current best evidence was reviewed and used to populate the option grid table. The option grid was reviewed by two physiotherapists and pilot tested with two people with knee OA, before being used as part of a large RCT involving 415 people with knee OA (36). Information within the option grid was updated with current best evidence in 2019 before being pilot tested again with 15 physiotherapists and 30 patients. It is currently being used in another RCT involving people with knee OA (37). In November 2020, the option grid was updated again with current best evidence (1–4) and surgery was added to the grid as a treatment option, with information based on an existing decision support tool (33). The option grid was reviewed for readability and content by four laypeople without knee OA in preparation for this RCT. All information pamphlets had 10.4 readability level on the Automated Readability Index (ie, appropriate for ages 14-15 and above) (38). Participants were required to confirm (via checkbox) that they had read the general information pamphlet and the option grid before then completing postintervention outcomes.

Option grid plus recommendation. This group was presented with the same two digital pamphlets as the option grid group. Participants were required to confirm (via checkbox) that they had read the general information pamphlet and option grid before then being presented with the following text on the next page of the survey: "During the consultations with your GP, they discuss with you the benefits of exercise and physical activity for your knee problems, including that exercise is safe for your joint, and recommend you commence an exercise and physical activity program first, before exploring other management options." Participants then completed postintervention outcome measures on the next page of the survey.

Outcome measures. Outcome measures (Table 1) were informed by previous relevant research (32). The primary outcome was agreement with the statement "I believe an exercise and physical activity program is the best management option for my knee problem at this time," rated on an 11-point numeric rating scale (NRS) ranging from 0 = strongly disagree to 10 = strongly agree. Secondary outcomes (Table 1) were also measured via an NRS (ranging from 0 = strongly disagree or definitely would not to 10 = strongly agree or definitely would) and included beliefs regarding treatments intentions and the use of surgery, weight loss, medications, injections, and x-rays. Exercise and weight loss are recommended by clinical guidelines as core first-line treatments for knee OA prior to consideration of adjunctive therapies (such as injections or medications) or surgery (1–4). Therefore, higher agreement with exercise and weight loss statements was deemed to be more desirable, whereas higher agreement with statements relating to surgery, medications, injections, and x-rays was deemed to be less desirable in relation to the hypothetical scenario.

Tertiary outcomes (Appendix 3) were included to evaluate perceptions about x-rays and treatments when taken out of personal context. This involved ascertaining agreement about whether each of exercise and physical activity, weight loss, surgery, injections, medications, and x-rays were "the best/necessary for MOST people with knee osteoarthritis."

Sample size. Based on a similar trial in low back pain (32), we aimed to detect a 1-unit difference on the 11-point NRS on the primary outcome in the primary pairwise comparison of interest between general information and option grid plus recommendation groups, using an $\alpha = 0.05$ and 80% power. We conservatively assumed a between-participant standard deviation (SD) of 3.4 units for the primary outcome at baseline across all participants (32) and no correlation between baseline and postintervention scores. Assuming 25% attrition (32), a minimum sample size of 729 (243 per arm) was required.

Statistical analysis. Data were analyzed in Stata version 16.1 (StataCorp LLC, College Station, TX). Because less than 5% of the primary outcome was missing, multiple imputation was not applied, and all analyses were performed on complete case data, including assessing regression assumptions of linearity and homoscedasticity using standard diagnostic plots. Separate linear regression models were used to estimate the mean (95% confidence interval [CI]) difference in postintervention scores between pairs of groups for each outcome, adjusted for the outcome at baseline.

Table 1. Primary and secondary outcome measures

Outcome	Desirable direction of change[a]
Primary outcome	
(11-point NRS, ranging from 0 = strongly disagree to 10 = strongly agree)	
I believe an exercise and physical activity program is the best management option for my knee problem at this time	Higher agreement more desirable
Secondary outcomes	
Beliefs about management for MY problem (11-point NRS, ranging from 0 = strongly disagree to 10 = strongly agree)	
I believe surgery is the best management option for my knee problem at this time	Lower agreement more desirable
I believe weight loss is the best management option for my knee problem at this time (only for those with a BMI above 25 kg/m^2)	Higher agreement more desirable
I believe medications are the best management option for my knee problem at this time	Lower agreement more desirable
I believe injections are the best management option for my knee problem at this time	Lower agreement more desirable
I believe an x-ray is necessary to determine the diagnosis of my knee problem at this time	Lower agreement more desirable
I believe an x-ray is necessary to determine the best treatment for my knee problem at this time	Lower agreement more desirable
Intentions about management of MY problem (11-point NRS, ranging from 0 = definitely would not to 10 = definitely would)	
At this appointment, I would ask my GP for a referral to an orthopedic surgeon for consideration of surgery for my knee problem	Lower agreement more desirable
At this appointment, I would ask my GP for a referral to a physiotherapist for an exercise and physical activity program for my knee problem	Higher agreement more desirable
At this appointment, I would ask my GP for a referral to a dietitian for a weight loss program for my knee problem (only for those with a BMI above 25 kg/m^2)	Higher agreement more desirable
At this appointment, I would ask my GP for mediations for my knee problem	Lower agreement more desirable
At this appointment, I would ask my GP for an injection for my knee problem	Lower agreement more desirable
At this appointment, I would ask my GP for an x-ray to determine the diagnosis of my knee problem	Lower agreement more desirable
At this appointment, I would ask my GP for an x-ray to determine the best treatment for my knee problem	Lower agreement more desirable

Abbreviations: BMI, body mass index; GP, general practitioner; NRS, numbered rating system.
[a]Based on recommended first-line treatments for knee osteoarthritis (1–4).

RESULTS

Figure 2 summarizes participant flow through the study. We enrolled 738 participants from 1875 people screened between March 24 and March 30, 2021. Major reasons for exclusion were having OA (n = 465, 41%) or having knee pain in the last 3 months (n = 283, 25%). Three participants (0.4%) discontinued the survey after randomization (reasons not known) and were excluded from analysis, resulting in a final sample of 735 participants. Baseline characteristics of participants were similar across groups (Table 2).

Primary outcome: Belief about exercise and physical activity for my problem. For the primary comparison, option grid plus recommendation led to higher agreement that exercise and physical activity is the best option by a mean of 0.4 (95% CI: 0.1-0.6) NRS units more than general information postintervention ($P = 0.012$, Tables 3 and 4). There was no evidence of differences in the primary outcome between option grid and general information (mean difference 0.1 units [CI: –0.2 to 0.4], $P = 0.40$) or between option grid plus recommendation and option grid (0.2 units [CI: 0.0-0.5], $P = 0.10$).

Secondary outcomes: Beliefs about treatment for my problem. Compared to general information, post intervention, option grid led to higher agreement that surgery is the best option (0.7 units [CI: 0.2-1.1], P = 0.002) and that an x-ray is necessary to determine treatment (0.5 units [CI: 0.1-1.0], P = 0.020). Compared with option grid plus recommendation, option grid had higher agreement that surgery is the best option (0.5 units [CI: 0.1-0.9], P = 0.014) and that an x-ray is necessary for diagnosis (0.5 units [CI: 0.1-1.0], P = 0.025) and to determine treatment (0.9 units [CI: 0.4-1.3], P < 0.001). There were no between-group differences in beliefs about weight loss, medications, and injections (Table 4). Findings were similar in tertiary outcomes evaluating treatment beliefs when participants were asked to consider the best management option for most people (Appendix 3).

Secondary outcomes: Intentions about management of my problem. Compared with general information post intervention, option grid led to higher intentions to seek referral to an orthopedic surgeon for surgery (0.6 units [CI: 0.2-1.1], P = 0.004). Compared with option grid plus recommendation, option grid led to higher intentions to seek an x-ray to determine treatment (0.8 units [CI: 0.3-1.2], P = 0.001). There were no between-group differences in intention to request referral to a dietitian for weight loss, request medications, or request injections (Table 4).

DISCUSSION

The primary aim of this study was to evaluate whether the addition of a treatment option grid, and GP recommendation, to general OA information changed beliefs about exercise and

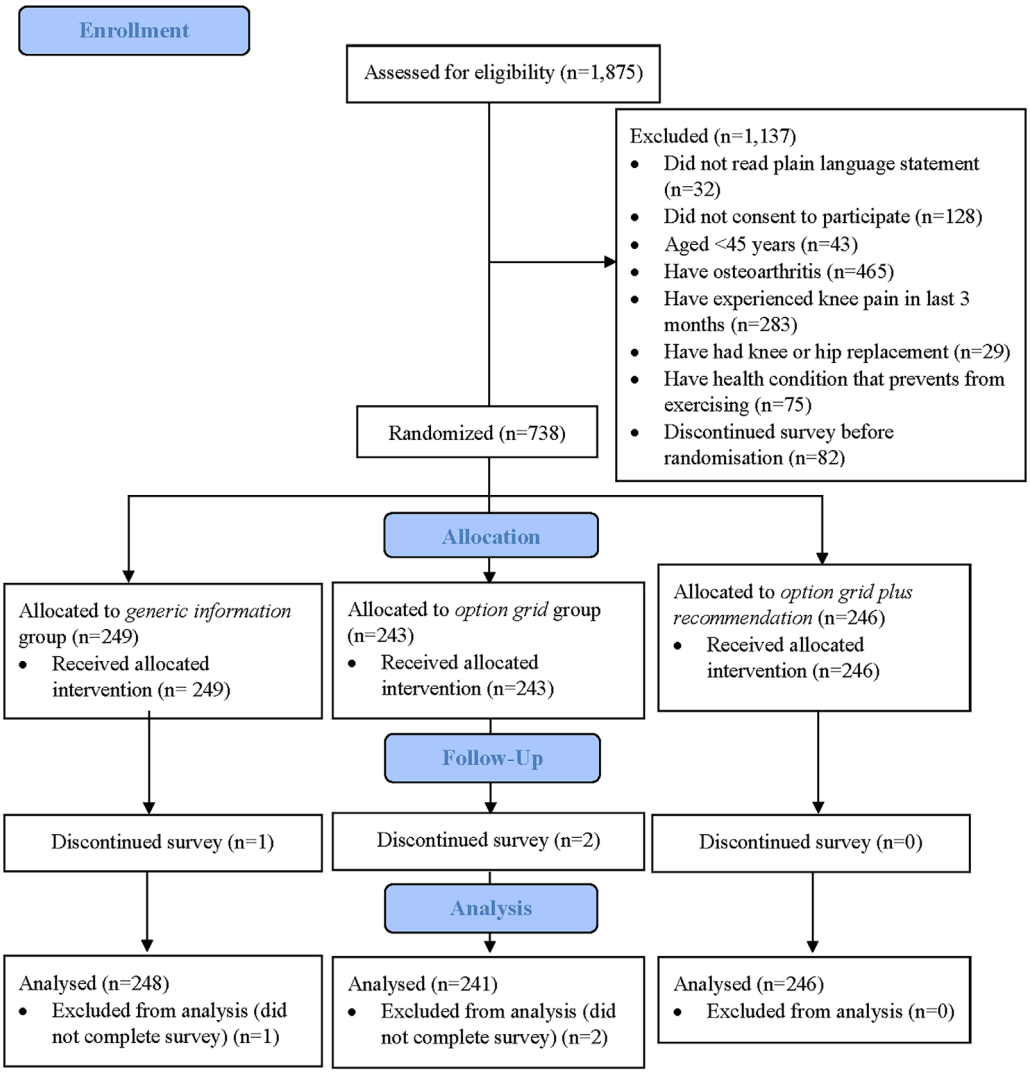

Figure 2. Participant flow through the trial.

physical activity in the management of a hypothetical knee problem. We found that the option grid with GP recommendation led to increases in agreement that exercise and physical activity were the best option, compared with general information alone. Secondary outcomes suggested that the option grid led to increased agreement that surgery was best, and x-rays were necessary, compared with when the option grid was combined with a GP recommendation to exercise or compared to general information alone. However, it should be noted that all pairwise differences were small and are of unclear clinical importance.

Our findings suggest that a clinician recommendation in addition to an option grid increases beliefs about the importance of exercise and physical activity in the management of knee OA. Other research also supports the important role that clinician recommendations have on patient treatment decisions. A qualitative study exploring the use of option grids for patients with OA in physiotherapy found that, despite provision of information about pain killers, injections, and surgery, patients still felt it was necessary to defer treatment decisions to the clinician (40). Patients also believed they would go along with the treatment decision of their clinician, even if it did not match their own treatment preference (40). There is also evidence that people with OA feel anxious about making their own choices about surgery (41) and that doctor referral positively influences decisions to have surgery (42) or seek physiotherapy care (29) for their OA. Our data support these findings, given that the option grid alone did not change treatment beliefs compared with general information. Collectively, research suggests that clinician recommendations could play an important role in influencing patient treatment decisions and that provision of treatment option grids or decision aids alone may not be effective in achieving the desired patient beliefs or intentions (27). GPs who provide care to people with OA often perceive exercise to be outside their scope of practice (11,43); however, our findings suggest that providing a simple recommendation that exercise is safe and beneficial for OA may lead to small changes in patient beliefs. A limitation of our RCT is that we did

Table 2. Baseline characteristics of participants, by group, reported as mean (SD) unless otherwise stated

Characteristic	General (n = 248)	Option grid (n = 241)	Option grid + recommendation (n = 246)
Age (y), median (IQR)	61 (53, 69)	59 (50, 67)	59 (50, 67)
Gender, n (%)			
Male	119 (48.0)	112 (46.5)	120 (48.8)
Female	129 (52.0)	127 (52.7)	126 (51.2)
Transgender male	0 (0)	1 (0.4)	0 (0)
Transgender female	0 (0)	1 (0.4)	0 (0)
Gender variant/nonconforming	0 (0)	0 (0)	0 (0)
Prefer not to say	0 (0)	0 (0)	0 (0)
State/territory, n (%)			
Australian Capital Territory	2 (0.8)	3 (1.2)	6 (2.4)
New South Wales	64 (25.8)	70 (29.0)	78 (31.7)
Northern Territory	0 (0)	1 (0.4)	3 (1.2)
Queensland	61 (24.6)	53 (22.0)	57 (23.2)
South Australia	32 (12.9)	20 (8.3)	22 (8.9)
Tasmania	9 (3.6)	5 (2.1)	3 (1.2)
Victoria	54 (21.8)	66 (27.4)	53 (21.5)
Western Australia	26 (10.5)	23 (9.5)	24 (9.8)
Self-reported height (m), median (IQR)	1.7 (1.6, 1.8)	1.7 (1.6, 1.8)	1.7 (1.6, 1.8)
Self-reported weight (kg)	78.7 (17.7)	77.7 (19.6)	77.7 (17.0)
Body mass index (kg/m^2), median (IQR)	26.8 (23.5, 31.2)	26.2 (23.1, 30.9)	26.6 (23.4, 30.0)
Highest education level, n (%)			
Primary school	1 (0.4)	3 (1.2)	4 (1.6)
Secondary school	81 (32.7)	73 (30.3)	83 (33.7)
Trade or trade certificate	61 (24.6)	55 (22.8)	52 (21.1)
University	105 (42.3)	110 (45.6)	107 (43.5)
Financial situation, n (%)			
Find it a strain to get by from week to week	22 (8.9)	15 (6.2)	17 (6.9)
Have to be careful with money	75 (30.2)	83 (34.4)	88 (35.8)
Able to manage without much difficulty	81 (32.7)	82 (34.0)	69 (28.0)
Quite comfortably off	50 (20.2)	44 (18.3)	60 (24.4)
Very comfortably off	16 (6.5)	14 (5.8)	10 (4.1)
Prefer not to answer	4 (1.6)	3 (1.2)	2 (0.8)
Participation in regular exercise/physical activity, n (%)			
No	57 (23.0)	47 (19.5)	54 (22.0)
0-1 times per week	33 (13.3)	33 (13.7)	23 (9.3)
2-3 times per week	73 (29.4)	79 (32.8)	67 (27.2)
4-5 times per week	49 (19.8)	41 (17.0)	47 (19.1)
6+ times per week	36 (14.5)	41 (17.0)	55 (22.4)
Sustained knee injury in past, n (%)	31 (12.5)	42 (17.4)	29 (11.8)
Prior knee surgery, n (%)	21 (8.5)	15 (6.2)	10 (4.1)
Regular pain relief for musculoskeletal condition, n (%)	7 (2.8)	8 (3.3)	10 (4.1)
Family member with osteoarthritis, n (%)			
Yes	35 (14.1)	29 (12.0)	24 (9.8)
No	182 (73.4)	181 (75.1)	182 (74.0)
Unsure	31 (12.5)	31 (12.9)	40 (16.3)
Ability to read and understand written health information[a], median (IQR)	5 (4, 5)	5 (4, 5)	5 (4, 5)
Knee osteoarthritis knowledge[b]	47.3 (5.0)	47.0 (4.7)	47.0 (5.0)

Abbreviations: IQR, interquartile range.
[a]Rated using a 5-point scale with terminal descriptors of 1 = "always difficult" to 5 = "always easy."
[b]Measured on the Knee Osteoarthritis Knowledge Scale (39). Scores range from 15 to 75, with higher scores indicating greater knowledge about OA.

not examine the effects of GP recommendation alone (without the option grid) on treatment beliefs and intentions, which would have provided more information about the relative effects of option grids and clinician recommendations.

We found that the option grid, without GP recommendation, led to higher agreement that surgery and x-rays are best or necessary compared with general information alone and compared with option grid with GP recommendation. To our knowledge, no other studies have examined the effects of an option grid on beliefs and intentions about treatments for people with OA. However, other RCTs have evaluated the effects of decision aids on beliefs and intentions for surgery in people with OA. One RCT found that provision of a surgical decision aid for people with OA increased procedure rates by 85%, compared with provision of standard educational information (44). Five other RCTs involving people with knee OA who had been referred for joint

Table 3. Mean (SD) scores on outcome measures across time, by group

Outcome	Baseline			Postintervention		
	General[b] (n = 248)	Option grid[c] (n = 241)	Option grid + recommendation[d] (n = 246)	General[b] (n = 248)	Option grid[c] (n = 241)	Option grid + recommendation[d] (n = 246)
Primary outcome[a]						
Exercise and physical activity are best option	6.3 (2.3)	6.4 (2.2)	6.1 (2.2)	8.3 (1.7)	8.4 (1.7)	8.6 (1.6)
Secondary outcomes						
Beliefs about management options for my hypothetical knee problems[a]						
Surgery is best option	3.9 (2.4)	3.9 (2.6)	4.0 (2.5)	2.3 (2.5)	2.9 (2.8)	2.4 (2.7)
Weight loss is best option	7.2 (2.1)	7.2 (2.1)	7.2 (2.0)	7.7 (2.1)	7.5 (2.4)	7.8 (2.2)
Medications are best option	5.5 (2.3)	5.4 (2.3)	5.5 (2.1)	4.9 (2.5)	5.2 (2.5)	5.0 (2.6)
Injections are best option	4.7 (2.4)	4.7 (2.3)	4.8 (2.3)	3.6 (2.6)	3.8 (2.7)	3.7 (2.7)
X-ray is necessary for diagnosis	7.5 (2.3)	7.4 (2.4)	7.6 (2.1)	6.2 (2.9)	6.6 (2.8)	6.2 (3.0)
X-ray is necessary to determine treatment	7.1 (2.5)	7.0 (2.4)	7.4 (2.1)	5.9 (3.0)	6.4 (3.0)	5.8 (3.1)
Intentions to request management options for my hypothetical knee problems[e]						
Referral to physiotherapist for exercise and physical activity	6.4 (2.5)	6.4 (2.6)	6.3 (2.7)	7.4 (2.6)	7.5 (2.6)	7.3 (2.8)
Referral to orthopedic surgeon for surgery	4.5 (3.0)	4.5 (3.1)	4.5 (3.1)	2.7 (2.9)	3.3 (3.3)	2.9 (3.2)
Referral to dietitian for weight loss	5.4 (2.8)	5.5 (3.0)	5.6 (2.8)	6.6 (2.9)	6.8 (3.0)	6.8 (3.0)
Medications	6.1 (2.6)	6.1 (2.8)	6.1 (2.7)	5.3 (2.7)	5.6 (2.8)	5.3 (2.8)
Injection	4.0 (2.7)	4.4 (2.7)	4.1 (2.7)	3.2 (2.8)	3.8 (3.0)	3.2 (2.9)
X-ray for diagnosis	7.1 (2.5)	7.3 (2.4)	7.3 (2.4)	6.1 (3.2)	6.5 (3.0)	6.1 (3.2)
X-ray to determine treatment	7.1 (2.5)	7.1 (2.5)	7.2 (2.6)	5.8 (3.3)	6.3 (3.1)	5.7 (3.2)

[a]Measured on 11-point NRS ranging from 0 = strongly disagree to 10 = strongly agree.
[b]n = 160 for "Weight loss is best option" and "Referral to dietitian for weight loss" (only asked to those with BMI >25).
[c]n = 143 for "Weight loss is best option" and "Referral to dietitian for weight loss" (only asked to those with BMI >25).
[d]n = 153 for "Weight loss is best option" and "Referral to dietitian for weight loss" (only asked to those with BMI >25).
[e]Measured on 11-point NRS ranging from 0 = definitely would not to 10 = definitely would.

replacement surgery found that provision of a surgical decision aid, compared with standard educational material alone, did not reduce preferences for, or rates of, surgery as was hypothesized (20,22,45–47). However, given that all those studies were conducted in people with OA who had been referred for surgery, and did not incorporate nonsurgical treatment options into the decision aids (27), comparison with our findings is difficult. Other studies in people with back pain found that provision of a decision aid that included conservative treatment options did not change treatment beliefs about, or willingness to use, acupuncture (48) or other nonpharmacological treatment options (types not specified) (49), /compared with general information. It may be that treatment option grids introduce uncertainty about the relative effectiveness of the available options (50), and too much information may actually increase uncertainty about a decision (27). This may be particularly relevant in our cohort, given that we recruited people without OA who were asked to imagine that they had developed knee pain and thus may be less familiar with treatment options. Our findings suggest that, to increase effects on treatment beliefs, an option grid may be most effective if provided in combination with a clinician recommendation to exercise. However, further research is needed to confirm this finding.

It is not clear why inclusion of the option grid increased agreement that x-rays are necessary to determine treatment compared with general information, particularly given that the option grid did not contain any information about x-rays. We also observed that the option grid increased agreement that surgery is best, and together these findings may reflect a commonly held community belief that x-rays are required to determine need for surgery (7,13). Nonetheless, these are undesirable outcomes from the option grid, as OA guidelines do not recommend routine use of x-rays for diagnosis or to determine initial treatment (3,4). As described previously, it may be that the added volume and/or complexity of information in our option grid actually increased uncertainty about treatment options (27). Further research is needed to evaluate whether differences in the volume or complexity of OA information has any effect on OA beliefs and whether greater volumes of educational information do "more harm than good." A recent RCT in people with low back pain examined the effects of different information formats on intentions and beliefs about diagnostic imaging, finding that using behavioral cues to emphasize the harms of unnecessary imaging reduced intentions to request diagnostic imaging (32). Further research should consider evaluating whether differences in beliefs about x-rays remain if similar framing is used in our pamphlets.

The clinical relevance of our findings is uncertain. All mean differences between groups in our study were less than 1.0 unit on an 11-point NRS, and it is not clear whether the observed effects would be large enough to translate into meaningful changes in treatment uptake. To our knowledge, no previous studies have examined the clinical meaningfulness of changes in beliefs on an 11-point NRS. A Cochrane review of decision

Table 4. Change within groups (at the mean baseline score of the relevant outcome) and difference in postintervention scores between groups (adjusted for the outcome at baseline), for outcomes

Change within groups (postintervention minus baseline)[a]			Difference in postintervention scores between groups[b]					
			Option grid vs. general		Option grid + recommendation vs. general		Option grid + recommendation vs. option grid	
General Mean (SD)	Option grid Mean (SD)	Option grid + recommendation Mean (SD)	Mean (95% CI)	*P*	Mean (95% CI)	*P*	Mean (95% CI)	*P*
Primary outcome[c]								
Exercise and physical activity is best option								
1.9 (2.3)	2.0 (2.3)	2.4 (2.4)	0.1 (−0.2 to 0.4)	0.40	0.4 (0.1 to 0.6)	0.012	0.2 (0.0 to 0.5)	0.100
Secondary outcomes								
Beliefs about best management options for my hypothetical knee problems[c]								
Surgery is best option								
−1.7 (2.5)	−1.0 (2.3)	−1.5 (2.8)	0.7 (0.2 to 1.1)	0.002	0.1 (−0.3 to 0.6)	0.48	−0.5 (−0.9 to −0.1)	0.014
Weight loss is best option								
0.5 (1.7)	0.2 (2.1)	0.6 (2.1)	−0.2 (−0.6 to 0.2)	0.31	0.2 (−0.2 to 0.6)	0.42	0.4 (0.0 to 0.8)	0.075
Medications are best option								
−0.6 (2.4)	−0.2 (2.4)	−0.5 (2.4)	0.4 (0.0 to 0.8)	0.059	0.1 (−0.2 to 0.5)	0.46	−0.2 (−0.6 to 0.2)	0.25
Injections are best option								
−1.1 (2.5)	−0.9 (2.4)	−1.2 (2.8)	0.2 (−0.2 to 0.6)	0.33	0.0 (−0.4 to 0.4)	0.96	−0.2 (−0.6 to 0.2)	0.31
X-ray is necessary for diagnosis								
−1.4 (2.6)	−0.8 (2.4)	−1.4 (2.8)	0.5 (0.0 to 0.9)	0.031	0.0 (−0.5 to 0.4)	0.93	−0.5 (−1.0 to −0.1)	0.025
X-ray is necessary to determine treatment								
−1.2 (2.8)	−0.6 (2.5)	−1.6 (2.8)	0.5 (0.1 to 1.0)	0.020	−0.3 (−0.8 to 0.1)	0.16	−0.9 (−1.3 to −0.4)	<0.001
Intentions to request management options for my hypothetical knee problems[d]								
Referral to physiotherapist for exercise and physical activity								
1.0 (2.5)	1.1 (2.4)	1.0 (2.5)	0.1 (−0.3 to 0.5)	0.71	−0.1 (−0.5 to 0.3)	0.76	−0.1 (−0.5 to 0.3)	0.51
Referral to orthopedic surgeon for surgery								
−1.9 (2.4)	−1.2 (2.5)	−1.6 (3.0)	0.6 (0.2 to 1.1)	0.004	0.3 (−0.2 to 0.7)	0.24	−0.4 (−0.8 to 0.1)	0.088
Referral to dietitian for weight loss								
1.2 (2.2)	1.3 (2.3)	1.3 (2.6)	0.1 (−0.4 to 0.6)	0.69	0.1 (−0.3 to 0.6)	0.57	0.0 (−0.5 to 0.5)	0.87
Medications								
−0.8 (2.3)	−0.5 (2.3)	−0.8 (2.6)	0.3 (0.0 to 0.7)	0.085	0.0 (−0.4 to 0.4)	0.99	−0.3 (−0.7 to 0.0)	0.087
Injection								
−0.8 (2.1)	−0.6 (2.2)	−0.9 (2.7)	0.3 (−0.1 to 0.7)	0.11	0.0 (−0.4 to 0.3)	0.81	−0.4 (−0.8 to 0.0)	0.065
X-ray for diagnosis								
−1.0 (2.5)	−0.8 (2.3)	−1.3 (2.8)	0.2 (−0.2 to 0.7)	0.27	−0.2 (−0.6 to 0.2)	0.33	−0.5 (−0.9 to 0.0)	0.040
X-ray to determine treatment								
−1.3 (2.7)	−0.8 (2.5)	−1.6 (2.9)	0.5 (0.0 to 0.9)	0.041	−0.3 (−0.7 to 0.2)	0.24	−0.8 (−1.2 to −0.3)	0.001

Abbreviations: CI, confidence interval; NRS, numeric rating scale; SD, standard deviation.
[a]Positive change within groups = higher agreement or higher intentions.
[b]Positive difference in postintervention scores between groups indicates higher score in the first named group in the pairwise comparison, whereas a negative difference indicates higher score in the second named group.
[c]Measured on 11-point NRS ranging from 0 = strongly disagree to 10 = strongly agree.
[d]Measured on 11-point NRS ranging from 0 = definitely would not to 10 = definitely would.

aids for people facing health treatments, which included 105 studies, reported a relative risk of 0.86 (95% CI: 0.75-1.0) for choosing surgery over conservative treatment options, although this was not specifically in people with musculoskeletal conditions. In fact, a recent systematic review suggested that decision aids might be less suitable for people with chronic musculoskeletal pain, compared with other conditions (eg, cancer, smoking, diabetes), because patients often use multiple interventions concurrently (27). However, that review reported that decision aids may have other positive effects, such as increased knowledge about treatment options and increased arthritis self-efficacy (27). These domains were not evaluated in our RCT. Another recent systematic review of patient education for people with OA found that, although patient education led to better short-term improvements in pain and function than usual care, the differences were small (ie, standard mean difference −0.35; 95% CI −0.56 to −0.14) and of unclear clinical importance (51). It concluded that patient education should not be provided as a standalone treatment (51). Decision aids are often used by clinicians in a shared decision making approach rather than being independently read by the patient without discussion (25). As such, the best way to incorporate option grids and decision aids into the management of people with OA warrants further examination.

Our findings may have implications for health care providers. Our findings suggest that treatment option grids may be

most effective for increasing beliefs about the importance of exercise and physical activity when delivered in combination with a GP recommendation to exercise and, by themselves, may be no better than provision of general OA information alone. These findings were also supported by our tertiary outcomes, where beliefs were similar when considering the best management option for most people with OA. It is likely that option grids are best used as part of a comprehensive person-centered clinical encounter and that different patients may have different preferences for how they receive information about treatment options (eg, verbal, written, video, etc.). Indeed, a recent systematic review compared the effects of video and paper decision aids for people with chronic musculoskeletal pain, finding that both were equally effective (27). There is also some evidence that incorporating behavioral cues into written information helps persuade patients to change treatment beliefs and intentions (32), highlighting the importance of framing educational information.

Our study has a number of strengths and limitations. Strengths include the RCT design, the large sample size representing people across all states and territories of Australia, and the very high retention rate. Our study also has limitations. We recruited a sample of people without OA in order to imitate a scenario in which someone first presents to their GP with knee pain. As such, participants were asked to imagine a hypothetical scenario, and so our findings may not necessarily be generalizable to those who have OA with a lived experience of knee pain or to experiences after an actual encounter with a GP. We did not use any measures to evaluate whether participants had actually read through the educational information as instructed, apart from requiring participants to tick a box to confirm that they had done so. Future studies could consider embedding measures within the survey software to evaluate the length of time participants spend reading the information as a measure of fidelity.

In conclusion, we found that addition of an option grid and GP exercise recommendation to general OA information led to more favorable views that exercise and physical activity were best for a hypothetical knee problem. However, differences were small, and the clinical importance of the change in beliefs is unclear.

ACKNOWLEDGMENTS

None.

AUTHOR CONTRIBUTIONS

All authors were involved in drafting and revising the article or revising it critically for important intellectual content, and all authors approved the final version to be published. Dr. Lawford had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

Study conception and design. Lawford, Bennell, Hall, Egerton, McManus, Lamb, Hinman.
Acquisition of data. Lawford.
Analysis and interpretation of data. Lawford, Bennell, Hall, Egerton, McManus, Lamb, Hinman.

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