

Outcomes of a medical second opinion programme before knee arthroplasty: A prospective cohort study

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Abstract

Background: German social legislation gives patients the right to obtain a second opinion before elective surgery and defines quality criteria for reimbursement by statutory health insurance. However, the effects of second opinions before elective surgery are largely unknown. The aim of this study was to evaluate the effects of a second opinion programme in patients recommended for knee arthroplasty.

Methods: The largest statutory health insurance funds in Bavaria offered patients to whom knee arthroplasty was recommended participation in a second opinion programme with personal presentation to an experienced knee surgeon. In this cohort study, consecutive patients from this second opinion programme who signed informed consent were included from 07/10/2016 to 14/02/2020. Data were collected before and after the second opinion visit.

Results: A total of 141 (66%) of 215 second opinion patients participated in the evaluation study. The second opinion physician recommended knee arthroplasty to 40% of the patients, later knee arthroplasty if the conditions worsened to 40%, and no knee arthroplasty to 20%. The frequency of undecided patients decreased from 41% to 12%. After the second opinion, the patients were more confident in their decision according to the decision confidence scale (before: 5.4 ± 3.0 ; after: 7.8 ± 2.5 ; $p < 0.001$). Logistic regression analyses showed that higher radiological severity of osteoarthritis on the Kellgren/Lawrence scale ($p = 0.001$) and lower knee-joint-specific quality of life on the KOOS questionnaire ($p = 0.041$) were associated with the recommendation for knee arthroplasty by the second opinion physician. The patients rated their satisfaction with the second opinion programme with a mean grade of 1.35 (± 0.60) on a scale from 1 to 5.

Conclusion: The second opinion of an experienced knee surgeon frequently deviates from the initial recommendation for knee arthroplasty. The results of this study suggest that a second opinion may improve adherence to guidelines for indications of knee arthroplasty. From the patient perspective, the second opinion reduces uncertainties in their treatment decision.

Background

Knee arthroplasty (KA) is a very common procedure in orthopaedic surgery. It is performed particularly frequently in Switzerland, the United States, Austria and Germany, with more than 200 surgeries per year per 100,000 inhabitants, while the average of 33 OECD countries is 126 (1). Population ageing and increasing levels of obesity are expected to more than double the incidence of KA in many countries by 2050 or even earlier (2–4). The popularity of KA can be explained by the prospect of large improvements in pain and physical function (5). However, approximately 20% of patients still complain about pain one year after surgery (6, 7) and are not satisfied with the results. New surgical techniques do not seem to reduce the proportion of unsatisfied patients (8).

One possible reason for unsatisfactory outcomes is weakness in the decision-making process before KA. This is supported by large age-adjusted variations in frequencies of KA in Germany at the state and district levels (9). In Bavaria, for example, the probability of receiving KA is 70% higher than in Berlin. Additionally, a study in the United States found substantial regional variations that could not be sufficiently explained by differences in morbidity (10). An inadequate decision-making process may be one of the causes of these regional differences.

The German S2k guideline indications for KA (2k = structured consensus) of the Association of the Scientific Medical Societies in Germany (AWMF) recommends that the decision for KA should be based on both medical criteria and patient preferences (11). It defines five main criteria: knee pain for at least 3–6 months; evidence of structural damage; failure of conservative treatment for at least 3–6 months; limitation of quality of life related to knee joint disease; and subjective substantial suffering. After a physician has determined the indication for KA, the guideline additionally recommends a shared decision-making process. The German AWMF osteoarthritis S2k guideline additionally recommends that in case of doubt, a second medical opinion (SO) from an experienced knee surgeon from a KA centre should be obtained (12). However, the regional differences suggest that decisions for KA sometimes do not correspond to the recommendations of the guidelines.

Since 2015, in the German health care system, patients have the legal right to obtain an independent SO for certain elective surgeries for which, “particularly in view of the numerical development of its implementation, the risk of an expansion of indications cannot be ruled out” (§ 27b, Code of Social Law V) (13). Social law defines two main quality criteria for the second opinion physician (SP): first, many years of experience as a specialist in a field relevant to the indication for surgery and Second, knowledge of the current state of scientific research on the respective diagnostics and therapy, including knowledge of alternative treatments to the recommended intervention. The Federal Joint Committee (G-BA) defines further details in a directive (14). Public health insurance reimburses SO. To date, the Federal Joint

Committee (G-BA) has defined tonsillectomy, hysterectomy and shoulder arthroscopy as interventions for this SO (14). KA could be one of the next elective surgeries since it qualifies for SO according to the criteria mentioned above.

In a representative survey in Germany, 56% of the respondents considered it important to have the opportunity to obtain an SO before orthopaedic surgery (15). However, the literature on the effects of an SO is limited (16, 17). Therefore, it remains unclear whether an SO actually improves adherence to guidelines and offers more certainty to patients. In contrast, an SO may also increase uncertainty if the recommendations of the initial physician (IP) and the second SP are divergent. On a societal level, an SO could add additional costs to the health system. In contrast, if an SO reduces unnecessary surgery, it may save costs. Accordingly, more evidence for the effects of an SO is required.

In a pilot project, the German public health insurance AOK Bayern in cooperation with the Department for Orthopaedics, Physical Medicine and Rehabilitation at the University Hospital Munich provides a patient-initiated SO programme for patients recommended for KA by their IP. The overall objective of this study was to evaluate the effects of this SO programme with personal presentation to the SP.

Methods

Aims

The specific aims were a) to evaluate the agreement between the recommendations of the IP and the SP; b) to examine the effects of the SO on the patients' decision and the certainty of the decision; c) to evaluate the patients' satisfaction with the SO concept; and d) to examine the association between the recommendations of the SP and the main criteria for KA in the German AWMF guideline indications for KA (11).

Study design

This prospective cohort study evaluated an SO pilot project in patients with recommendations for KA by their IP. It was approved by the institutional review board at the medical faculty of the Ludwig Maximilian University Munich (project number 17–098). All patients signed informed consent forms prior to enrolment. The study was conducted in accordance with the Declaration of Helsinki. The analysis plan was registered in the open science framework before the analyses were performed (<https://osf.io/>).

Setting

The study was conducted at the Department of Orthopaedics, Physical Medicine and Rehabilitation (OPMR), University Hospital, LMU, Munich. OPMR is certified by Endocert as an endoprosthesis centre of maximum care. Endocert is the world's first joint arthroplasty-specific quality assurance system for certifying the quality of knee and hip arthroplasty. It had certified 543 in German facilities by the end of 2018 (18).

Patient recruitment and inclusion criteria

Patients were informed about the SO project by the AOK Bayern webpage, the AOK Bayern Facebook page, articles in the AOK members' magazine and by AOK Bayern branches. With over 3.5 million members, AOK Bayern has a market share of more than 40% among the statutory health insurance funds in Bavaria (19).

Interested patients called the OPMR. The patient flow, criteria for participation in the SO programme and additional criteria for inclusion in this study are shown in Figure 1.

Intervention

The patients presented in person to the SP. The SP was a specialist in orthopaedics with at least 5 years of experience in KA. The SP evaluated the indication for KA by taking a medical history, performing a clinical examination, evaluating X-ray images and, if available, evaluating other medical reports.

In the medical history, the SP asked particularly about pain under exertion, at rest and at night, restrictions in daily life, quality of life, pharmacological and non-pharmacological treatments, previous surgery, subjective suffering, previous illnesses, psycho-social stress situations, contraindications for KA and risk factors for surgery. The SP examined the mobility and stability of the knee joint, crepitus, leg axis, clinical signs of inflammation and pain upon pressure of the knee joint structures. Depending on the medical history and symptoms,

additional examinations were added. The SP assessed the radiological severity of osteoarthritis according to the Kellgren and Lawrence (K-L) scale (see section measures) (20, 21).

At the end of the presentation, the SP discussed the recommendation with the patient, taking into account the strength of the recommendation, the chances and risks of KA and other treatment options. In recommending KA, the SP aimed to follow the criteria of the German guideline indication for KA (11). The SP provided the patients with a report that included information on the results of the clinical examination, the evaluation of imaging, and the treatment recommendation.

Data collection

T0: Participants received a set of questionnaires on the day of the appointment and completed the questionnaires before the doctor visit. During the visit, height and weight were measured, and X-ray images were evaluated.

T1: After the doctor visit, patients completed another questionnaire and submitted it on the same day.

Measures

The patient decision at T0 and T1 was evaluated by the question "Do you want surgical treatment for your knee?" Patients answered on a 5-point Likert scale: "Yes, definitely", "rather yes", "undecided", "rather no" and "No, definitely not". Decision confidence was assessed by the question "On a scale from 0 (not at all) to 10 (extremely), how confident are you about your decision for surgery?" These two questions were adapted from a longer decision quality instrument and translated into German. The answer options of the first questions were expanded from a 3-point to a 5-point Likert scale (22).

Pharmacological and non-pharmacological conservative treatment, previous surgeries, comorbidity and sociodemographic data were collected by closed questions.

The Knee injury and Osteoarthritis Outcome Score (KOOS) was used to measure knee pain (9 items), other knee symptoms (7 items), restrictions in activities of daily living (17 items), restrictions in sport and recreation function (5 items) and knee-related quality of life (4 items) (23–25). Each item was scored on a 4-point Likert scale. The scale ranged from 0 (worst) to 100 (best). For ease of interpretation of the regression model, the original scale was reversed prior to analysis (0 = best; 100 = worst). The KOOS has been validated in many languages, including German, and has demonstrated good reliability and responsiveness in patients with knee osteoarthritis and KA. Compared to the older, frequently used Western and Ontario Osteoarthritis Index (WOMAC), the KOOS has the advantage of fewer ceiling effects (25).

Generic health status was assessed by the 5-level version of the EuroQOL Group 5-Dimension Self-Report Questionnaire (EQ-5D-5L) (26, 27). It comprises five items that evaluate five dimensions: mobility, self-care, usual activities, pain/discomfort, and anxiety/depression (23, 24). An algorithm was used to calculate the EQ-5D index. The range was from – 0.661 (worst health) to 1 (best health). We also applied the EQ-5D-visual analogue scale (EQ-5D-VAS) (0 = worst; 100 = best). The EQ-5D-5L has been validated in patients with knee osteoarthritis and KA (27).

Anxiety and depression were assessed by the patient Health Questionnaire 4 (PHQ-4). The PHQ-4 is an ultra-brief, reliable and valid instrument with two items regarding anxiety and depression. Each item has four answer options (score 0–3). The scales range from 0 to 6. Scores ≥ 3 are considered probable cases of anxiety or depression.

In the course of the study, we added a question on the urgency of the recommendation of the IP because patients reported considerable differences in medical history. Accordingly, a more detailed description of the recommendation was considered important for a better understanding of differences between the IP and the SP.

The radiological severity of osteoarthritis was assessed by the K-L scale (20). The K-L scale is a commonly used system that classifies the radiological severity of osteoarthritis from 0 to 4 depending on joint space narrowing, osteophytes, sclerosis, and joint deformity of bone ends. Patients with grade 3 or 4 osteoarthritis show larger effects after KA than patients with lower grades (21).

At T1, patients were asked about the recommendation of the SP: "Did your second opinion doctor recommend KA?" The answer options were yes (surgery recommended immediately or within less than 3 months), no or "later surgery recommended depending on the course of the disease".

To assess the influence of the SO on the patient's decision, we asked the following question: "How strongly does the second opinion influence your decision for or against a knee prosthesis?" The patients responded on a 5-level Likert scale (min = 1, max = 5): very

strongly/strongly/somewhat/little/very little.

Satisfaction with the SO project was measured by the question: "What school grade do you give the AOK-LMU second opinion project?" The response options were adapted from the grading system of German schools: 1 = very good; 2 = good; 3 = satisfying; 4 = sufficient; 5 = deficient; 6 = insufficient.

Statistical analyses

Details of the statistical analysis plan were made publicly available before analyses were performed (<https://osf.io/>). The person who conducted the analysis (second author) was not involved in the data collection and was not employed at the SO department. Means and standard deviations were calculated for metric variables. Frequencies are expressed as percentages. Changes in the frequencies of decision preferences to T0 and T1 were tested for significance using the Chi-square test, and changes in decision confidence were tested for significance using the t-test for paired samples.

The association between the recommendation of the SP and the indication criteria of the German S2k guideline indications for KA was first analysed by descriptively comparing these criteria between patients with and without a current recommendation for KA. Then, the influence of these criteria on the recommendation was analysed in a multivariable logistic regression model. The independent variables were the K-L scale after transformation into a binary scale (1–2 versus 3–4), the KOOS scales for knee pain and knee-joint-related quality of life and previous treatments with exercise therapy (yes/no) or pain medication (no/on demand/always). The cut-off value for the K-L scale was set between 2 and 3 because patients with grade > 2 osteoarthritis show larger treatment effects (21). The dependent variable was the current recommendation for KA (yes/no). We did not use statistical selection of criteria because the model was designed to compare all of these variables. The Hosmer-Lemeshow test was used as the goodness-of-fit test.

Statistical analyses were performed with the software package IBM SPSS Statistics for Windows, Version 25.0. Armonk, NY: IBM Corp.

Results

Study population

A total of 215 patients met the inclusion criteria for the study between 07/10/2016 and 14/02/2020. Of these, 141 (66 %) declared their consent to participate in the study. The sociodemographic data and comorbidities are presented in Table 1. The mean age was 64.5 ± 9.9 years, 70 patients (50 %) were female, and 48 patients (36 %) were obese with a BMI > 30.

Table 2 shows the results of the radiological and patient-relevant outcome measures and the previous treatments. The radiological K-L score was 3 or 4 in 108 patients (77 %). Previous exercise therapy was reported by 96 patients (76 %), 9 patients (7 %) had tried to lose weight, and 39 patients (28 %) took pain medication regularly.

Table 1
Baseline characteristics of the patients.

Characteristic	All patients (n = 141)	Second opinion: Knee arthroplasty recommended (n = 57)	Second opinion: Knee arthroplasty currently not recommended (n = 84)
	n (%) or mean ± SD	n (%) or mean ± SD	n (%) or mean ± SD
Female sex (n = 141)	70 (50%)	29 (51%)	41 (49%)
Age - yr (n = 141)	64.5 ± 9.9		63.6 ± 10.5
Living alone (n = 141)	31 (22%)	13 (23%)	18 (21%)
Education, highest degree (n = 137)			
No degree	2 (2%)	0 (0%)	2 (3%)
Basic school (8–9 years of education)	80 (58%)	35 (63%)	45 (56%)
Middle school (10 years of education)	38 (28%)	15 (27%)	23 (29%)
High school (12–13 years of education)	7 (5%)	3 (5%)	4 (5%)
University	10 (7%)	3 (5%)	7 (9%)
Number of comorbidities (n = 141)			
0	20 (14%)	10 (18%)	10 (12%)
1	38 (27%)	13 (23%)	25 (30%)
2	34 (24%)	17 (30%)	17 (20%)
3	23 (16%)	10 (18%)	13 (16%)
≥ 3	26 (18%)	7 (12%)	19 (21%)
Body weight (n = 134)			
Body mass index ^a (BMI)	28.8 ± 5.7	29.4 ± 6.4	28.4 ± 5.0
Normal weight (BMI < 27)	50 (37%)	20 (35%)	30 (37%)
Overweight (BMI 27–30)	36 (27%)	13 (23%)	23 (28%)
Obesity (BMI > 30)	48 (36%)	19 (33%)	29 (35%)
Mental health (PHQ-4)			
Depression score (n = 134)	0.91 ± 0.80	0.90 ± 0.78	0.91 ± 0.81
Probable cases of depression	4 (3%)	1 (2%)	3 (4%)
Anxiety score (n = 133)	0.65 ± 0.72	0.61 ± 0.75	0.69 ± 0.70
Probable cases of anxiety	4 (3%)	2 (4%)	2 (3%)

^aThe body mass index is the weight in kilograms divided by the square of the height in metres. Patient health questionnaire 4 (PHQ-4): Scores range from 0 to 6. Scores above 3 are considered probable cases of anxiety or depression.

Agreement of the recommendations between the IP and SP

The SP recommended KA for 57 patients (40%) immediately, later KA if the condition worsened for 56 patients (40%), and no KA for 28 patients (20%).

The agreement between the urgency of the recommendation of the IP and the SP was assessed in 111 patients. In the 35 patients with an urgent recommendation for KA by the IP ("as soon as possible" or "fixed date for KA"), the SP confirmed the current recommendation for immediate surgery in 13 patients (37 %).

Effects of the second opinion on the patient's decision

Changes in the patients' decisions between T1 and T2 are shown in Figure 2 (total N=137). The number of undecided patients decreased from 56 (41 %) to 17 (12 %), and the number of patients who were sure of their decision for or against KA increased from 19 (14 %) to 66 (48 %) ($p<0.001$). The SO improved the decision confidence from 5.4 (± 3.0) to 7.8 (± 2.5) ($p< 0.001$).

The average influence of the SO on patients' decisions was 1.79 (± 0.84) on a scale of 1–5. The influence was considered very strong by 56 (42%) and strong by 41 (43%) of 135 answering patients.

Satisfaction with the second opinion concept

The second opinion concept received an average school grade of 1.35 (± 0.60). The distribution was 1 = 70%, 2 = 26%, 3 = 2% and 4 = 1%.

Association between the recommendation of the SP and the indication criteria of the S2K guideline "Indication for KA"

Tables 1 and 2 compare the results of patients with and without a current recommendation for KA by the SP. Patients with a current recommendation for KA had higher radiological severity, higher pain intensity and lower knee-joint-specific quality of life. They more frequently reported previous exercise therapy and regular intake of pain medication.

Table 2
Health status and previous treatments.

Characteristic	All patients (n = 141)	Second opinion: Knee arthroplasty recommended (n = 57)	Second opinion: Knee arthroplasty currently not recommended (n = 84)
	n (%) or mean ± SD	n (%) or mean ± SD	n (%) or mean ± SD
Health Status			
Kellgren-Lawrence score ^a (n = 141)			
1	7 (5%)	0 (0%)	7 (8%)
2	26 (18%)	2 (4%)	24 (29%)
3	69 (49%)	30 (53%)	39 (46%)
4	39 (28%)	25 (44%)	14 (17%)
KOOS ^b scores			
Symptoms (n = 138)	46.5 ± 19.6	53.8 ± 17.2	49.6 ± 17.6
Pain (n = 136)	51.3 ± 17.5	49.3 ± 20.5	44.8 ± 19.0
Activities of daily living (n = 141)	44.6 ± 19.1	48.7 ± 19.2	41.8 ± 18.5
Sport and recreation (n = 127)	72.8 ± 21.3	78.5 ± 18.4	68.9 ± 22.3
Quality of life (n = 140)	71.4 ± 15.9	75.2 ± 14.0	68.8 ± 16.7
EQ-5D scores ^c			
Visual analogue scale (n = 136)	60.1 ± 18.8	57.4 ± 18.4	61.9 ± 19.1
Index (n = 136)	0.64 ± 0.27	0.59 ± 0.29	0.68 ± 0.26
Previous treatment			
Exercise therapy ^c	96 (76%)	43 (83%)	53 (72%)
Attempt to lose weight	9 (7%)	4 (8%)	5 (7%)
Pain medication			
None	34 (24%)	14 (25%)	20 (24%)
On demand	68 (48%)	23 (40%)	45 (54%)
Regularly	39 (28%)	20 (35%)	19 (23%)
Knee surgery	83 (59%)	33 (58%)	50 (60%)
Knee injection	51 (36%)	21 (37%)	30 (36%)

^aKellgren-Lawrence score: range from 0 to 4, with a score of 2, 3, or 4 indicating definite osteoarthritis and higher scores indicating more severe disease. ^bKOOS: Knee Injury and Osteoarthritis Outcome Score, scores range from 0 (best) to 100 (worst); ^cEQ-5D scores: the visual analogue scale ranges from 0 (worst) to 100 (best); the index score ranges from -0.661 (worst) to 1 (best). ^dExercise therapy: supervised strength or endurance training (individually or in group) or home-based strength or endurance training or comprehensive rehabilitation intervention.

Table 3

Association between the recommendation of the initial physician and the second opinion physician (n = 111).

	Recommendation of the second opinion physician for knee arthroplasty			
	Yes	If the condition is worsening	No	Sum of the row n (% of all)
Urgency of recommendation for knee arthroplasty, initial physician, n (% from category)				
"fixed date for surgery"	5 (24%)	13 (62%)	3 (14%)	21 (19%)
"as soon as possible"	8 (57%)	3 (21%)	3 (21%)	14 (13%)
"can wait a few more months"	14 (56%)	9 (36%)	2 (8%)	25 (23%)
"if condition is worsening"	13 (42%)	16 (52%)	2 (7%)	31 (28%)
"at some point in time"	4 (20%)	7 (35%)	9 (45%)	20 (18%)
Sum of the column, n (% of all)	44 (40%)*	48 (43%)*	19 (17%)*	

* Frequencies of patients with available data for the urgency of the recommendation of the initial physician. The frequencies for all 141 patients for yes/if the condition is worsening/no are 40%/40%/20%.

In the logistic multivariable regression model (Table 4), a higher K-L score (p=0.001) and lower knee-joint-specific quality of life (p=0.041) predicted a recommendation for KA. The goodness-of-fit test of the logistic, multivariable regression model showed no indications for poor fit (χ^2 -Test=3.908; p=0.865).

Table 4

Multivariable logistic regression model, predictors for recommendation of knee arthroplasty by the second opinion physician

Multivariable logistic regression				
Criterion	Adjusted odds ratio ^d	95% CI	p-value	
Kellgren-Lawrence score ^a (3 or 4 versus 1 or 2)	17.24	3.65	81.38	0.001
KOOS ^b score – pain	0.99	0.95	1.02	0.486
KOOS ^b score – quality of life	1.04	1.00	1.08	0.041
Exercise therapy ^c	1.88	0.63	5.57	0.258
Pain medication (reference: none)				0.089
On demand	0.38	0.12	1.21	0.101
Regular	1.10	0.31	3.91	0.873
Age – yr	1.03	0.98	1.08	0.234
Sex (reference: male)	1.02	0.41	2.53	0.975
Nagelkerkes R ² : 0.346 ^e				
^a Kellgren-Lawrence score: range from 0 to 4, with higher scores indicating more severe disease. Scores of 1 and 2 as well as scores of 3 and 4 were combined.				
^b KOOS: Knee Injury and Osteoarthritis Outcome Score, scores ranging from 0 (worst) to 100 (best).				
^c Exercise therapy: supervised strength or endurance training (individually or in group), home-based strength or endurance training or comprehensive rehabilitation intervention.				
^d Adjusted odds ratio, meaning: Kellgren-Lawrence score ^a : 17.24 times higher probability for a recommendation of grade 3 or 4 than of grade 1 or 2; KOOS Quality of Life: Probability of a recommendation increases by 4% per unit increase;				
^e Nagelkerkes R ² : The explained variance of the model was 34.6%.				

Discussion

In this observational study, only 40% of initial recommendations for KA were confirmed by an experienced knee surgeon in a certified knee arthroplasty centre after personal presentation. Predictors for this recommendation by the SO physician were radiological severity of osteoarthritis and lower knee-pain-specific quality of life. Both are main criteria for the indication of KA according to the German S2K guideline "Indication for KA". These results suggest that the option for a second opinion with defined quality standards is important and may support treatment recommendations according to guidelines.

To obtain a more detailed picture of the association between the recommendation of the IP and the SP, we asked the patients for the urgency of the recommendation for KA by the IP. In only 24% of patients in whom the IP had already recommended a fixed date of surgery, the SP confirmed the current indication for KA. An explanation for this low confirmation rate could be that after making the appointment for surgery, the patients may have read more information about KA and experienced doubts regarding the acute indication for KA based on this information. These doubts may have encouraged them to seek a second opinion. If the doubts of the patients were caused by guideline-conforming patient information, the SP may have not recommended KA.

The literature reports some reasons for discrepancies between the recommendations of an IP and SP. Financial incentives for KA implantation and surgery plannability as well as a limited budget for the prescription of exercise therapy are mentioned (9). It has also been discussed that some patients and some physicians have negative attitudes towards conservative osteoarthritis treatment despite many guidelines with consistent evidence-based recommendations for exercise therapy, self-management programmes and weight loss in overweight patients (11, 28, 29). They consider osteoarthritis as fateful and later surgery as inevitable (30).

The 40% agreement rate between the IP and SP for a current indication for KA was higher than that from another evaluation of an SO in Germany that found only 26% agreement between the IP and SP for the recommendation of knee surgery. In contrast to the present study,

in the previous study, patients were not seen personally by the SP (31, 32), and specific results for KA were not presented. In the national SO programme "Best Doctors, Inc" in the United States, 34.6% of orthopaedic surgery patients changed their treatment after the SP recommendation (33). However, again, patients were not seen personally by the SP, and no specific data were reported for patients with KA. We found only one other study that evaluated a SO programme with face-to-face contact that reported specific results for knee surgery (34). However, that study was conducted in 1978. Accordingly, 52% of confirmed treatments are hardly comparable to present SO programmes because the surgical techniques and guidelines have changed significantly since then.

The frequency of patients (85%) who reported a strong or very strong influence of the SO on the treatment decision in this study was even higher than the 60% and 61% of patients reported in the literature (32, 33). The face-to-face contact with the SP may have contributed to the high influence of the SO on the treatment preference. The strong influence of the SO on treatment decisions emphasises the need to define high-quality standards for the SO in patients before elective surgery.

In accordance with the guidelines, radiological criteria and knee-joint-specific quality of life were significant predictors for the recommendation of KA by the SP. These positive effects of the SO on adherence to guidelines have not yet been proven for elective surgery, while the avoidance of errors through a second opinion in pathology and radiology is already well documented (35, 36).

New evidence-based guidelines strongly recommend weight reduction in overweight people in addition to exercise therapy and self-management programmes for patients with osteoarthritis of the knee (28, 29). This study showed that the pre-treatment of patients with recommendations for KA did not consistently comply with these guidelines. Almost a quarter of the patients did not receive active exercise therapy, and only 7% received recommendations or therapies for weight reduction, although 36% of patients were obese.

The quality of a decision is considered high; if the patient is well informed, the recommended treatment is clinically appropriate, and the treatment meets the goal of the patient (37). The influence of the SO on the decision and the high confidence in the decision indicate that the second opinion concept improves the first criterion, and the concordance of the recommendation of the SP with criteria from the guideline supports the improvement of the second criterion.

The high satisfaction of the patients with 97% of patients rating the SO concept "very good" or "good" is in line with the results from second opinion portals who report 89% to 95% of satisfied patients (31–33).

The main strength of the present study is that, to the best of our knowledge, it is the first study that systematically analyses the effects of an SO prior to KA. It is also the first study that evaluated an SO that is in concordance with the quality criteria for SOs that are required by the German Code of Social Law V, § 27b (13).

Limitations

This study has some limitations. First, the lack of data from non-participants could result in a self-selection of patients with more optimistic results. However, we are confident that this may introduce little or no bias because the willingness to participate was higher than in comparable studies (33, 34). Second, the patients were not followed further. Thus, in this study, we could not confirm that patients finally followed their intended decision, but other studies suggest that the majority of patients adhere to their decision after the SO (32). Third, the SP did know the recommendations for KA made by the IP. This could increase the frequency of recommendations for KA because some studies on SOs showed that an SP who knows about a recommendation for interventional therapy by an IP tends to recommend interventional therapy more often than those who do not know the initial therapy. In contrast, the frequency of recommendations for KA in this study could be reduced by the fact that the SP was reimbursed by the health insurance AOK that may be interested in saving costs by reducing the frequency of KA recommendations. However, AOK did not provide any incentives to reduce the frequency of KA recommendations. Last, according to the voluntary basis of the second opinion, disagreement between the IP and SP may be higher than in a mandatory SO programme (34).

Conclusions

Medical second opinion concepts can have a great influence on a patient's therapy decision. A second opinion with personal presentation to an experienced knee surgeon in a certified knee arthroplasty centre can improve adherence of the treatment decision to the guidelines for KA indications. From the patient's perspective, a SO can reduce uncertainty and improve confidence in the treatment decision. A broader implementation of existing guidelines for the indication of KA in practice may reduce disagreement between the initial recommendation and the recommendation of an SP.

Declarations

Ethics approval and consent to participate

The study was approved by the ethics committee at the medical faculty of the Ludwig Maximilian University Munich (project number 17-098).

Consent for publication

Not applicable

Availability of data and materials

The analysis plan is available at <https://osf.io/>. Project name: "Evaluation Zweitmeinung Knieprothese". The data set is not available because patients did not consent to the use of their data in a public repository.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

MW: Study conception and design; major contribution to the interpretation of data; drafting and revising all parts of the manuscript.

JP: Study design; acquisition of data; minor contribution to the interpretation of data; drafting all parts of the manuscript.

RK: Statistical analyses; interpretation of data; drafting methods section of the manuscript; contribution to the revision of the manuscript.

AP: Interpretation of data; drafting of intervention in the methods section of the manuscript; minor contribution to the revision of the manuscript.

VJ: Study conception; minor contribution to the revision of the manuscript.

EG: Study conception and design; interpretation of data; major contribution to the revision of the draft.

All authors read and approved the final manuscript.

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Figures

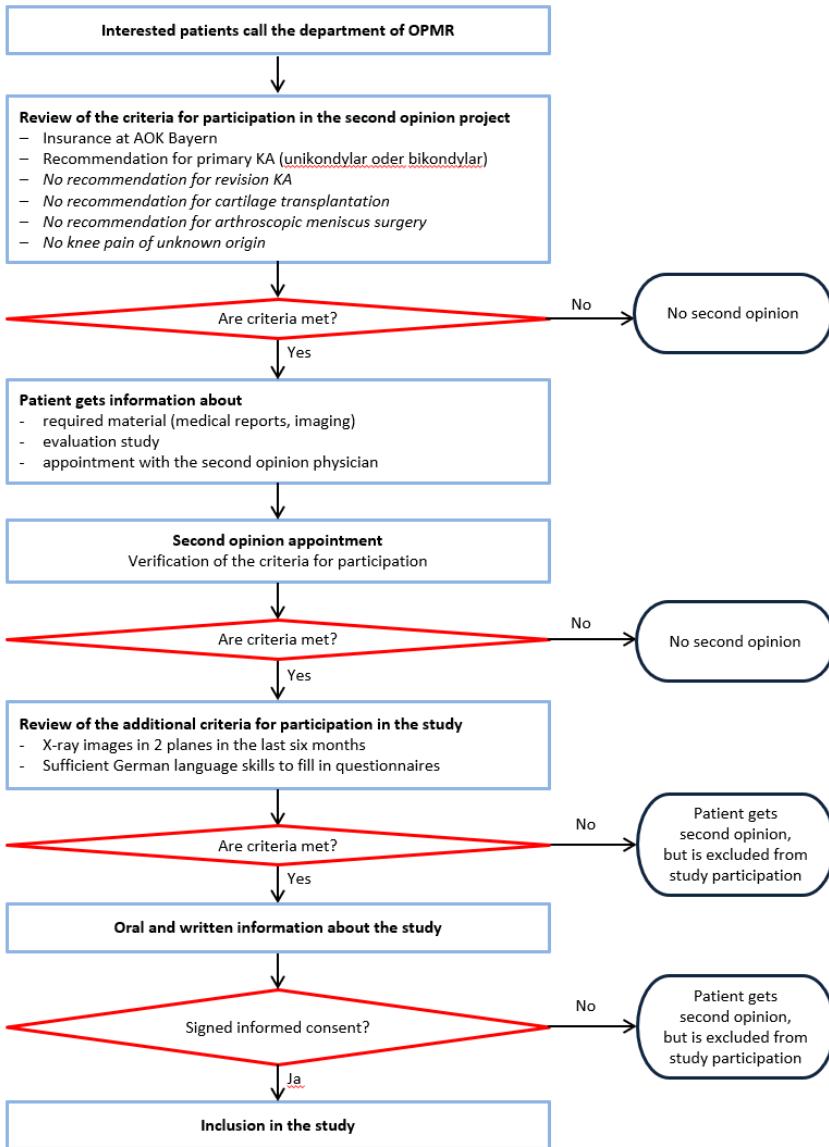


Figure 1

Patient flow, criteria for participation in the second opinion programme and study inclusion criteria.

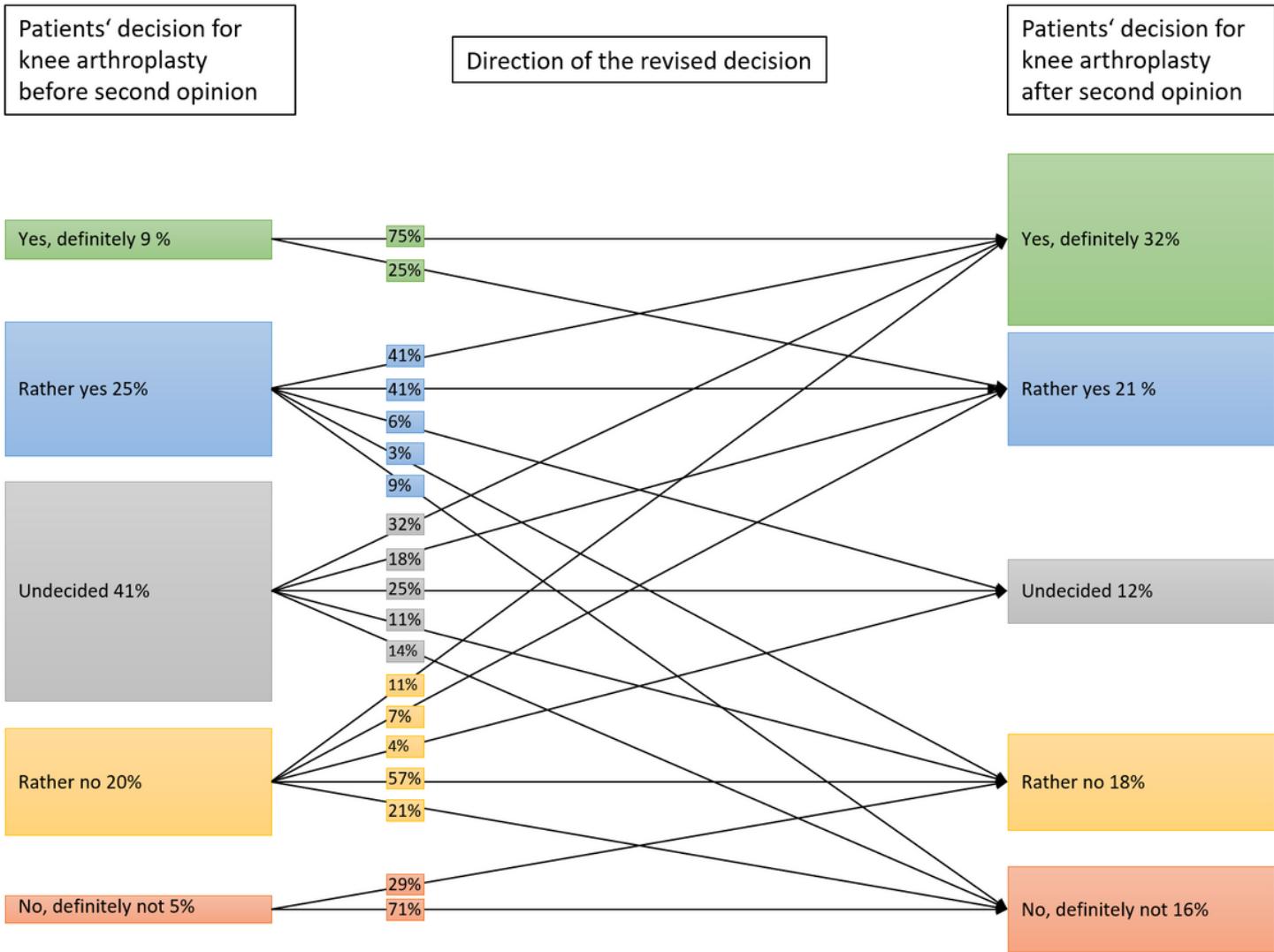


Figure 2

Change in the patients' decision preference (N=137).