Observational Study

Medicine

OPEN

The influence of involving patients in postoperative pain treatment decisions on pain-related patient-reported outcomes

A STROBE-compliant registering observational study

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Abstract

The evidence regarding the influence of allowing patients to participate in postoperative pain treatment decisions on acute pain management is contradictory. This study aimed to identify the role of patient participation in influencing pain-related patient-reported outcomes (PROs). This is a cross-sectional study. The data were provided by PAIN OUT (www.pain-out.eu). A dataset specific to adult Chinese patients undergoing orthopedic surgery was selected. The PROs were assessed on postoperative day 1. The patient participant was assessed using an 11-point scale. Participants who reported >5 were allocated to the "participation" group, and those who reported ≤5 were allocated to the "nonparticipation" group. A 1:1 propensity score matching was conducted. The primary outcome was the desire for more pain treatment. All other items of PROs were the secondary outcomes comprising pain intensity, interference of pain with function, emotional impairment, adverse effects, and other patient perception. From February 2014 to November 2020, 2244 patients from 20 centers were approached, of whom 1804 patients were eligible and 726 pairs were matched. There was no significant difference between the groups in the desire for more pain treatment either before (25.4% vs 28.2%, risk ratio [95% CI]: 0.90 [0.77, 1.05], $P = .18$) or after matching (26.7% vs 28.8%, risk ratio [95% CI]: 0.93 [0.79, 1.10], $P = .43$). After matching, patients in the participation group reported significantly better PROs, including pain intensity (less time spent in severe pain [$P < .01$]), emotional impairment (less anxiety [$P < .01$]), interference with function (less interference with sleep [$P < .01$]), adverse effects (less drowsiness [$P = .01$]), and patient perception (more pain relief [$P < .01$] and more satisfaction [$P < .01$]), than the nonparticipation group. Patient participation in pain treatment decisions was associated with improved pain experience but failed to mitigate the desire for more treatment.

Abbreviations: CI = confidence intervals, IRBs = institutional review boards, MI = multiple imputation, NRS = numerical rating scale, NSAIDs = nonsteroidal anti-inflammatory drugs, PROs = patient-reported outcomes.

Keywords: pain management, patient participation, patient-reported outcomes, postoperative pain, satisfaction

1. Introduction

Perioperative acute pain management is a public health topic of high interest.[1–3] Inappropriately managed postoperative pain impedes recovery,[4] worsens suffering, and causes adverse events such as delirium, cardiovascular complications,[5] and the development of chronic pain.[6] The high individual and societal costs urge health care providers to improve postoperative pain management. Nevertheless, attempts to develop novel nerve blocks,[7,8] establish specialized pain care teams,[9] and create tools for predicting severe postoperative pain[1,10] are not only relatively difficult to implement but also expensive.[11]

Given the highly subjective nature of pain,[12] it is an appealing alternative to provide nonmedical methods,[13] especially

This work was supported by the National Key Research and Development Program of China (grant number 2018YFC2001905). The PAIN OUT project was supported by the European Community's Seventh Framework Program FP7/2007-2013 (grant number 223590).

The authors have no conflicts of interest to disclose.

The data supporting this study are available from the PAIN OUT at www.pain-out.eu. Access to the data is subject to approval and a data-sharing agreement due to the publication strategy and plan project of the PAIN OUT Project. The datasets generated during and/or analyzed during the current study are not publicly available, but are available from the corresponding author on reasonable request.

All participating centers in this study obtained ethical approval from local institutional review boards (IRBs). Ethical approval for this study (approval number: 2018PHB050-01) was provided by the IRB of Peking University People's Hospital, Beijing, China (the principal investigator organization, Chairperson Prof Kaiyan Liu).

Supplemental Digital Content is available for this article.

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How to cite this article: Jiang B, Wu Y, Wang X, Gan Y, Wei P, Mi W, Feng Y. The influence of involving patients in postoperative pain treatment decisions on pain-related patient-reported outcomes: A STROBE-compliant registering observational study. Medicine 2022;101:38(e30727).

Received: 14 April 2022 / Received in final form: 20 August 2022 / Accepted: 24 August 2022

http://dx.doi.org/10.1097/MD.0000000000030727

psychological ones.[14] Involving patients in planning pain management was associated with higher patient satisfaction.[15,16] Compared to complex techniques, allowing patients to participate in decisions about their pain management is an easy practice. This will be encouraging, provided it could improve the pain-related patient-reported outcomes (PROs). However, there is conflicting evidence. It has been reported that patients with less allowed participation reported higher satisfaction levels than those who had been allowed more.[17] Moreover, the treatment decisions from a patient lacking appropriate knowledge might intuitively not be plausible to mitigate postoperative pain. As the present evidence is contradictory, it is warranted to clarify this issue.

This study aimed to compare the multidimensional PROs between patients with different participation levels using propensity score matching. It might also shed light on the question that allowing patients to participate in pain treatment decisions is a fundamental or complementary approach to improving PROs.

2. Methods

2.1. Study design and data source

This cross-sectional study analyzed the data from the PAIN OUT (www.pain-out.eu), an international quality improvement and perioperative pain registry project.[18] PAIN OUT provided a standardized methodology to assess multidimensional pain-related PROs on postoperative day 1.[1,2] The methodology is registered at ClinicalTrials.gov (NCT02083835) and was described previously.[18] Surveyors from each center had undergone training and passed quizzes to achieve a high standard for approaching patients, collecting data, and entering them into a web-based, password-secure portal. All participating centers in this study obtained ethical approval from their institutional review boards (IRBs). Approval number from the principal investigator organization was 2018PHB050-01. According to the requirements of the local IRBs, either written informed consent or oral consent was obtained from all subjects. Anonymized data for this analysis were obtained from PAIN OUT. This article adheres to Strengthening the Reporting of Observational Studies in Epidemiology guidelines.

2.2. Patient cohort

A dataset specific to Chinese adult patients undergoing orthopedic surgery was selected to reduce the influence of potential confounders. Patients were eligible if they fulfilled the following inclusion criteria: underwent any kind of inpatient orthopedic surgery; were 18 years or older; were on POD 1 and returned to the ward from the postanesthesia care unit for at least 6 hours; and agreed to take part in the survey. Patients were excluded if their data regarding "allowed participation in decisions about pain treatment" were missing or they were from a center contributing less than 30 valid datasets to alleviate the a priori risk of inconsistency in a local approach to dataset collection.[2]

In the PROs, patients reported how much they had been allowed to participate in postoperative pain treatment decisions. This item was scored using an 11-point numerical rating scale (NRS, 0 = null, 10 = most). The distribution of patient participation was typically bimodal, with less than 15% of patients reporting middle scores (4–6 on a 0–10 NRS; see Figure S1, Supplemental Digital Content, http://links.lww.com/MD/H382 which illustrates the distribution of patient participation in postoperative pain treatment). To facilitate the analysis, a dichotomous approach was used to divide patient ratings into two subsets. Patients whose NRS of participation in treatment decisions was 5 or less were defined as having low participation (nonparticipation group), and those with an NRS of more than 5 were defined as having high participation (participation group).

2.3. Outcomes

PROs were assessed using the International Pain Outcomes Questionnaire,[19] which evaluates 5 outcome domains. Four of these are pain experiences: intensity of the pain (worst pain, least pain, and time spent in severe pain); interference of pain with function (activities in and out of bed, breathing deeply or coughing, and sleep); emotional impairment due to pain (anxiety and helplessness); and adverse effects (nausea, drowsiness, itch, and dizziness). The 5th is the patient perception of postoperative pain management, including pain relief from treatment, satisfaction with pain treatment, desire for more pain treatment, receipt of information about pain treatment options, and participation in decisions about pain treatment. Most of the items used an 11-point NRS, 2 addressing "time spent in severe pain" and "pain relief from treatment" were recorded using a percentage scale (0%–100%), and 2 comprising "desire for more treatment" and "receipt of information" were assessed using a dichotomous yes/no scale. Considering that some patients may not have been out of bed until the survey, pain interference with activities outside the bed was not analyzed in this study.

The primary outcome was the desire for more pain treatment, which was considered a global judgment of pain management, encompassing various dimensional information, such as pain intensity, pain-related interference, preference for specific treatment modalities, individual pain tolerance, and perceived or actual adequacy of treatment.[3,15] The secondary outcomes were other items of the PROs, except for participation in pain treatment decisions, which were used to determine the groups in this study. Outcomes and allocations were defined before the analyses of this study.

2.4. Baseline characteristics and missing values

Demographic characteristics and perioperative clinical data that were probably associated with PROs were collected and analyzed as potential confounders. These included sex, age, body mass index, comorbidities (including diabetes, renal, cardiovascular, or pulmonary disease), psychiatric comorbidities (including depression, anxiety, and bipolar disorder), chronic pain before the current admission, type of surgery (merged into 5 broad categories to facilitate the analysis; including joint replacement, fracture fixation, spine surgery, reconstruction, and others), perioperative use of regional anesthetic techniques (including peripheral neural blockades and neuraxial nerve blockades), general anesthesia, intraoperative administration of nonopioid drugs (including nonsteroidal anti-inflammatory drugs [NSAIDs], acetaminophen, and ketamine), wound infiltration analgesia, and postoperative administration of NSAIDs.

The multiple imputation (MI) technique[20] was used to handle random missing data, and 5 MI datasets were established for the following analysis. Therefore, the consequential statistics used in this study were pooled.

2.5. Statistical analysis

To reduce bias between the groups, 1:1 propensity score matching was conducted. All baseline characteristics described above were used to create a logistic regression model to calculate propensity scores. Nearest neighbor matching within a caliper of 0.02 was performed without replacement. After propensity score matching, standardized differences were used to measure the balance between the 2 groups. A standardized difference less than 0.2 was considered negligible.[21] Matchings and analyses were conducted in each MI dataset, and pooled results were presented as the final results.

Sensitivity analysis was performed using a modified Poisson regression model to adjust the primary outcome for other PROs (pain intensity, emotional impairment, interference with function, adverse effects, and other patient perception) in the matching set. A post hoc analysis was performed using a generalized linear model to adjust satisfaction with pain treatment and pain relief from treatment for the receipt of information regarding pain treatment options in the matching set.

Continuous variables are expressed as the means with standard deviations or medians with interquartile ranges, and categorical data are presented as numbers and proportions. Two-sided P values < .05 were considered statistically significant. Statistical analyses were performed using IBM SPSS Statistics (version 25.0; IBM Corp, Armonk, NY).

3. Results

3.1. Patient characteristics

From February 2014 to November 2020, 2244 patients from 20 centers were approached, of whom 1804 patients from 16 centers qualified for the analysis (Fig. 1). Of these, 960 patients reported high participation (participation group), and 844 reported a low level (nonparticipation group). There were 3.4% of missing data for body mass index and 3.2% for wound infiltration analgesia. Missing data rates were less than 1% for other variables.

Prior to propensity-score matching, the patients in the participation group were older than those in the nonparticipation group (53.0 [42.0, 63.0] vs 54.0 [43.9, 64.0], P = .048); there were fewer patients in the participation group who suffered psychiatric comorbidities (0.3% vs 3.3%, P < .001); more general anesthesia, regional anesthetic techniques, and intraoperative nonopioid drugs were adopted in the participation group (72.1% vs 67.4%, P = .032; 60.6% vs 55.2%, P = .020; 77.0% vs 63.5%, P < .001, respectively). Fewer patients received postoperative NSAIDs in the participation group (40.2% vs 48.5%, P < .001).

The final inclusion of 726 pairs was determined using propensity score matching (Fig. 1). All baseline characteristics showed an acceptable balance between the groups, with standardized differences of less than 0.2. Table 1 indicates the baseline characteristics of the two groups before and after matching.

3.2. Influence of patient participation on PROs

Table 2 compares the differences in outcomes between the groups before and after matching. Before matching, continuous variables were compared using the Mann–Whitney U test, and categorical variables were compared using the chi-square test or Fisher exact test. After matching, continuous variables were compared with the Wilcoxon matched-pair signed-rank test with the estimated 95% confidence intervals (95% CI) of

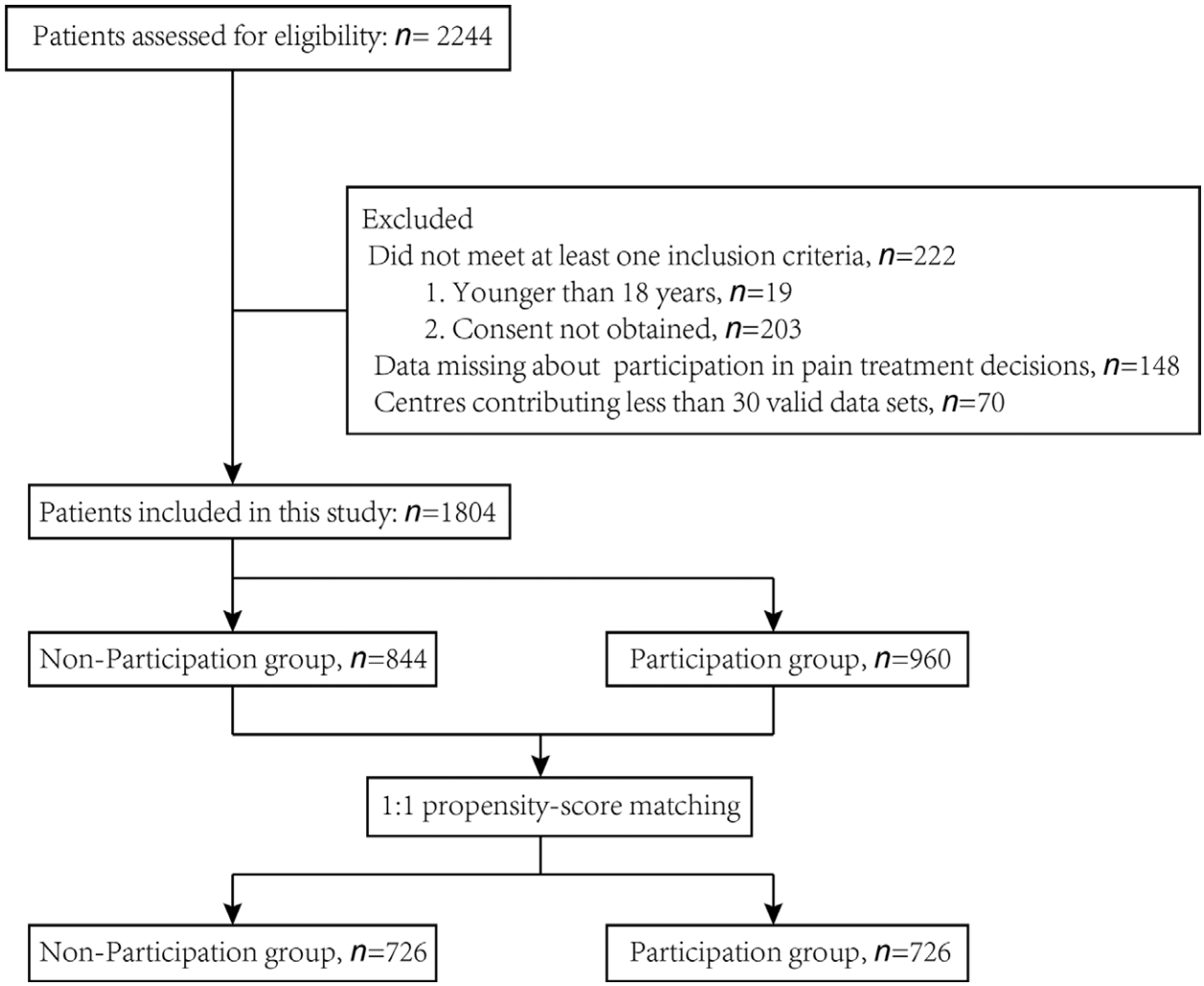

Figure 1. Flow chart of the patients included in this study.

Table 1

Baseline characteristics of patients before and after propensity-score matching.

Patient characteristics	Before propensity-score matching			After propensity-score matching		
	Participation group (n = 960)	Nonparticipation group (n = 844)	Standardized difference* (%)	Participation group (n = 726)	Nonparticipation group (n = 726)	Standardized difference* (%)
Age	53.3 ± 15.3	51.9 ± 15.6	9.1	52.2 ± 15.4	52.0 ± 15.1	1.3
BMI	24.3 ± 3.9	24.6 ± 3.9	7.7	24.4 ± 4.0	24.5 ± 3.8	2.6
Male sex	484 (50.4)	422 (50.0)	0.9	358 (49.3)	352 (48.5)	1.8
Type of surgery						
Joint replacement	291 (30.3)	279 (33.1)	7.0	216 (29.8)	240 (33.1)	8.5
Fracture fixation	254 (26.5)	236 (28.0)	4.2	194 (26.7)	191 (26.2)	1.2
Spine surgery	175 (18.2)	119 (14.1)	16.9	142 (19.6)	110 (15.2)	17
Reconstruction	137 (14.3)	124 (14.7)	1.9	102 (14.1)	115 (15.9)	7.8
Others	103 (10.7)	86 (10.2)	3.2	71 (9.8)	70 (9.6)	0.9
Comorbidities	360 (37.5)	292 (34.6)	6.9	244 (33.7)	238 (32.7)	2.1
Psychiatric disease	3 (0.3)	28 (3.3)	131.9	3 (0.4)	3 (0.4)	0.0
Chronic pain	344 (35.8)	305 (36.1)	0.7	262 (36.1)	279 (38.4)	5.5
General anesthesia	692 (72.1)	569 (67.4)	12.2	506 (69.6)	518 (71.3)	4.4
Regional anesthetic techniques	582 (60.6)	466 (55.2)	12.3	412 (56.7)	389 (53.6)	7.1
Intraoperative nonopioids	739 (77.0)	536 (63.5)	36	510 (70.3)	512 (70.4)	0.7
Wound infiltration analgesia	204 (21.3)	165 (19.5)	5.8	139 (19.1)	139 (19.1)	0.0
Postoperative NSAIDs	386 (40.2)	409 (48.5)	18.5	315 (43.4)	325 (44.7)	3.1

Data were shown as n (%) or mean ± SD.

BMI = body mass index, MH = standardized MH statistic, NSAIDs = nonsteroidal anti-inflammatory drugs.

*It was considered balanced if the standardized difference was less than 20%.

differences calculated by the Hodges–Lehmann method, binary variables were compared using McNemar test or Fisher exact test when appropriate, and multilevel categorical variables were compared with the marginal homogeneity test.

There was no significant difference between the groups in the desire for more pain treatment either before (25.4% vs 28.2%, risk ratio [95% CI]: 0.90 [0.77, 1.05], $P = .18$) or after matching (26.7% vs 28.8%, risk ratio [95% CI]: 0.93 [0.79, 1.10], $P = .43$).

Before matching, the participation group was superior to the nonparticipation group in the pain intensity (least pain [$P = .04$] and time spent in severe pain [$P < .01$]), emotional impairment (anxiety [$P < .01$] and helplessness [$P < .01$]), interference with function (pain interference with sleep [$P < .01$] and breathing deeply or coughing [$P = .01$]), adverse effects (drowsiness [$P < .01$] and dizziness [$P < .01$]), and patient perception (pain relief from treatment [$P < .01$], satisfaction with pain treatment [$P < .01$], and receipt of information about pain treatment options [$P < .01$]). A few items remained significantly better in the participation group than in the nonparticipation group after matching, including pain intensity (less time spent in severe pain [$P < .01$]), emotional impairment (less anxiety [$P < .01$]), interference with function (less interference with sleep [$P < .01$]), adverse effects (less drowsiness [$P = .01$]), and patient perception (more pain relief [$P < .01$], more satisfaction [$P < .01$], and more receipt of information [$P < .01$]).

3.3. Ancillary analyses

After adjusting for other PROs (pain intensity, emotional impairment, interference with function, adverse effects, and other patient perception) in the matching set, the desire for more pain treatment was consistently not associated with participation (risk ratio [95% CI]: 1.03 [0.87, 1.21], $P = .73$) (Fig. 2).

After adjusting for the receipt of information, patients in the participation group reported higher satisfaction (mean difference [95% CI]: 0.8 [0.6, 1.0], $P < .01$) and higher pain relief (mean difference [95% CI]: 6.4 [3.7, 9.2] %, $P < .01$) than those in the nonparticipation group.

4. Discussion

This study reported the influence of patient participation on postoperative acute pain outcomes. The patient sample originated from China and underwent orthopedic surgery. We found that the patient's participation improved the pain experience in some respects, which even included part of the pain intensity (time spent in severe pain), albeit slightly. However, it failed to alter the desire for more treatment, which was considered a global measure for pain management.[3,15] Although this is a cross-sectional study that collected the data regarding the allocation and outcomes at the same timepoint, involving patients in postoperative pain treatment decisions had logically been initiated prior to the reported outcomes. Thus, the association between participation and outcomes could partly shed some light on causality.

Recent practice guidelines have highlighted the appropriate management of postoperative acute pain as a high priority.[22] Nevertheless, pain is a subjective sensation[15] and is so intricate that the assessment can be construed into 5 dimensions. Although many studies have focused on the intensity of pain and used the most or average pain to assess and guide pain treatment,[10,23] the intensity does not encompass all aspects of pain. The inconformity of pain intensity with satisfaction regarding pain treatment occurred at times.[16,23] Recent studies have advised using the desire for more pain treatment as a global measure to judge pain management.[3,15] The desire for more pain treatment may represent not only the pain per se but also the psychosocial situation.[3,15] We inspected all aspects of pain collected by the International Pain Outcomes Questionnaire in this study, which is the relevant way to assess pain.[24] However, we took the desire for more pain treatment as the top priority to test the role of patient participation. This was conducive to a

Table 2

Pain-related patient-reported outcomes before and after propensity-score matching.

	Before propensity-score matching					After propensity-score matching				
Outcomes	**Participation group (n = 960)**	**Nonparticipation group (n = 844)**	**Estimated difference*/ RR (95% CI)**	**Z/χ^2 value**	***P* value**	**Participation group (n = 726)**	**Nonparticipation group (n = 726)**	**Estimated difference*/ RR (95% CI)**	**Z/χ^2 value**	***P* value**
Primary outcome										
Desire for more treatment	244 (25.4)	238 (28.2)	0.90 (0.77, 1.05)	1.78	.18	194 (26.7)	209 (28.8)	0.93 (0.79, 1.10)	0.69	.43
Secondary outcomes										
Pain intensity										
Worst pain	4.0 [3.0, 6.0]	4.0 [2.0, 6.0]	0.0 (0.0, 0.0)	0.69	.49	4.0 [3.0, 6.0]	4.0 [2.0, 6.0]	0.0 (–0.4, 0.0)	0.52	.62
Least pain	1.0 [0.0, 2.0]	1.0 [0.0, 2.0]	0.0 (0.0, 0.0)	2.10	.04	1.0 [0.0, 2.0]	1.0 [0.0, 2.0]	0.0 (0.0, 0.0)	0.78	.44
Time spent in severe pain (%)	10 [0, 30]	10 [0, 30]	0 (–10, 0)	6.50	<.01	10 [0, 30]	10 [0, 39]	–5 (–5, –1)	3.86	<.01
Emotional impairment										
Anxiety	0.0 [0.0, 2.0]	1.0 [0.0, 3.0]	0.0 (0.0, 0.0)	6.86	<.01	0.0 [0.0, 2.2]	1.0 [0.0, 3.0]	–0.5 (–0.5, 0.0)	3.81	<.01
Helplessness	0.0 [0.0, 1.0]	0.0 [0.0, 2.0]	0.0 (0.0, 0.0)	3.65	<.01	0.0 [0.0, 1.0]	0.0 [0.0, 2.0]	0.0 (0.0, 0.0)	1.40	.17
Interference with function										
Breathing deeply or coughing	0.0 [0.0, 1.0]	0.0 [0.0, 1.0]	0.0 (0.0, 0.0)	2.47	.01	0.0 [0.0, 1.0]	0.0 [0.0, 1.0]	0.0 (0.0, 0.0)	1.99	.05
Activities in bed	3.0 [1.0, 5.0]	3.0 [1.0, 5.0]	0.0 (0.0, 0.0)	0.17	.87	3.0 [1.0, 5.0]	3.0 [1.0, 5.0]	0.0 (0.0, 0.5)	0.49	.63
Sleep	0.0 [0.0, 2.8]	2.0 [0.0, 4.0]	–1.0 (–1.0, 0.0)	9.47	<.01	0.0 [0.0, 3.0]	2.0 [0.0, 4.0]	–0.6 (–1.0, –0.5)	5.34	<.01
Adverse effects										
Dizziness	0.0 [0.0, 1.0]	0.0 [0.0, 2.0]	0.0 (0.0, 0.0)	2.86	<.01	0.0 [0.0, 1.0]	0.0 [0.0, 2.0]	0.0 (0.0, 0.0)	1.22	.25
Drowsiness	0.0 [0.0, 3.0]	0.0 [0.0, 3.0]	0.0 (0.0, 0.0)	4.25	<.01	0.0 [0.0, 3.0]	0.3 [0.0, 3.0]	–0.1 (–0.5, 0.0)	2.81	.01
Itch	0.0 [0.0, 0.0]	0.0 [0.0, 0.0]	0.0 (0.0, 0.0)	0.46	.65	0.0 [0.0, 0.0]	0.0 [0.0, 0.0]	0.0 (0.0, 0.0)	0.93	.42
Nausea	0.0 [0.0, 2.0]	0.0 [0.0, 2.0]	0.0 (0.0, 0.0)	0.11	.91	0.0 [0.0, 2.0]	0.0 [0.0, 1.0]	0.0 (0.0, 0.0)	0.63	.53
Perception of pain management										
Pain relief (%)	80 [60, 90]	70 [50, 90]	10 (10, 10)	7.02	<.01	80 [60, 90]	70 [50, 90]	5 (5, 10)	5.13	<.01
Satisfaction	9.0 [8.0, 10.0]	8.0 [7.0, 10.0]	1.0 (0.0, 1.0)	8.67	<.01	9.0 [8.0, 10.0]	8.0 [7.0, 10.0]	0.5 (0.5, 1.0)	7.51	<.01
Receipt of information	671 (69.9)	291 (34.5)	2.03 (1.83, 2.25)	226.4	<.01	504 (69.4)	265 (36.4)	1.90 (1.71, 2.12)	141.7	<.01

Data were shown as n (%) or median (IQR). Continuous variables were compared to Mann–Whitney *U* test before and Wilcoxon matched-pair signed-rank test after matching; proportions were analyzed using chi-squared test before and McNemar test after matching.

CI = confidence intervals, IQR = interquartile range, RR = risk ratio.

*A pseudo-median difference was calculated using Hodges-Lehmann estimate.

summary and straightforward estimation in case the outcomes were conflicting. Furthermore, the desire for more treatment could directly address the issue of whether patient participation would improve postoperative pain management (mitigating the need for reinforced analgesia). Unfortunately, this influence was not observed in this study.

Although it has been reported that patient participation might be associated with a desire for more treatment,[15] we did not observe this encouraging result. Similarly, except for a slight improvement in the time spent in severe pain, neither worst nor least pain was ameliorated by participation. This might indicate that participation did work but was not competent to mitigate the absolute intensity of the pain and the actual desire for more treatment. The desire for more treatment might be more associated with absolute pain intensity than other experiences, based on the results.

Notwithstanding the defect in controlling pain intensity, participation profited the patient's psychology, contributing to better outcomes regarding the perception of care, such as satisfaction with pain treatment. This is consistent with previous studies.[15,16] Similarly, patients in the participation group reported significantly more pain relief from the treatment. Moreover, participation improved the outcomes of anxiety, interference with sleep, and one of the adverse effects, drowsiness. It is plausible that the participation conciliated the patients, consequentially alleviated the anxiety, and then contributed to better sleep. Thanks to this, the mitigated drowsiness ensued. Although not definitive, this hypothesis sounds fair or at least intuitively understandable.

Furthermore, patients who participated in the pain treatment decisions were provided with more information regarding pain treatment options. The rationale for the role of patient participation was generally considered to involve information sharing and cooperation between the patients and health care providers in arriving at realistic expectations and clear goals.[16] The benefit of participation might partly be adequate communication. Nevertheless, after adjusting for the receipt of information, participation was still associated with higher satisfaction and higher pain relief. This indicated that participation provided more support than adequate information.

Involving patients in the planning process of pain treatment behooves. It did improve patient perception of postoperative pain

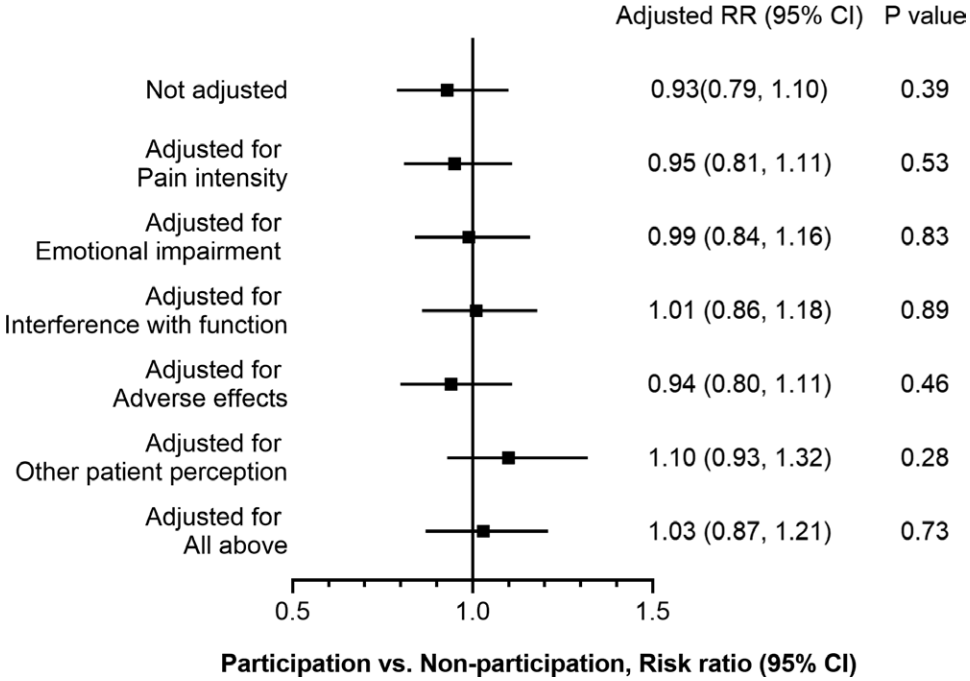

Figure 2. The desire for more pain treatment adjusted for other patient-reported outcomes. Pain intensity: worst pain, least pain, time spent in severe pain; emotional impairment: anxiety, helplessness; interference with function: breathing deeply or coughing, activities in bed, sleep; adverse effects: dizziness, drowsiness, itch, nausea; other patient perception: pain relief, satisfaction, receipt of information. CI = confidence interval, RR = risk ratio.

management and then benefited the patients in several aspects of pain experience, possibly via a psychological approach. Given the highly subjective nature of pain, it even subtly worked in the time spent in severe pain, an index of pain intensity. On the other hand, it should be noted that patient participation is an intriguing complementary method but not a robust tactic to mitigate postoperative pain. Encouraging patients to participate in decisions is warranted, yet sufficient pain treatment is always a priority. The patients' requests should be appreciated but not obeyed unconditionally, which might lead healthcare to be astrayed.[25]

5. Limitations

This is a cross-sectional study with the intrinsic limitation of clarifying causality. Although the initiation of participation was logically prior to the reported outcomes, the only association could be concluded in this study. Data collection was limited on postoperative day 1, which precluded addressing the impact on rehabilitation and long-term clinical outcomes. According to the bimodal distribution of patient participation, a dichotomous approach was defined before the analyses. Although a deliberated cutoff is more convincing, the sensitivity analysis might alleviate some concerns. Further studies might indicate the optimal cutoff of participation. Considering that the primary outcome was negative, the exact effect size was not calculated in this study. Additionally, the findings of this study are pertinent to Chinese patients undergoing orthopedic surgery. It remains to be determined whether they can be generalized to other populations. To facilitate the analysis, the type of operation was not classified in detail. However, it was not the aim of this study to describe and compare different potential operations in detail, and the broad categories revealed a comparable balance between groups.

6. Conclusions

Patient participation in pain treatment decisions was associated with several better outcomes regarding the pain experience and patient perception of pain management. However, no association between participation and the desire for more pain treatment was observed.

Acknowledgments

The authors thank all collaborators of PAIN OUT CHINA for the data analyzed in this study. Furthermore, we appreciate the continuous support provided by the PAIN OUT.

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