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# Pragmatic design and inclusion of patient–partner representatives improves participant experience in clinical research

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**Abstract**

**Objectives:** Patient engagement in the design and implementation of clinical trials is necessary to ensure that the research is relevant and responsive to patients. The PREP-IT trials, which include 2 pragmatic trials that evaluate different surgical preparation solutions in orthopaedic trauma patients, followed the patient-centered outcomes research (PCOR) methodology throughout the design, implementation, and conduct. We conducted a substudy within the PREP-IT trials to explore participants' experiences with trial participation.

**Methods:** At the final follow-up visit (12 months after their fracture), patients participating in the PREP-IT trials were invited to participate in the substudy. After providing informed consent, participants completed a questionnaire that asked about their experience and satisfaction with participating in the PREP-IT trials. Descriptive statistics are used to report the findings.

**Results:** Four hundred two participants participated in the substudy. Most participants (394 [98%]) reported a positive experience, and 376 (94%) participants felt their contributions were appreciated. The primary reasons for participation were helping future patients with fracture (279 [69%]) and to contribute to science (223 [56%]). Two hundred seventeen (46%) participants indicated that their decision to participate was influenced by the minimal time commitment.

**Conclusions:** Most participants reported a positive experience with participating in the PREP-IT trials. Altruism was the largest motivator for participating in this research. Approximately half of the participants indicated that the pragmatic, low-participant burden design of the trial influenced their decision to participate. Meaningful patient engagement, a pragmatic, and low-burden protocol led to high levels of participant satisfaction.

**Keywords:** patient engagement, patient-centered outcomes research, PREP-IT, randomized controlled trials, orthopaedic trauma

## 1. Background

Meaningful patient engagement in the design of randomized controlled trials is an essential component of a trial's success.[1,2] Patient engagement is partnership with patients during the research process. This can take various forms but may involve including patient representatives that reflect the trial population as advisory members and using their lived experience to inform the design, conduct, closeout, and dissemination of the trial.

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*The data sets used and/or analyzed during the current study are available from the corresponding author on reasonable request.*

*The authors declare that they have no competing interests.*

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Patient engagement has been seen as the paradigm shift from research being done "to" or "for" patients, to research being performed "with" or "by" patients themselves.[3] Patient engagement allows for democratization of the research process and empowering patients throughout the entire research process—from trial design through to knowledge dissemination.[4]

Research has found that patients are motivated to be involved in research for a wide variety of reasons, including a desire to contribute to research for the benefit of others.[5] Previous research has argued that patient engagement enhances the focus of clinical trials on outcomes that are relevant to patients themselves, thus increasing the utility of any research findings.[6] Furthermore, patient engagement has been argued to improve recruitment and retention rates, which increases the validity of the results of the trial.[7]

From the onset of the Program of Randomized Trials to Evaluate Preoperative Antiseptic Skin Solutions in Orthopaedic Trauma (PREP-IT) trials, the PREP-IT Investigators have engaged multiple patient–partners in the design, implementation, and conduct of the PREP-IT trials. The PREP-IT trials followed the patient-centered outcomes research (PCOR) approach, which includes allowing patient voices to be heard and focusing on outcomes that are relevant to patients and their caregivers.[8] One of the mandates of the PREP-IT trials is to improve orthopaedic fracture research through meaningful engagement with our patient–partners and to identify ways to better engage with PREP-IT study participants. To support this, we conducted a substudy with the objective to learn about and explore participants' experiences with clinical research and their participation in the PREP-IT trials. Specific themes include (1) experience with clinical trials, (2) reasons for participating in PREP-IT, (3) satisfaction with participation in PREP-IT, (4) preferred methods of follow-up, (5) importance of the research topic, and (6) areas of improvement for future trials.

## 2. Methods

### 2.1. PREP-IT trials

The PREP-IT trials consist of 2 multicenter cluster-randomized crossover trials, Aqueous-PREP (Pragmatic Randomized Trial Evaluating Pre-Operative Aqueous and Antiseptic Skin Solution in Open Fractures) and PREPARE (Pragmatic Randomized Trial Evaluating Pre-Operative Alcohol Skin Solutions in Fractured Extremities), which evaluate the effectiveness of iodine and chlorhexidine preoperative antiseptic skin solutions at reducing surgical site infections and unplanned fracture-related reoperations.[9] Enrolled participants of the PREP-IT trials were aged 18 years or older and had either an open or closed fracture of their extremities requiring surgical management with an implant. Participants received either an iodine-based or chlorhexidine-based antiseptic solution preoperatively for their fracture management surgical procedure. Consent in the PREP-IT trials was usually conducted after surgical management of their fracture and before discharge from the hospital.[10]

Outcome data for the PREP-IT trials, including surgical site infection and unplanned fracture-related reoperations, were collected during in-person routine clinical follow-up appointments at 6 weeks, 3 months, 6 months, 9 months, and 12 months after their fracture. In cases in which the participant did not return to the clinic, study personnel contacted the participant by telephone, text message, e-mail, or standard mail to complete follow-up visits. The PREP-IT trials are highly pragmatic and require very limited time commitment from participants including no additional clinic visits, medications, x-rays, or other diagnostic tests. In addition, there are only 2 outcomes, surgical site infection (primary outcome) and unplanned fracture-related reoperation (secondary outcome).

The Aqueous-PREP and PREPARE trials are registered on ClinicalTrials.gov (Aqueous-PREP: NCT03385304; PREPARE: NCT03523962). The committee on research ethics has approved these studies at the applicable institutions in which the research was conducted in accordance with the Declaration of the World Medical Association (www.wma.net). Because this sub-study was included in the Aqueous-PREP and PREPARE protocols, it falls under the same ethic approval numbers. A protocol amendment was approved prior to initiating participant enrollment in the sub-study. Informed consent was obtained from each participant for the trial (Aqueous-PREP and PREPARE) and the current sub-study.

### 2.2. Patient engagement in the PREP-IT trials

Patient engagement is foundational to the PREP-IT trials' organization. To ensure continuous patient engagement, the 10-step patient engagement framework[11] was used to guide the PREP-IT trials in PCOR best practices. Patient–partner representatives are members of PREP-IT's Patient-Centered Outcomes Core who are involved in many aspects of the trial and drive the trial decisions and activities.[10] Partners include patients who experienced orthopaedic trauma and other medical events and professional association representatives. They work together with the research team and a multidisciplinary health care team to conduct the PREP-IT trials.[12]

### 2.3. Participant enrollment and data collection for the substudy

Research personnel at contributing PREP-IT sites invited participants to take part in this substudy before or at their final (12-month postfracture) visit. After providing informed consent, participants completed an 11 multiple choice questionnaire at the end of the 12-month follow-up visit. The questionnaire included 11 questions that asked participants whether this is their first study, their reasons behind participating, whether they were influenced to participate by various elements of the study, their level of satisfaction with participation, their preferences regarding follow-up, how important the research topics are to them, and their overall experience with participating in PREP-IT. The questionnaire also collected feedback on ways for improvement and allowed opportunity to share any other comments they may have. The questionnaire was developed for the purpose of this study, with guidance from our patient–partners.

### 2.4. Sample size

To determine the number of participants needed to sufficiently power our analysis, the sample size was calculated using a 5% margin of error with 95% confidence intervals, a potential population of all patients who have completed 12 months of follow-up (approximately 1600) and an expected response rate of 50%. Therefore, a sample size of at least 310 participants was required.

### 2.5. Data analysis

We summarized all categorical and dichotomous variables with frequencies and percentages. Continuous data were described with means and standard deviations (SDs). All analyses were conducted using R software (version 4.0.2, R Foundation for Statistical Computing, Vienna, Austria).

## 3. Results

### 3.1. Participation

We invited 6 clinical sites who are participating in the PREP-IT trial in Canada and the United States to contribute to this substudy (Fig. 1). This allowed for wider geographical variation. Eight hundred and twenty-seven PREP-IT participants were approached to participate in the patient experience substudy, and 487 (59%) provided informed consent. Of the 487 participants who provided informed consent, 402 (83%) participants completed the questionnaire.

### 3.2. Participant characteristics

The mean age of the participants was 53.1 years (SD 18.3 years), and 227 (57%) were female. Three hundred and sixty-two (90%) participants identified as White, and 393 (98%) were non-Hispanic. A fall from standing was the most common mechanism of injury (33%), followed by a twist injury (18%) (Table 1).

### 3.3. Experience with clinical trials

Three hundred and fifteen (78%) participants indicated that PREP-IT was the first research study that they had taken part in, and 34 (9%) indicated that they were participating in another study at the same time as PREP-IT (Table 2).

### 3.4. Satisfaction with participation in PREP-IT

Two hundred ninety-four (73%) participants indicated that their experience in the trial was excellent, and 100 (25%) participants responded that their experience was good. No participants indicated a poor or very poor experience. Three hundred thirty-three (83%) participants felt that their participation was appreciated a lot, and 43 (11%) participants felt that their participation was appreciated a little. Two hundred eight (52%) participants indicated that they would definitely participate in another medical study, and 141 (35%) indicated that they would probably participate in another medical study (Table 3).

### 3.5. Reasons for participating in PREP-IT

When participants were asked to select the reasons for deciding to participate in the PREP-IT trials, 279 (69%) indicated "to help future patients with broken bones," and 223 (56%) indicated "to contribute to science." When participants were asked to select all items associated with the trial design that influenced their decision to participate, 185 (46%) selected at least one item. This includes no extra clinic visits (35%), limited time commitment (31%), no additional medications (29%), few questionnaires (28%), and no additional test (26%) (Table 4).

### 3.6. Preferred methods of follow-up

Participants were also asked for their preferred method of contact during follow-up. Approximately 275 (68%) indicated that telephone was their preferred method of contact, followed by in-person during routine appointments (15%), e-mail (14%), and text message (3%). Three hundred eighty-nine (97%) participants indicated that the study team followed up just the right amount of times.

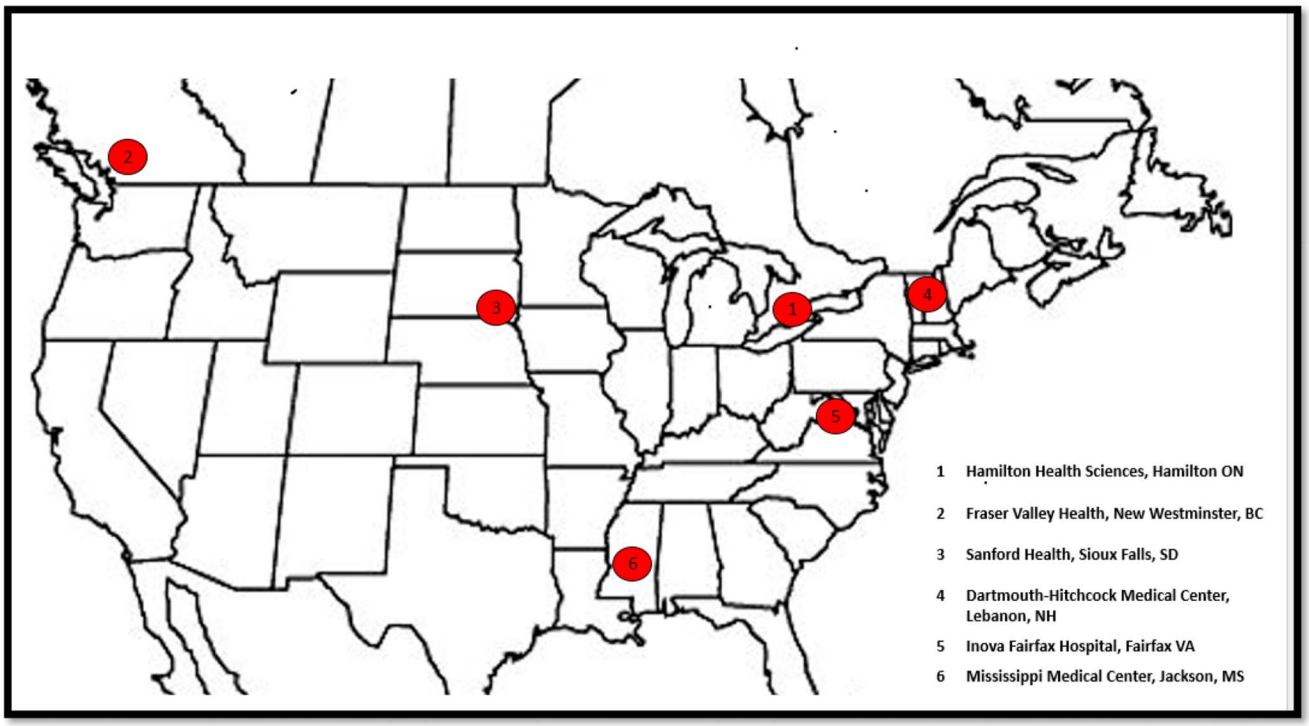


**Figure 1.** Location of sites participating in the patient experience substudy.

**TABLE 1**

**Participant demographic and injury characteristics**

| | Total (N = 402) |
|---|---|
| Age, years; mean (SD) | 53.1 (18.3) |
| Sex, n (%) | |
| Female | 227 (56.5) |
| Male | 175 (43.5) |
| Race, n (%) | |
| White | 362 (90.0) |
| Asian | 27 (6.7) |
| Indigenous | 8 (2.0) |
| Black | 5 (1.3) |
| Latin or Hispanic origin, n (%) | |
| Non-Hispanic | 393 (97.8) |
| Hispanic | 9 (2.2) |
| Level of education, n (%) | |
| 8th grade or less | 7 (1.7) |
| 9th to 12 grade, no diploma | 27 (6.7) |
| General education diploma or high school graduate | 101 (25.1) |
| Some college, no degree | 53 (13.2) |
| Associates degree (2-year degree) | 30 (7.5) |
| Bachelors/college degree | 130 (32.3) |
| Some graduate work, no degree | 8 (2) |
| Graduate degree | 36 (9) |
| Professional degree | 10 (2.5) |
| Mechanism of injury, n (%) | |
| Motor vehicle accident | |
| Driver/passenger | 36 (9.0) |
| Motorcycle | 35 (8.7) |
| Pedestrian/cyclist | 16 (4.0) |
| Cycling | 11 (2.7) |
| Recreational vehicle | 7 (1.7) |
| Fall | |
| Standing | 133 (33.1) |
| Height (>1 m) | 34 (8.5) |
| Height (<1 m) | 18 (4.5) |
| Other | |
| Twist injury | 71 (17.7) |
| Direct trauma (blunt) | 23 (5.7) |
| Crush injury | 11 (2.7) |
| Direct trauma (penetrating) | 2 (0.5) |
| Spontaneous | 2 (0.5) |
| Periprosthetic | 2 (0.5) |
| Ballistic injury | 1 (0.2) |

### 3.7. Importance of research topics

Two hundred sixty-nine (67%) participants indicated that research aimed at reducing infection after breaking a bone is extremely important to them. Fifty-nine (15%) participants indicated it is fairly important, 30 (8%) participants indicated it was somewhat important, and 5 (1%) participants indicated it is not very important. When participants were asked about the importance of research aimed at reducing the number of surgeries after breaking a bone, 304 (76%) indicated it is extremely important. Seventy-six (19%) indicated it is fairly important, 15 (4%) indicated it is somewhat important, 4 (1%) indicated it is not very important, and 3 (1%) indicated it is not important at all (Table 5).

### 3.8. Areas of improvement for future trials

When participants were given the opportunity to share their feedback regarding their experiences in the PREP-IT trials, most responses were positive. Examples include that the researchers and personnel were attentive, pleasant, and polite; the questions were efficient and to the point; and that they felt their contribution was appreciated. Areas of improvement include 4 (1%) participants who indicated that consent took place too soon after their surgery and that they would have preferred an alternative time so that they could better understand the trial. Four (1%) participants also indicated that a re-explanation of the trial at follow-up would have been preferred. Two (0.5%) participants expressed interest in knowing the outcome of the trial. One (0.25%) participant would have preferred more simplified language, and another recommended having a consistent contact person for the study, so they know who is contacting them for follow-up.

## 4. Discussion

The purpose of this study was to receive participant feedback to better understand the lived experiences in participating in a large pragmatic, cluster-randomized crossover trial. We administered a survey to participants to achieve this goal with the intention of helping researchers in the design, planning, implementation, and conduct of future trials.

Approximately 21% of participants have participated in research. This is much higher than the 5% reported in a recent survey of 3689 adults in the United States.[13] Most participants were also very interested in research aimed at reducing infections and surgeries after breaking a bone. These responses were not surprising and likely influenced by all participants experiencing a recent broken bone that is at high risk of infection and reoperation.

Altruism seems to be the largest motivator behind participating in the PREP-IT trials, with most participants selecting "to help future patients" and "to contribute to science" as the primary reason behind participation. This finding aligns closely with conclusions from other research studies. However, nearly half (46%) of participants indicated that they were influenced to participate by either the limited time commitment and/or the lack of extra visits, tests, medications, and questionnaires. This finding suggests that researchers should consider ways to make their trial as convenient to participants as possible to optimize enrollment. These items likely contributed to the high enrollment rate in the PREP-IT trials. We believe that they also contributed to retention rates currently above 90% at the 12-month follow-up visit. Participant retention is a challenging element in many clinical trials, and continuous patient engagement can help researchers identify items in a trial that are important to participants, improve enrollment and retention rates, and ultimately increase the validity of the trial's findings.

Almost all participants reported at least a good experience, with the rest reporting a fair experience. Given the positive experiences associated with this trial, it is not surprising that most

**TABLE 2**

**Participant experience with clinical trials**

| | Total (N = 402), N (%) |
|---|---|
| First study participant taken part in | 315 (78.4) |
| Close family member (parent, child, sibling) ever taken part in a research study | 44 (10.9) |
| Taking part in a medical study other than this study | 34 (8.5) |

**TABLE 3**

**Satisfaction with participating in PREP-IT**

| | Total (N = 402), N (%) |
|---|---|
| Overall experience taking part in this study | |
| Excellent | 294 (73.1) |
| Good | 100 (24.9) |
| Fair | 8 (2.0) |
| Poor | 0 (0.0) |
| Very poor | 0 (0.0) |
| Research team appreciated the time participants gave to be in this study | |
| Yes, a lot | 333 (82.8) |
| Yes, a little | 43 (10.7) |
| I don't know | 12 (3.0) |
| No, not at all | 9 (2.2) |
| No, not very much | 5 (1.2) |
| The research team checked in with participant | |
| Just the right amount | 389 (96.8) |
| Not often enough | 10 (2.5) |
| Way too often | 3 (0.7) |
| Would you take part in another medical study | |
| Definitely yes | 208 (51.9) |
| Probably yes | 141 (35.2) |
| Maybe | 43 (10.7) |
| Probably not | 5 (1.2) |
| Definitely no | 4 (1.0) |

participants indicated that they would probably or definitely participate in another study.

Most participants indicated that their preferred method of follow-up is telephone, followed by in-person visits during clinic appointments. Although electronic approaches may be convenient and cost-effective for researchers, our results show preferences for them remain low among participants. Despite the promise of electronic follow-up approaches,[14] we suspect that the personal nature of traditional approaches such as telephone calls can establish trust and a positive relationship that yields higher satisfaction and increased retention.

Although telephone follow-up is not without its challenges, they can be mitigated with proper planning. For example, in the PREP-IT trials, patient partners offered patient perspectives on many aspects of the trial to help maximize retention. Suggestions included using reminder calls and text messages to participants, collecting alternative contact information, increasing the size of the follow-up windows, and using consistent personnel for follow-up to establish a relationship. They also advised excluding participants who are at a high likelihood of loss to follow-up. Relevant information was communicated directly to sites through in-person site visits, investigator meetings, grand round presentations, and through e-mail, telephone calls, and newsletters.

**TABLE 4**

**Reasons for participating in PREP-IT**

| | Total (N = 402), N (%) |
|---|---|
| Reason for taking part in this study* | |
| To help future patients with broken bones | 279 (69.4) |
| To make a contribution to science | 223 (55.5) |
| To feel part of something | 73 (18.2) |
| Other (details not specified) | 63 (15.7) |
| Items that influenced decision to take part in this study* | |
| None of these influenced my decision | 217 (54.0) |
| No extra clinic visits | 141 (35.1) |
| Limited time commitment | 125 (31.1) |
| No additional medications | 118 (29.4) |
| Few questionnaires or surveys | 111 (27.6) |
| No additional x-rays or tests | 106 (26.4) |

* Multiple responses could be selected.

**TABLE 5**

**Importance of research objectives**

| | Total (N = 402), N (%) |
|---|---|
| Importance of research aimed at reducing infections after breaking a bone | |
| Extremely important | 269 (66.9) |
| Fairly important | 98 (24.4) |
| Somewhat important | 30 (7.5) |
| Not very important | 5 (1.2) |
| Not at all important | 0 (0.0) |
| Importance of research aimed at reducing the number of surgeries after breaking a bone | |
| Extremely important | 304 (75.6) |
| Fairly important | 76 (18.9) |
| Somewhat important | 15 (3.7) |
| Not very important | 4 (1.0) |
| Not at all important | 3 (0.7) |

This survey identifies areas for improvement in future trials. For example, our group will attempt to avoid consent during stressful times such as immediately after a surgical procedure or at times when a participant may not be feeling well. We will also provide leaflets, brochures, or verbally communicate the trial details and products used at subsequent follow-up visits. We intend to share the outcome of the PREP-IT trials and future trials with participants where possible.

To the best of our knowledge, this is also the first trial capturing participant experiences in a pragmatic cluster-randomized crossover trial using a deferred consent model. Given the increasing popularity of pragmatic trials,[15] these findings have increasing utility for researchers interested in conducting pragmatic trials.

Some of the limitations to this study are the limited heterogeneity of participants with only 6 of the 35 PREP-IT sites participating in this substudy, and most participants recruited from 2 of the 6 sites. The participant population was also older (53.1 years), and therefore, the generalizability is limited to a slightly older population and may not necessarily reflect the similar attitudes and beliefs as younger North Americans. In addition, some participant responses may have been biased because of some research personnel administering and collecting the survey. However, most participants were administered the survey by personnel independent of the trial to minimize this bias. Finally, it was not possible to survey anyone who was lost to follow-up and anyone who was unhappy with their experience tended to decline to help in any additional way.

The overall experiences by participants in the PREP-IT trials are almost exclusively positive. Although the observational nature of this trial limits our ability to infer causation, patient engagement in the design, implementation, and conduct of the trials likely contributed to this finding and the patient-friendly design may have also indirectly improved the trial validity through improved enrollment and retention rates. We highly encourage meaningful patient engagement in orthopaedic trauma clinical trials.

## 5. Conclusions

To ensure continuous patient engagement in the PREP-IT trials, the 10-step framework to patient engagement was used. Trial participants reported a high level of satisfaction with their participation, and strong enrollment and retention rates were achieved in this trial. We believe that continuous patient engagement through the 10-step framework contributed to these outcomes. We hope this article encourages other researchers to incorporate meaningful patient engagement in their research.

## APPENDIX: THE PREP-IT INVESTIGATORS

**Executive Committee:** Gerard P. Slobogean (Principal Investigator, University of Maryland School of Medicine, Baltimore, MD); Sheila Sprague (Principal Investigator, McMaster University, Hamilton, ON); Jeffrey Wells (Patient Representative, Trauma Survivors Network, Falls Church, VA); Mohit Bhandari (Principal Investigator, McMaster University, Hamilton, ON)

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**University of Maryland School of Pharmacy, The PATIENTS Program** (Baltimore, MD): C. Daniel Mullins (Executive Director); Michelle Medeiros (Director of Research); Genevieve Polk (Assistant Director, Dissemination and Research); Eric Kettering (Senior Instructional Technology and Dissemination Specialist); Nirmen Mahal (Program Specialist)

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