

Determinants of Patient Satisfaction After Severe Lower-Extremity Injuries

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Background: In health care, increased emphasis has been placed on patient-centered care, but to our knowledge little work has been conducted to understand the influences on patient satisfaction after surgery for the treatment of severe lower-extremity injury. Our purpose was to analyze how the patient's satisfaction with the outcome correlates with other measures of outcome (clinical, functional, physical impairment, psychological impairment, and pain) and with the sociodemographic characteristics of the patient, the nature of the injury, and the treatment decisions.

Methods: Four hundred and sixty-three patients treated for limb-threatening lower-extremity injuries at eight level-I trauma centers were followed prospectively. Multivariate regression techniques were used to identify factors correlating with variation in patient self-reported satisfaction at two years after the injury. The outcomes that were tested in the model were pain, range of motion, muscle strength, self-selected walking speed, depression, anxiety, the physical and psychosocial scores of the Sickness Impact Profile (SIP), return to work, and the number of major complications. The patient characteristics that were tested in the model were age, sex, education, poverty status, insurance status, occupation, race, personality profile, and medical comorbidities. Injury severity was tested in the model with use of both the Injury Severity Score and a score reflecting the probability of amputation. The treatment decisions that were tested were amputation versus reconstruction and time to treatment.

Results: No patient demographic, treatment, or injury characteristics were found to correlate with patient satisfaction. Only measures of physical function, psychological distress, clinical recovery, and return to work correlated with patient satisfaction at two years. Five of these outcome measures accounted for >35% of the overall variation in patient satisfaction; these were return to work ($p < 0.05$), depression ($p < 0.05$), the physical functioning component of the SIP ($p < 0.01$), self-selected walking speed ($p < 0.001$), and pain intensity ($p < 0.001$). The absence of major complications and less anxiety were marginally significant ($p < 0.1$).

Conclusions: Patient satisfaction after surgical treatment of lower-extremity injury is predicted more by function, pain, and the presence of depression at two years than by any underlying characteristic of the patient, injury, or treatment.

Level of Evidence: Prognostic Level I. See Instructions to Authors for a complete description of levels of evidence.

High-energy lower-extremity trauma is a potentially life-altering injury. Patients with such injuries often require treatment for years and have substantial morbidity for a prolonged period of time¹⁻⁵. Previous investigators have attempted to determine risk factors for a poor outcome as measured with

metrics such as the Sickness Impact Profile (SIP) and more traditional clinical outcomes in this patient population¹⁻⁵. The efforts have shown the outcomes of surgery for the treatment of limb-threatening high-energy injury to be generally poor and to be similar following either reconstruction or amputation¹⁻⁵.

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Currently in the health-care field, increased emphasis is being placed on patient-centered care and patient satisfaction as valuable outcome measures⁶⁻¹⁸. The movement away from a paternalistic medical decision-making model has been accompanied by a similar movement away from outcome measures that are based solely on the treating physician's perspective. The idea that patients' and surgeons' perspectives regarding outcome might differ has been explored in multiple clinical settings¹⁹⁻⁵⁴, and this research has reinforced the potential importance of efforts to better understand the determinants of patient satisfaction.

Despite its potential importance, to our knowledge little work has been done to analyze the determinants of patient satisfaction after surgery for the treatment of severe lower-extremity injury. These injuries have been shown to be debilitating in terms of the parameters measured by the SIP, the number of complications, long-term pain, and the need for additional surgery¹⁻⁵. However, it is not known what determines the level of patient satisfaction after these procedures.

Our goal was to analyze how the patient's satisfaction with the outcome correlates with other more traditional measures of outcome, such as clinical parameters, functional results, physical and psychological impairment, and pain. Additionally, we aimed to investigate the sociodemographic characteristics of the patient, the nature of the injury, and treatment decisions as related to patient satisfaction after surgery.

Materials and Methods

Study Population

The data for this project were derived from the Lower Extremity Assessment Project (the LEAP Study), as has been described in previous studies^{1,2,55}. This investigation was a secondary analysis of the LEAP study data. The study population consisted of patients treated at eight level-I centers for limb-threatening lower-extremity injuries distal to the femur. Patients were enrolled prospectively and were followed for two years, as described previously^{1,2,55}.

The inclusion criteria have been described in detail previously^{1,2} and included patients between the ages of sixteen and sixty-nine years with a high-energy lower-extremity injury that was deemed to be limb-threatening by the treating surgeon. These injuries included open Gustilo and Anderson^{56,57} type-IIIB, type-IIIC, and select severe type-IIIA fractures as well as certain dysvascular leg injuries. To meet the definition of a type-IIIC injury, the vascular injury must be deemed by the attending physician(s) to require repair. Patients who did not have a fracture but had a degloving or high-energy soft-tissue injury were also included in this study.

In an attempt to standardize the inclusion criteria within this subgroup and within other subgroups of patients with similarly subjective inclusion criteria, photographs of all injuries were made at the time of the initial treatment and were reviewed at a single site by a group of investigators not affiliated with the site at which the patient in question had been treated. Agreement among the independent investigators after review of the clinical data, radiographs, and photographs was

TABLE I Patient Demographics and Injury Characteristics (N = 463)

	No.	%
Treatment group		
Amputation	132	28.5
Reconstruction	331	71.5
Reconstruction		
Tibial shaft fracture	99	21.4
Articular fracture	167	36.1
Foot fracture	36	7.8
Soft-tissue injury	29	6.3
Amputation		
Partial foot	9	1.9
Below-the-knee	80	17.3
Through-the-knee	16	3.5
Above-the-knee	27	5.8
Injury Severity Score		
<13 points	297	64.1
≥13 and <17 points	82	17.7
≥17 points	84	18.1
Type of flap		
Standard coverage	202	43.6
Rotational or free flap	261	56.4
Sex		
Male	348	75.2
Female	115	24.8
Age		
<25 yr	102	22.0
≥25 and <35 yr	128	27.6
≥35 and <45 yr	124	26.8
≥45 yr	109	23.5
Type of employment		
Unemployed	112	24.2
Blue collar	242	52.3
White collar	109	23.5
Education		
Less than high school	121	26.1
High-school graduate	187	40.4
Some college	155	33.5
Race		
White	341	73.7
Non-white	122	26.3
Poverty status		
Poor	161	34.8
Not poor	302	65.2

necessary before a patient was included in the final study population.

Patients were excluded if they had a spinal cord injury, a previous foot or leg amputation, a substantial brain injury (a Glasgow Coma Scale score⁵⁸ of <15 at twenty-one days after the injury or at the time of discharge), or third-degree burns on the injured extremity. Exclusion criteria also included transfer

TABLE II Patient Satisfaction with Overall Recovery at Two Years

	Overall Recovery (% of patients)
Not-satisfied group*	
Total in group	34.0
Patients answering "not satisfied"	3.3
Patients answering "slightly satisfied"	9.1
Patients answering "moderately satisfied"	21.6
Satisfied group*	
Total in group	66.0
Patients answering "very satisfied"	36.9
Patients answering "completely satisfied"	29.1

*Scores of 1, 2, and 3 were dichotomized into the not-satisfied group, and scores of 4 and 5 were dichotomized into the satisfied group.

to the treating center more than twenty-four hours after the injury, an inability to speak English or Spanish, and a documented history of mental retardation or a psychiatric disorder. Informed consent was obtained from all patients in accordance with each center's institutional review board.

A total of 601 patients were recruited into the study. Twenty-four patients who had been completely lost to follow-up and thirty-two with bilateral study injuries were excluded from this analysis, leaving a potential study cohort of 545 patients. Patient satisfaction data were available for 463 (85%) of these patients.

Study participants were enrolled during their initial hospitalization. They were asked to return for follow-up at three, six, twelve, and twenty-four months after injury. Before discharge from the initial admission, sociodemographic data were collected. The attending orthopaedic surgeon documented the severity and nature of the injury and the initial treatment. A host of demographic parameters, clinical outcomes, and treatment variables were recorded, as has been previously described for this patient set^{1,2,55}. Selected demographic data are displayed in Table I.

Measurement of Patient Satisfaction

At twenty-four months after injury, the study participants underwent a clinical evaluation that included answering questions regarding their perception of the clinical outcomes of the surgical treatment of the lower extremity. The questions were asked by a trained research interviewer, using a preprinted interview booklet, in a separate structured follow-up interview not in the presence of any member of the treating team. The quality of the data collection was monitored by the data coordinating center. The answers to the questions at the twenty-four-month follow-up visit were used as the basis for this study.

The patients' overall outcome score was based on the question, "Overall, how satisfied are you with the progress you

have made in recovering from your leg injuries?" The study participants were asked to respond to each question with use of a 5-point scale of descriptors that included "not at all satisfied," "slightly satisfied," "moderately satisfied," "very satisfied," and "completely satisfied." The answer to this question was converted to a number ranging from 1 ("not at all satisfied") to 5 ("completely satisfied"). The result was then dichotomized, with values of 1, 2, and 3 assigned to "not satisfied" and values of 4 and 5 assigned to "satisfied." The analysis was performed with both the raw values and the dichotomized values. The results were essentially the same with use of either analysis. For ease of interpretation, the dichotomized results are presented in this report.

Analysis

Multivariate regression techniques were used to identify factors correlating with variation in the patient's self-reported overall satisfaction with the outcome two years after the trauma. The patient characteristics that were tested in the model included age, sex, education, poverty status, insurance status, occupation, race, personality (measured with the personality index described by McCrae and Costa⁵⁹), and medical comorbidities. Injury severity was tested by using both the Injury Severity Score and a score reflecting the probability of amputation¹. The treatment decisions that were tested were amputation versus reconstruction and time to treatment variables. The outcomes that were tested included pain, range of motion, muscle strength, self-selected walking speed, depression, anx-

TABLE III Factors Not Associated with Degree of Patient Satisfaction at Two Years After Initial Injury*

Patient demographics
Age
Gender
Education
Poverty status
Race
Insurance status
Personality profile
Medical comorbidities
Preinjury work status
Preinjury job type
Injury characteristics
Mechanism of injury
Open fracture type
Severity of bone or skin damage
Severity of nerve damage
Treatment parameters
Reconstruction or amputation
Timing of initial débridement
Timing of admission
Timing of definitive soft-tissue coverage

*Multiple logistic regression, $p > 0.2$.

TABLE IV Factors Associated with Degree of Patient Satisfaction at Two Years After Initial Injury*

	P Value
Significant	
Return to work	<0.05
No depression	<0.05
Higher SIP physical functioning score	<0.01
Faster walking speed	<0.001
Lower pain intensity	<0.001
Borderline significant	
Absence of major complication	<0.1
Less anxiety	<0.1

*Multiple logistic regression, $p < 0.05$. SIP = Sickness Impact Profile.

ity, the physical and psychosocial scores of the SIP, return to work, and the number of major complications.

All of the factors listed above were examined with use of bivariate and multivariate regression models, including testing of interaction terms. In addition, we examined the covariance among all variables tested in the model to avoid biases related to autocollinearity. Robust variance estimation was used throughout. A p value of <0.05 was defined as significant.

We conducted the analysis by using the response both as an ordinal variable and as a dichotomized response. Furthermore, we conducted the dichotomized response analysis with inclusion of the category of “moderately satisfied” in both the “satisfied” and the “not satisfied” groups. All three analyses yielded similar results. For simplicity, we will present the results of only the dichotomous analysis throughout this text.

Results

Sixty-six percent of the patients were satisfied with their overall outcomes at two years (Table II), and 34% were not satisfied. The multivariate regression model yielded no patient demographic, treatment, or injury characteristics that were associated with patient satisfaction at a significant level (Table III). We were therefore not able to identify any factors known preoperatively that could have reliably predicted the eventual level of patient satisfaction at two years after injury.

The only factors that correlated with the degree of patient satisfaction at two years were measures of physical function, psychological distress, clinical recovery, and return to work. Five of these outcome measures accounted for $>35\%$ of the overall variation in patient satisfaction. The five outcome measures associated with more satisfaction were return to work, absence of depression, a better score on the physical functioning component of the SIP, faster self-selected walking speed, and lower pain intensity ($p < 0.05$, Table IV). The absence of major complications and less anxiety were marginally significant ($p < 0.1$).

Discussion

Patient satisfaction has emerged as a potentially valuable tool driving changes in medical care. Although some researchers have shown that patients are surprisingly savvy in terms of evaluating the quality of care that they receive¹⁴, others have argued that the relationship between patient satisfaction and quality of care is tenuous at best⁸. Regardless of its efficacy as a surrogate for quality of care, patient satisfaction seems to be an important driver of medical economics and therefore is likely to have more influence on medical decision-making in the future^{9,11}. Despite the emerging understanding of the importance of patient satisfaction, there has been very little research on patient satisfaction in the domain of high-energy orthopaedic trauma.

Although work has been done to evaluate the outcomes of surgery for treatment of high-energy injuries of the lower-extremity¹⁻⁵, little focus has been placed on the determinants of patient satisfaction after these potentially devastating injuries. To our knowledge, the only other reported data on patient satisfaction with the result of surgery after high-energy trauma are contained within a series of outcomes after amputations⁶⁰. Only half of the patients in that series underwent amputation as a result of trauma (the remainder underwent amputation as a result of peripheral vascular disease, infection, or other disease); no patient in that series underwent reconstruction. Therefore, extrapolating data from that previous report to our population of interest—patients with high-energy lower extremity injury treated with amputation or limb salvage—is difficult.

One possibility is that patient satisfaction after severe lower-extremity injuries is predetermined by the nature of the injury and the psychological and sociological backgrounds of the patient. Those with this view would contend that improving patient satisfaction is perhaps a poor goal for clinical research and medical decisions because it is beyond the control of medical and surgical intervention. If that is true, focusing on improving patient satisfaction might be considered somewhat futile because it is predetermined before the surgeon even meets the patient.

Our results clearly contradict this hypothesis. In our study, patient satisfaction after surgery for treatment of high-energy lower-extremity injury was unrelated to the details of the injury, patient demographics, or psychological profile of the patient. Furthermore, in this patient population, the degree of patient satisfaction was also independent of the details and timing of the surgery.

Instead, our study showed that patient satisfaction after high-energy lower-extremity trauma was related only to other outcome parameters. The most important seem to be physical function, less pain, the absence of depression, and the ability to return to work at two years, as detailed in Table IV. These factors seem to be the important drivers of patient satisfaction regardless of the type of patient or injury or the details of treatment. Understanding these important drivers of patient satisfaction might help surgeons to direct treatment in ways that will lead to more patient-centered care.

The fact that patient satisfaction after these high-energy injuries does not seem to be linked to the type of injury or to patient demographics is counterintuitive. One explanation for our results might be that although the specifics of the injuries sustained by these patients seem varied, all of the patients had very severe lower-extremity injuries, making them a somewhat homogeneous group in terms of injury characteristics. If we compared this group of patients with a group with a wider spectrum of injuries, we might expect the injury type to better predict outcome.

Other authors have reported patient satisfaction scores after orthopaedic procedures, such as arthroplasty^{53,61,62}; however, few have examined the factors influencing patient satisfaction. In two previous reports in the sports literature, the authors analyzed the determinants of patient satisfaction after rotator cuff surgery and anterior cruciate ligament reconstruction^{63,64}. In these studies, as in ours, the main determinants of patient satisfaction were "pain, functional difficulty, or work disability."⁶³ As was the case in our study, the demographic variables in the previous studies were not predictive of patient satisfaction.

Limitations of our study include the facts that it was a secondary data analysis and that all patients were treated at high-volume level-I trauma centers by experienced orthopaedic traumatologists. How these results extrapolate to patients treated in other clinical settings is unknown. There might have been more variability in treatment had other clinical settings been included, which would have allowed an expanded comparison of the direct effect of treatment selection on patient satisfaction. Furthermore, there is an inherent limitation in measuring patient satisfaction with a single question graded ordinally on a scale of 1 to 5. Patient satisfaction has many components^{7,9,13,16}, and although the scale that we used has

been validated in the literature¹⁷ and our method of measuring overall satisfaction with the outcome by asking a single question has been used in previous studies^{63,64}, our use of a single question is a potential limitation of our study. Additional research is needed to learn how other aspects of patient satisfaction (financial, interpersonal, and convenience of care) relate to our question in this population.

Our study provides evidence that patient satisfaction after high-energy lower-extremity trauma is associated with the outcome of the treatment and is not predetermined by the nature of the injury or the underlying psychological or socioeconomic characteristics of the patient. As medical care becomes more focused on patient-centered models, studies such as this might help to clarify the determinants of patient satisfaction. ■

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