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David N Bernstein

Dylan Koolmees

Josh Hester

Nikhil R. Yedulla

Eric C. Makhni

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David N. Bernstein, M.D., M.B.A., M.A., Dylan Koolmees, B.S., Josh Hester, B.S., Nikhil Yedulla, B.S., and Eric C. Makhni, M.D., M.B.A.

Purpose: The purpose of the current study was to (1) determine the percentage of new orthopedic patients reporting their symptoms to be acceptable at presentation, as measured by the Patient Acceptable Symptom State (PASS) question, and (2) evaluate whether patient-reported outcome measures (PROMs), including Patient-Reported Outcome Measurement Information System (PROMIS) Physical Function (PF) or Upper Extremity, Pain Interference (PI), and Depression (D), or sociodemographic factors are associated with acceptable symptoms at presentation. **Methods:** Between February 7, 2020, and March 16, 2020, new orthopedic patients who completed PROMs were identified. Patient records were reviewed for those who also completed the PASS question, a yes/no question about whether a patient's current symptom state is satisfactory. Bivariate analysis was conducted to compare patient characteristics, such as area deprivation index (ADI), between those reporting acceptable symptoms and those who did not. Multivariable logistic regression models were used to determine factors associated with acceptable symptoms at presentation. **Results:** A total of 570 patients were included, with one-fourth (n = 143 [25%]) reporting acceptable symptoms at presentation. In multivariable regression analysis, only pain, as measured by the PROMIS PI, was associated with acceptable symptoms at presentation (non−upper extremity patient regression: PROMIS PI: odds ratio [OR], 0.84; 95% confidence interval [CI], 0.79-0.90, $P < .01$; upper extremity patient regression: PROMIS PI: OR, 0.91; 95% CI, 0.85-0.98, $P < .01$). In both multivariable regression analyses, insurance type (private, Medicare, Medicaid, other), visit subspecialty (sports, hand, joints, foot and ankle, spine, other), PROMIS PF, PROMIS D, and national ADI were not associated with acceptable symptoms at presentation (all $P > .05$). **Conclusions:** One-fourth of new orthopedic patients reported their symptoms to be acceptable at presentation. Of those who considered their symptom state unsatisfactory, pain—not functional status, mental health, or sociodemographic factors—was the primary determinant. **Level of Evidence:** Level III, diagnostic.

The routine use of patient-reported outcome measures (PROMs) is growing within orthopedic surgery globally.[1] PROMs allow patients to report their own perspective on their health[2] and allow surgeons to capture patient well-being without the need for interpretation or input from others. As health care continues to transition away from volume and toward value—defined as health outcomes achieved per dollar spent over the full cycle of care[3]—PROMs are likely to become an even more integral part of the care process. One set of PROMs that may be of most value to fully understand is the Patient-Reported Outcomes Measurement Information System (PROMIS), which has been shown to perform as well as, if not better than, many legacy instruments (ie, lower ceiling and floor effects and decreased response burden), is generalizable across musculoskeletal conditions (ie, focus on general health domains as opposed to specific diagnoses), and may be linked to reimbursement in the future.[4-6] Ensuring as robust an understanding as possible of PROMIS and their utility in clinical practice is crucial to delivering high value care, improving shared clinical decision-making discussions, and understanding and setting patient expectations.

While PROMs—and PROMIS in particular—are helpful in understanding patient health states of function and

pain, these instruments can become even more relevant if correlated with patient perception of satisfaction and overall well-being. One commonly used tool is the Patient Acceptable Symptom State (PASS) question, which is a single yes/no question that asks if a patient considers their current symptom state to be acceptable or not.[7] Moreover, further assessing the relationship of an overall subjective evaluation of health with not only symptom measures (eg, PROMIS questionnaire) but also measures of social determinants of health can provide a more robust and holistic understanding of each orthopedic patient's health. Thus far, research has shown that foot and ankle patients with lower income find significantly worse symptom states acceptable at presentation.[8] A better understanding of the patient factors and/or PROMIS domains associated with reporting an acceptable symptom state at presentation across orthopedic subspecialties may help guide orthopedic surgeons in their daily care of patients by allowing them to better prepare for clinic visits.

The purpose of the current study was to (1) determine the percentage of new orthopedic patients reporting their symptoms to be acceptable at presentation, as measured by the PASS, question and (2) evaluate whether PROMs, including PROMIS Physical Function (PF) or Upper Extremity (UE), Pain Interference (PI), and Depression (D), or sociodemographic factors are associated with acceptable symptoms at presentation. The hypotheses were that (1) very few new orthopedic patients, if any, would report their symptoms as acceptable upon presentation, and (2) functional status, pain, mental health, and sociodemographic factors would all be associated with perception of symptom satisfaction at the initial visit to the orthopedic clinic.

Methods

The retrospective observational study was approved by the appropriate institutional review board (IRB). Between February 7, 2020, and March 16, 2020, all records for patients seeking musculoskeletal care as a new patient at a single academic medical center were reviewed. Patients who were not new patients were excluded.

At the study institution, orthopedic patients are asked to complete PROMIS PF (v2.0) or UE (v2.0), PI (v1.1), and D (v1.0) computer adaptive tests (CATs) as part of routine clinical care. Patients were assigned either the PROMIS PF or PROMIS UE based on the main reason for their clinic visit, with upper extremity patients assigned the PROMIS UE. Developed with support from the National Institutes of Health (NIH),[9] PROMIS surveys are validated, universal PROMs that are normed to the general US population with a mean (SD) t score of 50 (10).[10] For all PROMIS domains, lower t scores represent "less" of the construct being measured, while higher t scores represent "more" of the construct being measured. In addition to PROMIS domains, all patients

were asked to complete the PASS question, a yes/no question that allows patients to report whether their current subjective symptom state is acceptable or satisfactory.[7] The yes/no PASS question states, "Taking into account all of the activities you do during your daily life, your pain level, and also your function, do you consider your current state satisfactory?" Importantly, the PASS question has been used in a number of studies within the orthopedic literature.[7,8,11]

In addition to PROMIS questionnaires and the PASS question, the following patient characteristics were recorded: age (years), sex (male or female), self-reported race (white, black, or other/unknown), self-reported ethnicity (non-Hispanic or Hispanic), insurance type (private, Medicare, Medicaid, or other), visit subspecialty (sports, hand, joints, foot and ankle, spine, oncology, or general), and the national area deprivation index (ADI). The ADI is a robust measure of socioeconomic status at the neighborhood (ie, census block group) level.[12] At the national level, the ADI is reported as a national percentile ranking; thus, the scores range from 1 (lowest level of disadvantage) to 100 (highest level of disadvantage).[12] The ADI is an accepted measure in the medical literature,[13,14] including within the orthopedic surgery literature.[15,16]

Statistical Analysis

Descriptive statistics were calculated and reported. The mean (SD) age of our patient sample was 51 (20) years, and just over half of all patients were female (n = 322 [56%]) (Table 1).

In addition, bivariate analysis was used to compare patient characteristics between those who reported acceptable symptoms at presentation and those who did not. For categorical variables, χ^2 tests were used. In such analyses, when a cell had a count of fewer than 5 (ie, n < 5), a Fisher exact test was used.[17] Continuous variables were compared using the Student t test.

Multivariable logistic regression models were constructed using a stepwise approach where those characteristics in the bivariate analysis that was significant at the $P \leq .10$ level were included. Similar stepwise approaches have been used frequently in the orthopedic literature.[18,19] Two multivariable logistic regression models were developed because of collinearity between PROMIS PF and PROMIS UE.

Differences in PROMIS domain t scores between groups (eg, patients who reported their symptoms to be acceptable and those who did not) were considered clinically relevant or not based on the concept of the minimal clinically important difference (MCID). For this study, we utilized a distribution-based MCID estimate, which is classically half of 1 SD of a given PROM.[20] Therefore, for this study, PROMIS PF, UE, PI, and D MCID values were 4.4, 5.1, 3.5, and 5.0, respectively.

Table 1. Patient Characteristics (n = 570)

Characteristic	n (%) or Mean (SD)
Age, y	51 (20)
Sex	
Female	322 (56)
Male	248 (44)
Self-reported race	
White	364 (64)
Black	80 (14)
Other/unknown	126 (22)
Self-reported ethnicity	
Non-Hispanic	558 (98)
Hispanic	12 (2.1)
Insurance type	
Private	387 (68)
Medicare	119 (21)
Medicaid	46 (8.1)
Other	18 (3.2)
Visit subspecialty	
Foot and ankle	54 (9.5)
Hand	101 (18)
Joints	78 (14)
Oncology	3 (0.5)
Spine	45 (7.9)
Sports	286 (50)
General orthopedics	3 (0.5)
PASS result	
Yes	143 (25)
No	427 (75)
PROMIS	
PF (n = 355)	38.6 (8.8)
UE (n = 217)	33.8 (10.1)
PI	62.6 (7.0)
Depression	46.9 (9.9)
National ADI	42.0 (27.2)

ADI, area deprivation index; D, Depression; PASS, Patient Acceptable Symptom State; PF, Physical Function; PI, Pain Interference; PROMIS, Patient-Reported Outcome Measurement Information System; UE, Upper Extremity.

Final significance was set a priori at $P < .05$. All statistical analyses were performed using Stata/SE 14.2 for Mac (StataCorp, College Station, TX, USA).

Results

Of the 607 new patient visits across 7 orthopedic subspecialties recorded, 37 patients (6.1%) were excluded because they did not complete all PROMIS questionnaires or the PASS question. This left a final patient sample of 570 patients (94%) for analysis.

One-fourth (n = 143) of all new orthopedic patients reported acceptable symptoms at presentation (Table 1). The mean (SD) national ADI was 42.0 (27.2). The mean (SD) PROMIS PF, UE, PI, and D t scores were 38.6 (8.8), 33.8 (10.1), 62.6 (7.0), and 46.9 (9.9), respectively.

In bivariate analysis, there was a significant difference in visit subspecialty by presence of acceptable symptoms (Table 2). In addition, insurance type—although not significant at the $P < .05$ level—met our criteria to be

included in the final multivariable logistic regression models. Across all PROMIS domains, those who responded "yes" had significantly better PROMIS t scores. The improvement in PROMIS PF, UE, PI, and D t scores, on average, was 7.7, 7.2, 7.1, and 4.7, respectively. With the exception of the PROMIS D, the t score differences between those with acceptable symptoms at presentation and those without acceptable symptoms at presentation represented clinically relevant differences in functional and pain symptoms. Last, in bivariate analysis, patients with acceptable symptoms at presentation were significantly less socially deprived, as measured by the national ADI.

In multivariable logistic regression analysis that included PROMIS PF and not PROMIS UE t scores, only pain (ie, PROMIS PI t score) was associated with acceptable symptoms at presentation (odds ratio [OR], 0.84; 95% confidence interval [CI], 0.79-0.90; $P < .01$) (Table 3). Similarly, in multivariable logistic regression

Table 2. Comparison of Patient Characteristics Based on PASS Status

Characteristic	Pass—No (n = 427) n (%) or Mean (SD)	Pass—Yes (n = 143) n (%) or Mean (SD)	P Value
Age, y	52 (20)	49 (21)	.17
Sex			.53
Female	238 (56)	84 (59)	
Male	189 (44)	59 (41)	
Self-reported race			.76
White	269 (63)	95 (66)	
Black	61 (14)	19 (13)	
Other/unknown	97 (23)	29 (20)	
Self-reported ethnicity			.99
Non-Hispanic	418 (98)	140 (98)	
Hispanic	9 (2.1)	3 (2.1)	
Insurance type			.10
Private	279 (65)	108 (76)	
Medicare	99 (23)	20 (14)	
Medicaid	36 (8.4)	10 (7.0)	
Other	13 (3.0)	5 (3.5)	
Visit subspecialty			.01
Foot and ankle	40 (9.4)	14 (9.8)	
Hand	67 (16)	34 (24)	
Joints	69 (16)	9 (6.3)	
Oncology	2 (0.5)	1 (0.7)	
Spine	37 (8.7)	8 (5.6)	
Sports	209 (49)	77 (54)	
General orthopedics	3 (0.7)	0 (0)	
PROMIS			
PF (n = 355)	36.9 (7.8)	44.6 (9.7)	<.01
UE (n = 217)	31.6 (8.0)	38.8 (12.3)	<.01
PI	64.4 (6.2)	57.3 (6.8)	<.01
Depression	48.1 (10.0)	43.4 (8.9)	<.01
National ADI	43.5 (27.7)	37.4 (25.2)	.02

ADI, area deprivation index; D, Depression; PASS, Patient Acceptable Symptom State; PF, Physical Function; PI, Pain Interference; PROMIS, Patient-Reported Outcome Measurement Information System; UE, Upper Extremity.

Table 3. Multivariable Logistic Regression Results—Including PROMIS Physical Function (PF)—to Determine Patient Characteristics Associated With PASS Status

Characteristic	Pseudo-R^2	0.24
	Odds Ratio (95% CI)	P Value
Insurance type		
Private	Reference	
Medicare	0.58 (0.24-1.41)	.23
Medicaid	0.67 (0.15-2.94)	.60
Other	0.49 (0.07-3.48)	.48
Visit subspecialty		
Sports	Reference	
Hand	—	
Joints	0.61 (0.22-1.67)	.34
Foot/ankle	1.70 (0.73-3.95)	.22
Spine	1.27 (0.47-3.43)	.64
Other	1.07 (0.10-11.28)	.95
PROMIS		
PF	1.04 (0.99-1.09)	.11
PI	0.84 (0.79-0.90)	<.01
Depression	1.00 (0.96-1.03)	.82
National ADI	1.00 (0.99-1.01)	.79

ADI, area deprivation index; CI, confidence interval; PF, Physical Function; PI, Pain Interference; PROMIS, Patient-Reported Outcome Measurement Information System.

analysis that included PROMIS UE and not PROMIS PF *t* scores, only pain (ie, PROMIS PI *t* score) was associated with acceptable symptoms at presentation (OR, 0.91; 95% CI, 0.85-0.98; *P* < .01) (Table 4).

Discussion

In the present study, we found that one-fourth of all new orthopedic patients reported their symptoms at presentation to be acceptable, which was contrary to the first study hypothesis. Further, we found that all patients, regardless of whether they report their symptoms as acceptable or not, present for musculoskeletal care with notable functional, pain, and mental health impairment. When accounting for all included patient factors, pain was the only independent variable associated with the odds of having acceptable symptoms at presentation. As pain worsened, the odds of patients reporting their symptoms as acceptable decreased. This finding was contrary to the second study hypothesis, as only pain was associated with acceptable symptom state at presentation.

The fact that one-fourth of patients newly presenting for orthopedic care were satisfied with their current symptom state is an interesting finding that begs for further research that examines why such patients seek care in the first place. However, it is still possible that some of these patients would clinically benefit from an intervention, such as physical therapy, an injection, or surgery. In such cases, we believe it is especially crucial for orthopedic surgeons to engage fully in shared clinical decision-making discussions prior to treatment.

Many patients may still—and hopefully do—find their symptoms satisfactory after an intervention, but it may take the expected recovery time before they appreciate the satisfaction again. The hope, however, is to also improve functional and pain levels even more through the treatment. Additionally, the finding that pain is associated with the odds of acceptable symptoms at presentation provides invaluable insight, as it demonstrates that the impact of pain on daily life—not function, mental health, or socioeconomic status—is the most important factor in patients finding their ailment manageable. Thus, supporting effective pain coping mechanisms—as PROMIS PI can be considered a proxy for pain coping[21]—may be beneficial.

Understanding the patient composition of those seeking musculoskeletal care is an important first step in better appreciating the value of PROMIS and PASS. Overall, we found that one-fourth of patients reported their symptom severity at presentation was acceptable (ie, responded "yes" to the PASS question). Thus, it appears that while a notable portion of patients finds their musculoskeletal concern manageable, they still seek physician evaluation and utilize health care resources. This may represent an underlying assumption of patients that any feelings of discomfort can be "fixed" in full. However, further research is warranted to determine if this is truly the case or if another reason underpins this unexpected finding.

Interestingly, our study did not find that sociodemographic factors were associated with patient satisfaction with symptom severity. While one may postulate this is to be expected because the PASS question specifically

Table 4. Multivariable Logistic Regression Results—Including PROMIS Upper Extremity—to Determine Patient Characteristics Associated With PASS Status

Characteristic	Pseudo-R^2	0.16
	Odds Ratio (95% CI)	P Value
Insurance type		
Private	Reference	
Medicare	0.81 (0.30-2.19)	.68
Medicaid	1.49 (0.47-4.79)	.50
Other	2.75 (0.43-17.71)	.29
Visit subspecialty		
Sports	Reference	
Hand	1.17 (0.59-2.35)	.65
Joints	0.80 (0.14-4.67)	.81
Foot/ankle	—	—
Spine	—	—
Other	—	—
PROMIS		
UE	1.03 (0.98-1.08)	.23
PI	0.91 (0.85-0.98)	<.01
Depression	0.97 (0.93-1.00)	.08
National ADI	0.99 (0.98-1.01)	.35

ADI, area deprivation index; CI, confidence interval; PI, Pain Interference; PROMIS, Patient-Reported Outcome Measurement Information System; UE, Upper Extremity.

asks about functional status, pain severity, and overall daily activities, we felt that sociodemographic factors were still important to consider. Indeed, we would argue that the national ADI, for example, can be considered a proxy variable for descriptors like job type (eg, manual labor job or desk job), access to support services, or historical social barriers (eg, racism) to equitable care, among others. Thus, a financially strapped patient who must work to provide for her and her family may have a very different level of acceptable pain than a wealthy, retired individual. Therefore, we feel it is appropriate to utilize the PASS question as we have done in this study. Ultimately, despite the patient sample having a mean (SD) ADI of 42.0 (27.2), which is an appreciable level of social deprivation just under the average level of social deprivation in the United States, we did not find any such relationship. Future work may seek to determine whether more specific measures of different sociodemographic variables have an association with PASS status.

Because PROMIS domains are general in design, they allow us to capture and compare health information important to patients across all orthopedic subspecialties in an appropriate and accurate manner.[6] This is remarkable and allows us to get a more complete picture of all patients in a streamlined fashion compared to using legacy instruments. In the present study, consistent with expectations, patients seeking care for any musculoskeletal concerns present with notable functional and pain impairment. For PROMIS PF, UE, and PI, presenting t scores were over 1 SD worse than the general US population. In fact, presenting PROMIS UE t scores were almost 2 SDs worse. In contrast, across all patients, PROMIS D t scores were nearly half of 1 SD better than the US population at presentation. While it is possible that the mental health status of patients seeking orthopedic care is, on average, truly better than the general population, it is also possible that it is reflective of the large floor effect of the domain appreciated in this population.[22-24] Orthopedic surgeons should recognize that many patients present with symptom severity that they consider satisfactory or acceptable; this is despite prominent functional and pain limitations and social deprivation. Further, PROMIS D t scores reflective of greater levels of depressive symptoms (ie, t score greater than 1 SD above the population mean of 50) are not the norm and should raise the alarm for true mental health concern.

When comparing patient characteristics between those who found their presenting symptom severity acceptable and those who did not, a few key findings were noted. First, those finding their symptoms at presentation acceptable had significantly better PROMIS PF, UE, PI, and D t scores. Further, these differences for PROMIS PF, UE, and PI t scores were clinically appreciable when considering the MCID using

the distribution-based approach (ie, half of 1 SD).[20] Differences in PROMIS D t scores did meet the MCID cutoff estimate. Importantly, however, even patients noting their symptoms were acceptable had notable functional and pain symptom impairment, with PROMIS PF and PI t scores being greater than half of 1 SD worse than the population average and PROMIS UE t scores being greater than a full SD worse than the population average. In addition, patients who felt their symptoms at presentation were acceptable had significantly less social deprivation. The combination of higher PROMIS domain t scores and lower social deprivation levels being associated with acceptable symptoms at presentation in bivariate analysis appears consistent with prior foot and ankle surgery literature.[8] However, to account for confounding, multivariable logistic regression analyses are required; when performed, many of the factors found to be significant in bivariate analysis no longer were significantly associated with acceptable symptoms at presentation.

Of all the patient characteristics considered, including self-reported race, insurance type, visit subspecialty, ADI, and all PROMIS domains, only pain (ie, PROMIS PI) was associated with new orthopedic patients reporting acceptable symptoms at presentation. For each t score point increase (ie, worsening of pain interference), there is a 16% and 9% decrease in the odds of patients reporting their symptoms as satisfactory when considering PROMIS PF and UE as the functional PROMs, respectively. PROMIS PI is the most useful questionnaire to evaluate patient coping ability in response to nociception.[21] Patients who are better able to cope with their musculoskeletal condition are more likely to find their symptoms acceptable, even when those symptoms are worse than many of those around them. Therefore, orthopedic surgeons who engage in patient expectation setting and assist patients in developing effective pain coping may ultimately improve patient well-being. Indeed, as patients grow older, many of the aches and pains are part of the normal aging process, and successful coping skills are crucial to decrease potential overuse of health care resources unnecessarily. Further, this may continue to grow in importance as reimbursement models continue to incorporate measures of patient satisfaction[25]; ultimately, patients who recognize their symptoms as satisfactory may report higher levels of overall satisfaction. However, future research is warranted to assess whether our findings across all orthopedic subspecialties hold true across a wide range of diagnoses and pathologies in each subspecialty.

Limitations

This study has limitations. First, despite our data coming from numerous clinics with a diverse patient population, the data are still from a single, integrated

health care center. Thus, the generalizability of our findings may be limited outside of such settings. Second, we used ADI, an area-based measure of social deprivation in this study that relies on US Census Bureau data to construct; thus, its accuracy is based on the US Census Bureau data used.[12] While individual patient data may be preferred, the practicality of collecting such information limits this approach. Third, similar to previous research,[8] we included all newly presenting orthopedic patients regardless of diagnosis. It is possible that the relationships evaluated in this study would be better at the diagnosis level. Fourth, the PASS question specifically asks patients about whether the impact of their pathology on daily activities, functional status, and pain level is satisfactory or not; thus, it is possible that the PASS question is not the most appropriate instrument to assess the relationship between mental health or sociodemographic factors and symptom satisfaction. Last, certain patient characteristics may not have been found to be associated with PASS status at presentation because of a lack of adequate power; thus, it is possible our work could suffer from type II error.

Conclusion

One-fourth of new orthopedic patients reported their symptoms to be acceptable at presentation. Of those who considered their symptom state unsatisfactory, pain—not functional status, mental health, or sociodemographic factors—was the primary determinant.

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