

Patient Expectations for Symptomatic Improvement before Cubital Tunnel Release

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Background: Patient expectations before cubital tunnel release (CuTR), a common procedure that leads to incomplete symptom resolution for many patients, are unclear. Study purposes included (1) describing preoperative patient expectations, and (2) identifying factors affecting expectations.

Methods: Included patients underwent isolated unilateral CuTR between 2015 and 2021 at a single tertiary academic medical center. Expectations regarding the level of symptomatic improvement were queried preoperatively. Univariate and multivariable binary logistic regression was performed to determine factors associated with expecting great improvement.

Results: Of the 92 included patients, 43 (47%) patients expected great improvement, whereas 27 (29%), four (4%), and five patients (5%) expected some, little, and no improvement, respectively. The remainder (14%) had no expectations. Multivariable modeling demonstrated that retired or unemployed/disabled work status, and commercial insurance status (versus Medicare or Medicaid) were associated with lower expectations independent of the surgeon, surgical technique, revision versus primary CuTR, preoperative atrophy or constant numbness, diabetes, and all studied demographic factors, including social deprivation.

Conclusions: Roughly half of the patients expect great relief, and a third expect lesser degrees of relief, following CuTR. Preoperative expectations are significantly higher in patients with Medicaid and Medicare insurance, representing an opportunity for education, given the association between public insurance payer status and worse health outcomes in general. Age, BMI, preoperative atrophy and/or numbness, and the presence of medical comorbidities do not influence expectations but have been shown to yield worse outcomes or influence need for revision CuTR, representing an opportunity for intervention to align patient and surgeon expectations. (*Plast Reconstr Surg Glob Open* 2022;10:e4174; doi: 10.1097/GOX.0000000000004174; Published online 7 March 2022.)

INTRODUCTION

Cubital tunnel syndrome (CuTS) is the second most common nerve entrapment condition in the upper extremity¹ and affects up to 6% of the population at an incidence rate of 19–30 cases per 100,000 persons.^{1–3} From 1996 to 2006, the total number of cubital tunnel

procedures increased by 47%.⁴ Given the high prevalence of CuTS, identifying which patient factors significantly relate to patient expectations before cubital tunnel release (CuTR) creates an opportunity for refinement in patient preoperative counseling. Specific patient factors seem to be associated with positive surgical outcomes, and research suggests that patients undergoing surgery generally have high preoperative expectations of their respective procedure.^{5,6}

The current literature identifies patient factors associated with outcome after CuTR, which include but are not limited to patient demographics, comorbid conditions, physical findings before surgery, and other considerations such as the chosen surgical technique.^{7–9} Although many studies demonstrate that various patient factors—such as age and BMI—influence postoperative outcomes,⁹ a consensus is lacking as to how preoperative expectations vary depending on those factors, particularly for CuTR.

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Furthermore, there is a dearth of studies about preoperative patient expectations before CuTR. Identification of patient expectations before CuTR allows surgeons to address discord between patient expectations and anticipated postoperative outcomes based on identifiable preoperative patient features, which may provide improved patient satisfaction by meeting patient expectations. Our primary purpose was to describe patient expectations before CuTR. Secondarily, we identified preoperative factors associated with expecting great relief or improvement for patients after CuTR.

METHODS

With institutional review board approval (IRB #00071740), adult patients (≥ 18 years) who underwent isolated unilateral CuTR surgery between January 2015 and June 2021 at a single tertiary academic medical center were identified. Surgeries were performed by one of the five fellowship-trained hand surgeons. We included patients undergoing CuTR with any observed surgical technique (in situ decompression, subcutaneous transposition, and submuscular transposition), including those undergoing revision CuTR. Patients undergoing additional simultaneous surgical procedures performed in conjunction with the index CuTR, and those undergoing bilateral simultaneous CuTR were excluded.

Patient expectations were queried within 3 months before undergoing CuTR. Specifically, a question designed to ascertain patient expectations regarding their surgical outcome was asked at preoperative clinic visits within 3 months of CuTR: “How much relief and/or improvement seems realistic to you as a result of the treatment you will be receiving?” Likert scale responses included “great relief/improvement,” “some relief/improvement,” “little relief/improvement,” “no relief/improvement,” and “I do not have any expectations.” All patients received the same version of this question on an electronic tablet computer. Notably, preoperative patient counseling before surgery was delivered by the treating surgeon in a nonscripted pragmatic fashion reflective of routine patient care. Manual chart review was performed to ensure that the anchor question was answered within 3 months preoperatively at an office visit specifically pertaining to the upcoming CuTR surgery. Patients lacking a response within 3 months preoperatively to the improvement question, and those responding to the improvement question at visits unrelated to the preoperative CuTR discussion, were excluded. For patients with multiple responses within 3 months preoperatively, the response closest to the date of surgery was used.¹⁰

Manual chart review was performed to verify coded procedures, to determine the surgical CuTR technique employed, and to collect potential predictor variables. Demographic data were obtained through a combination of electronic data acquisition and manual chart review. Other preoperative factors known to limit postoperative improvement⁹ following CuTR were collected via manual

Takeaways

Question: What are patient expectations before cubital tunnel release and what patient factors are correlated with expectations?

Findings: Most patients expect relief after cubital tunnel release and preoperative expectations are higher in patients with Medicaid and Medicare insurance.

Meaning: Patients with Medicaid and Medicare insurance have higher expectations before cubital tunnel release, but this population has been shown to have worse outcomes in the setting of surgery, providing an opportunity for counseling. Other patient factors, such as severity at presentation, do not impact expectations, providing additional opportunity for counseling if these factors are expected to worsen outcome.

chart review, including the presence of hypercoagulable disorder or chronic liver disease,⁷ obesity,⁷ age,^{10–13} presence of constant numbness or weakness/atrophy,^{10,13–18} and duration of symptoms.^{10,18–20}

Social deprivation was included as a potential predictor variable, given its impact on healthcare access²¹ and outcomes in general,^{22–29} utilizing the 2015 Area Deprivation Index (ADI) to determine the level of social deprivation on a national percentile basis for each patient (lower ADI indicates lower levels of social deprivation).³⁰ ADI has been studied in several upper extremity and general orthopedic studies that have demonstrated that higher levels of social deprivation are associated with worse patient-reported outcomes^{22,31–33} and decreased satisfaction with care.²² Additionally, specific to hand surgery, lower social deprivation has been associated with greater expectations for improvement after carpal tunnel release.³⁴ The ADI evaluates 17 factors that influence socioeconomic status, including education level, income, and housing type for a given 9 digit zip code,³⁵ which is granular to the level of 10–20 homes on average.³⁶ These data were originally collected from census records based on the Health Resources and Services Administration, and are updated regularly to include the most recent American Community Survey data.³⁵

Continuous variables were summarized as mean (SD), median [interquartile range (IQR)], and range. Categorical variables were summarized as counts (percentages). Univariable and multivariable logistic regressions were used to identify factors associated with expectations. Specifically, we investigated which preoperative factors were associated with patients expecting great relief/improvement, versus lower levels of expectations (binning of patients with no expectations and those expecting some, little, and no relief/improvement) as previously done.³⁴ The multivariable model included all variables with a *P* value less than 0.1 in the univariable analysis. Variance inflation factors were calculated to examine potential multicollinearity of the multivariable model. Variance inflation factors of less than five were deemed acceptable.^{37–39} Odds ratios, 95% confidence

intervals, and *P* values were reported from the models. Statistical significance was assessed at the 0.05 level, and all applicable tests were two-tailed.

RESULTS

Demographics and Surgical Details

The recruitment process and reasons for exclusion are illustrated in [Figure 1](#). Of the 92 included patients, mean age was 48.8 ± 14.9 years, and 60% were men. The vast majority were White (92%), more than half were actively employed and working (59%), and 64% were commercially insured. The mean ADI was 35.9 ± 18.7 , indicating that most patients fell within the lowest two quartiles of social deprivation. Additional demographic data are presented in [Table 1](#). Most of the included patients (90%) underwent primary CuTR (83/92), but 10% (9/92) underwent revision CuTR (all of which were transpositions—four subcutaneous and five submuscular). Most (92%) of the surgeries

were performed under general anesthesia with variable surgical techniques: 40% in situ decompression, 44% subcutaneous transposition, and 16% submuscular transposition. Additional surgical details are provided in [Table 2](#).

Expectations

Regarding the primary outcome of the study ([Table 3](#)), the majority of patients expected great or some relief/improvement from their CuTR (76%). Specifically, 47% (43/92) expected great relief/improvement, whereas 29% (27/92), 4% (4/92), and 5% (5/92) expected some, little, and no relief/improvement, respectively. A minority of patients expected little to no relief (10%) after CuTR, and 14% (13/92) patients had no expectations.

Univariable and Multivariable Analyses

In the univariable analysis, employment (retired, unemployed, or disabled), revision CuTR, and type of insurance (Medicare, Medicaid, or other versus

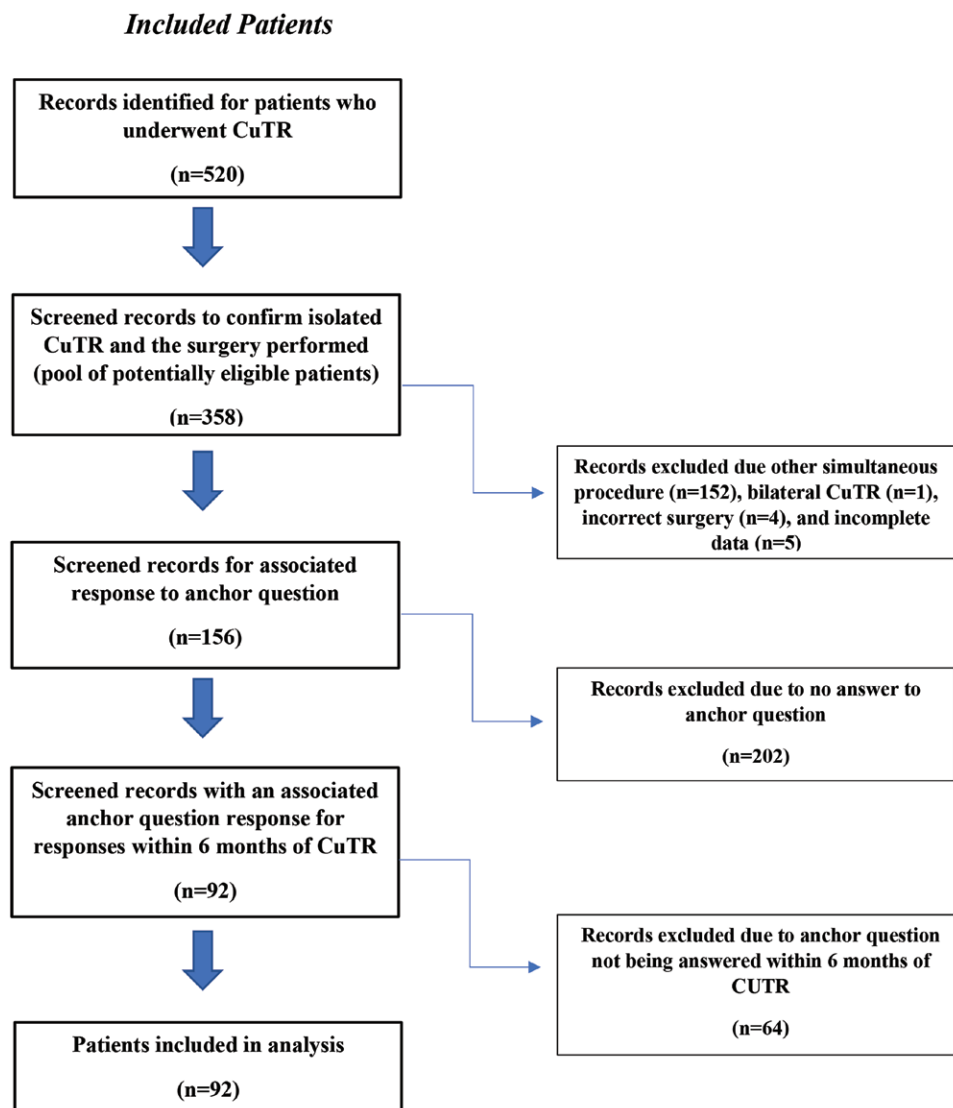


Fig. 1. Study inclusion flowchart.

Table 1. Baseline Patient Characteristics and Demographics

Descriptive Summary		
Variable		N*
Age at time of surgery	Mean (SD)	48.8 (±14.9)
	Median (IQR)	51.9 (35.4, 59.9)
BMI	Mean (SD)	28.6 (± 6.0)
	Median (IQR)	28.0 (24.7, 32.0)
Gender	Men	60 (65.2%)
	Women	32 (34.8%)
Race	White	85 (92.4%)
	Other	7 (7.6%)
Employment	Working	53 (58.9%)
	Retired	15 (16.7%)
	Disabled or unemployed	22 (24.4%)
Area deprivation index (national percentile)	Mean (SD)	35.9 (18.7)
	Median (IQR)	36.0 (21.8, 46.0)
Tobacco use	Current smoker	10 (10.9%)
	Former smoker	17 (18.5%)
	Never smoker	65 (70.6%)
Insurance type	Commercial	59 (64.1%)
	Medicare	18 (19.6%)
	Medicaid	8 (8.7%)
	Other	7 (7.6%)
Preoperative clinical features of severity	Constant numbness	80 (93.0%)
	Weakness	37 (53.0%)
	Atrophy	25 (32.1)
Preoperative testing	EMG	58 (63.0%)
Duration of symptoms (mo)	Mean (SD)	41.9 (110.0)
	Median (IQR)	12.0 (5.0, 35.0)
Patient factors	Diabetes mellitus	12 (13.0%)
	Hypothyroidism	10 (10.9%)
	Anticoagulation disorders	1 (1.1%)
	Chronic kidney disease	2 (2.1%)
	Chronic liver disease	5 (5.4%)

*N indicates a total of 92.

Summary of missing data: ADI N = 2, Constant numbness N = 6, Duration of symptoms N = 3, Marital status N = 3, Preoperative intrinsic atrophy N = 14, Work status N = 2.

commercial) were associated with expecting great relief/improvement ($P < 0.05$ for each; Table 4). Age, sex, BMI, surgical technique (in situ decompression, subcutaneous versus submuscular transposition), surgeon, preoperative presence of constant numbness, preoperative presence of

Table 2. Summary of Surgical Factors

Descriptive Summary		
Variable		N*
Surgical technique	In situ decompression	37 (40.2%)
	Subcutaneous transposition	40 (43.5%)
	Submuscular transposition	15 (16.3%)
	Revision CuTR†	9 (10%)
Anesthesia type	General	84 (92.3%)
	Other	7 (7.7%)
Surgeon	Surgeon A	7 (7.6%)
	Surgeon B	29 (31.5%)
	Surgeon C	15 (16.3%)
	Surgeon D	19 (20.7%)
	Surgeon E	22 (23.9%)
ASA class	ASA 1	23 (25.3%)
	ASA 2	46 (50.5%)
	ASA 3	20 (22.0%)
	ASA 4	2 (2.2%)

*N indicates a total of 92, with data missing for some specific demographic queries.

†Types of revisions: one in situ decompression, three subcutaneous transposition, and five submuscular transpositions.

ASA class, American Society of Anesthesiologists Classification; CuTR, cubital tunnel release.

Table 3. Summary of Patient Expectations

Descriptive Summary	
Preoperative Expectations	N* (%)
Level of relief/improvement	
Great	43 (46.7%)
Some	27 (29.4%)
Little	4 (4.4%)
None	5 (5.4%)
No expectations	13 (14.1%)

*N indicates a total of 92, with data missing for some specific demographic queries.

atrophy/weakness, duration of symptoms, and relevant patient disease factors (diabetes mellitus, hypothyroidism, chronic liver disease), and social deprivation (ADI) were not associated with expecting great relief/improvement ($P > 0.05$ for each).

In the multivariable analysis (Table 4), only patients insured by Medicaid or Medicare were significantly associated with higher expectations when compared with commercial insurance ($P < 0.05$ for each; Table 4). Specifically, those insured with Medicare were 19.1 times more likely to expect great relief/improvement before CuTR (OR: 19.1, 95% CI: 2.0–178.7; $P = 0.010$) and those insured with Medicaid were 11.6 times more likely to expect this as well (OR 11.6, 95% CI: 1.116–121.453; $P = 0.040$). In contrast, the multivariable analysis revealed that—relative to those who are working—patients who were retired (OR 0.1, 95% CI: 0.004, 0.869; $P = 0.039$) or unemployed/disabled (OR 0.1, 95% CI: 0.014, 0.426; $P = 0.003$) were significantly less likely to have great expectations.

DISCUSSION

CuTS remains a common upper extremity compressive neuropathy,¹ and CuTR is performed with increasing frequency.⁴ The relationship between preoperative patient expectations and outcome after surgery is nuanced, and there is a dearth of knowledge regarding patient expectations before CuTR. Our study revealed that most patients undergoing CuTR anticipated some to great relief from their surgery. Additionally, those with Medicaid and Medicare insurance had significantly higher expectations, whereas those with a retired or disabled/unemployed work status had lower expectations for improvement. These findings were independent of several factors that have been shown to yield worse outcomes or higher revision rates following CuTR. Specifically, patients undergoing revision CuTR, and those with diabetes or preoperative weakness, atrophy, or constant sensory symptoms had similar expectations for symptomatic improvement as those lacking these negative prognostic factors.

Although patient expectations before CuTR have not been widely studied previously, a variety of literature has assessed this topic in other surgical fields, observing that patient expectations can influence patient outcomes.^{40–43} Additionally, patients and their surgeons have been found to harbor discordant expectations before surgery,^{44–46} which highlights the importance of understanding patient expectations and discussing prognosis with patients. Given the potential for expectations to

Table 4. Univariable and Multivariable Analysis Results

Variable*	Univariable Model		Multivariable Model	
	Odds Ratio (95% CI)	P	Odds Ratio (95% CI)	P
Age*†	1.037 (0.903, 1.191)	0.604	—	—
Gender (men versus women)	0.561 (0.233, 1.348)	0.197	—	—
Race (White versus other)	0.843 (0.178, 4.00)	0.831	—	—
BMI‡	0.994 (0.704, 1.404)	0.976	—	—
Employment (reference—working)				
Retired	0.017 (0.000, 0.757)	0.035	0.065 (0.004, 0.869)	0.039
Unemployed or disabled	0.039 (0.004, 0.394)	0.006	0.079 (0.014, 0.426)	0.003
Substance use				
Active smoking	0.902 (0.226, 3.600)	0.885	—	—
Alcohol use	1.553 (0.662, 3.644)	0.311	—	—
Surgical details (reference—in situ decompression)				
Subcutaneous transposition	0.767 (0.308, 1.909)	0.570	0.405 (0.108, 1.521)	0.181
Submuscular transposition	2.133 (0.616, 7.384)	0.232	3.102 (0.462, 20.793)	0.244
Revision CuTR	9.450 (1.144, 78.001)	0.037	5.496 (0.276, 170.921)	0.331
Area deprivation index (national percentile)§	0.919 (0.735, 1.150)	0.464	—	—
Patient features¶				
Diabetes mellitus	1.266 (0.370, 4.327)	0.706	—	—
Hypothyroidism	0.863 (0.232, 3.211)	0.827	—	—
Chronic liver disease	0.567 (0.090, 3.565)	0.546	—	—
Clinical features				
Constant numbness	6.428 (0.718, 57.553)	0.096	—	—
Preoperative intrinsic atrophy	1.225 (0.471, 3.187)	0.677	—	—
Preoperative intrinsic weakness	1.380 (0.536, 3.559)	0.505	—	—
Duration of symptoms	1.001 (0.997, 1.006)	0.483	—	—
Preoperative testing				
EMG obtained	1.230 (0.526, 2.874)	0.631	—	—
Insurance (reference—commercial insurance)				
Medicare	101.788 (3.570, 2901.592)	0.007	19.085 (2.039, 178.637)	0.010
Medicaid	64.644 (2.121, 1969.669)	0.017	11.642 (1.116, 121.453)	0.040
Other ^b	18.129 (1.075, 305.487)	0.044	7.416 (0.737, 74.572)	0.089
Surgeon (reference—Surgeon A)				
B	0.0408 (0.001, 1.154)	0.061	0.203 (0.019, 2.09)	0.180
C	0.085 (0.006, 1.146)	0.063	0.240 (0.0378, 1.523)	0.130
D	0.726 (0.065, 8.022)	0.794	0.988 (0.185, 5.265)	0.989
E	3.486 (0.451, 26.948)	0.231	2.814 (0.585, 13.538)	0.197

Boldface values indicate <0.05 significance value.

*This multivariable model includes all variables under study. The following variables were included in the model but were eliminated through a backward elimination (alpha cutoff 0.10) and were deemed to be nonsignificant ($P > 0.10$ for each): Duration of symptoms, age, ADI (national percentile), BMI, revision versus primary surgery, surgeon, preoperative EMG, surgical technique, hypothyroidism, alcohol status, smoking status, race, gender, and marital status. Therefore, these variables do not appear in the final multivariable model.

†Per every 5-year increase in age.

‡Per every five-point increase in BMI.

§Per every decile (10 points).

¶Patient factors that were collected during chart review but occurred in numbers too small to be included in the univariable regression: chronic kidney disease, anticoagulation disorders, and ipsilateral elbow trauma.

||For every additional 1 month of symptoms.

**Other insurance includes other government payers, self-pay, and worker's compensation.

“—” indicates not included in multivariable analysis.

impact outcomes or satisfaction with the outcome, it also becomes important to understand how patient cohorts approach their surgeries. A notable 76% of patients undergoing CuTR anticipated improvement in their symptoms after CuTR, underscoring that most patients who agree to surgery are very hopeful that their complaints will be addressed with the surgery.

As has recently been shown in the setting of carpal tunnel syndrome, specific patient factors do influence expectations. Rogers et al found that male gender, lower BMI, and lower social deprivation correlated with significantly increased expectations before carpal tunnel release.³⁴ While our univariable analysis did identify employment, revision CuTR, lower levels of social deprivation, and type of insurance (Medicare, Medicaid) as associated with expecting great relief/improvement, the multivariable analysis highlighted a significant increase in expectations before CuTR, specifically in patients with Medicare and Medicaid. This is

concerning given that surgical outcomes have been found to be significantly worse in the Medicaid and Medicare populations. Ahmad et al found that patients undergoing surgery for gynecologic malignancies between 2015 and 2019 had significantly worse postoperative outcomes if they had public insurance.⁴⁷ A cohort of 893,658 surgical patients were assessed for the relationship between payer status and outcome after surgery. Those with Medicaid have been found to have increased risk-adjusted mortality after major surgical operations and those with Medicaid have a greater length of stay and total costs after surgery.⁴⁸ Younus et al identified higher rates of complications after endoscopic transsphenoid pituitary surgery in patients with Medicaid insurance.⁴⁹ Additionally, Singh et al demonstrated that patients undergoing primary total hip arthroplasty with Medicaid or Medicare insurance payer status had a significantly longer length of hospital stay, in-hospital postoperative complications, transfusions, revisions, and mortality.⁵⁰

Orthopedic arthroplasty literature has shown that patients with Medicaid have lower pre- and postoperative functional scores⁵¹ and continue to have lower outcomes up to a year after surgery.⁵² Although the reason for this relationship between expectation and Medicaid/Medicare payer status is unknown, it offers an opportunity for the surgeon to counsel these patients. Perhaps most importantly, these documented patterns encourage our field to implement ways in which to improve access in this population to mitigate these challenges and improve outcomes.

Importantly, expectations were independent of several relevant patient factors. Age, gender, BMI, and the presence of various medical conditions did not influence expectations in the current study. Patients with advanced age have been shown to experience poorer results after CuTR in several studies,^{10-13,19,53} whereas others have found no difference in age.^{9,19, 54-57} Older patients have expectations independent of their age, and given varying evidence that age impacts outcomes,⁹ should be appropriately counseled. Obesity has also been found to be a risk factor for needing revision CuTR,⁷ which provides an opportunity to counsel patients with a high BMI that may have outcomes after CuTR that are discordant from their preoperative expectations. Preoperative presence of constant numbness, preoperative presence of atrophy/weakness, increased duration of symptoms, and relevant patient disease factors (diabetes mellitus, hypothyroidism, BMI, and chronic liver disease) were not associated with expecting great relief/improvement. Prior evidence shows that patient comorbidities can also influence outcomes, with diabetes, hypercoagulable disorders, chronic liver and kidney disease, and thyroid disease being correlated with either need for revision or poor surgical outcomes.^{7,58,59} Patients with severe CuTR presenting with atrophy and/or weakness before surgery have been shown by some authors not to recover as quickly or completely as those without severe symptoms.^{19,60} The type of surgery performed also had no influence on patient expectations, though fortunately, research has shown similar outcomes and risk for revision between in situ decompression, submuscular transposition, and subcutaneous transposition.⁶¹⁻⁶³ Finally, patients undergoing revision CuTR had expectations independent of the fact that they were undergoing a revision procedure, which is notably known to have less predictable⁶⁴ and worse outcomes.⁶⁵ Ultimately, there are specific patient factors that influence patient outcomes but seemingly not expectations, highlighting a critical opportunity for the surgeon to educate the patient about their unique risk factors and how it influences their outcomes. In the setting of our research, particularly those who are publicly insured and presenting with atrophy and/or weakness before CuTR, are undergoing revision CuTR, or have relevant medical comorbidities, advanced age, or high BMI.

Of note, our results should be interpreted in light of the characteristics of our patient population. Specifically, 93% of our patients experienced constant numbness before CuTR and over half complained of weakness. This indicates that the included patients had more severe symptoms on average. When taken into context, it means

that patient expectations were high among those with fairly advanced symptoms. It is possible that expectations may differ for those with milder preoperative symptoms, although milder symptoms have been associated with failure of in situ CuTR.⁶⁶

There are several study limitations that warrant mention. There is the possibility of selection bias given that we did not have 100% enrollment. The generalizability of our study may be limited due to the homogeneity of our study population (mostly White). Additionally, our study may be subject to recall bias, as patient histories were used to gather symptom duration and other relevant details. There was no gold standard anchor question regarding how we queried for expectations preoperatively; so the use of different anchor questions or alternate wording and/or answer choices could theoretically affect the results. Additionally, preoperative visits were conducted by four different surgeons, and it is possible that the counseling offered at that time differed to some degree. Of note, our included patients generally demonstrated low levels of social deprivation, which may weaken any conclusions drawn about social deprivation as we do not have a representative sample with equal distribution among all four quartiles. Though this may be typical of patients undergoing elective surgery, this is a speculation.

In summary, the majority of patients expected great to some relief after CuTR. Preoperative expectations are significantly higher in patients with Medicaid and Medicare insurance, representing an opportunity for education given the association between public insurance payer status and worse health outcomes in general for this population. Age, BMI, preoperative atrophy and/or numbness, and the presence of specific medical comorbidities do not influence expectations but have been shown to yield worse outcomes or influence the need for revision CuTR, representing an opportunity for intervention. Preoperative counseling of this sort may better align patient expectations with surgeon expectations (which are based on prognostic factors in the literature), thereby potentially reducing patient dissatisfaction with the outcome.

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