Understanding Preoperative Demographics and Risk Factors for Early Revision Surgery in Patients Undergoing Hip Arthroscopic Surgery

A Large Database Study

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Background: Hip arthroscopic surgery has become an increasingly common surgical technique to diagnose and treat various hip abnormalities. While increased efficacy has been reported, debate remains regarding appropriate surgical indications. Multiple factors including patient demographics, surgical procedure, and underlying disease have been associated with poor surgical outcomes. Preoperative diagnostic and treatment interventions including physical therapy and injections may affect surgical indications and outcomes.

Purpose: To identify patient characteristics and preoperative factors associated with an increased risk of early revision surgery and/or extended postoperative medical care after index hip arthroscopic surgery.

Study Design: Case-control study; Level of evidence, 3.

Methods: Utah's All Payer Claims Database, a state-mandated registry containing data from all payers, including private insurance, Medicare Advantage, and Medicaid, was queried to identify patients who underwent hip arthroscopic surgery during a 3-year period (January 1, 2013, to December 31, 2015). Demographics, comorbidities, nonoperative care modalities, pain medications, and revision procedures were collected using claims data at 6 months preoperatively and 12 months postoperatively.

Results: A total of 1283 patients who underwent primary hip arthroscopic surgery were analyzed, of whom 57.6% (n = 739) were female. Within 1 year of index surgery, 7.8% and 2.1% of patients underwent revision hip arthroscopic surgery and conversion to total hip arthroplasty (THA), respectively. Patients older than 60 years and male patients were more likely to undergo revision arthroscopic surgery (odds ratio [OR], 0.89; $P < .001$ and OR, 1.59; $P = .04$, respectively) and convert to THA (OR, 1.03; $P = .01$ and OR, 2.25; $P = .05$, respectively). Preoperative opioid use was significantly associated with increased odds of revision surgery (OR, 1.64; $P = .05$) and THA (OR, 2.70; $P = .03$). No significant relationship existed between preoperative physical therapy or intra-articular hip injections and revision hip arthroscopic surgery (OR, 1.20; $P = .45$ and OR, 1.18; $P = .52$, respectively) or conversion to THA (OR, 0.89; $P = .79$ and OR, 0.71; $P = .46$, respectively).

Conclusion: This study showed that predictable patient factors can effectively guide preoperative decision making and may improve prognosis. Certain patient pools require optimization preoperatively, and a subset of patients appears to require additional surgical indications.

Keywords: hip arthroscopic surgery; revision surgery; large database study; patient prognostic factors

Hip arthroscopic surgery allows the treatment of many hip abnormalities, including femoroacetabular impingement (FAI), chondral defects, labral tears, and loose bodies, among others.[1,17,20,26,34] Despite the steep learning curve, its minimally invasive nature, low complication rate, and quick recovery have led to a rapid increase in utilization over the past 10 years.[4,8,23,25,29,36] While good efficacy and increased patient satisfaction occur in many populations,[8] the debate continues regarding surgical indications.[8,26] Poor outcomes include revision hip arthroscopic surgery, limited function, continued pain, and conversion to total hip arthroplasty (THA).[35,37] Negative predictors include

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specific demographics and procedures performed, workers' compensation status, persistent structural abnormalities, labral deficiency, chondral damage, capsular instability, and preoperative osteoarthritis.[4,7,30,32,35]

Preoperative physical therapy (PT) and diagnostic intra-articular (IA) injections have been identified as potential prognostic indicators. Insurers frequently require preoperative PT for approval, suggesting a perceived importance for surgical indications, despite a paucity of supporting data. In a small, randomized controlled pilot study, patients diagnosed with FAI were randomized to 7 weeks of supervised exercise with manual therapy versus activity modification counseling and a home exercise program.[45] Both cohorts reported significant improvements in pain and range of motion, suggesting that some hip abnormalities may be amenable to conservative management.[45] However, this study concluded that while PT may improve short-term pain and function, it does not address the underlying osseous morphology. This was supported by larger randomized clinical trial data suggesting that while PT can improve symptoms, hip arthroscopic surgery had more significant, clinically important improvements.[15]

Imaging-guided IA injections may also assist surgical decision making, including the evaluation of IA versus extra-articular hip pain sources. In fact, some insurance guidelines also require these injections for approval, with guidelines based on data demonstrating that a negative response to an IA injection may be associated with a poor surgical outcome.[3] Thus, over 80% of patients undergoing hip arthroscopic surgery report receiving IA injections before surgery.[21] However, studies have contradicted these findings,[22] and minimal data exist correlating preoperative IA injections to increased postoperative revision or care.

The goals of this study were to identify demographic variables, comorbidities, and preoperative evaluation modalities (PT, IA injection) that may be associated with early revision hip arthroscopic surgery, conversion to THA, other surgical procedures, extended medical care, and prolonged pain medication usage after index hip arthroscopic surgery.

METHODS

With institutional review board (#98713) approval, Utah's All Payer Claims Database (APCD) was queried to include a 3-year period between January 1, 2013, and December 31, 2015. Patients were identified using Current Procedural Terminology (CPT) codes and included if they were $\geq$14 years old, continuously insured, and had claims information at 6 months preoperatively and 12 months postoperatively. Utah's APCD is a state-mandated registry that contains claims data from all private and public payers (Medicare Advantage and Medicaid), representing 2.4 million persons and 80% of Utah's population beginning in the year 2013.[41,43] The APCD provided 3-year longitudinal data, affording the ability to correlate large-volume preoperative factors with postoperative management in a fashion not available with other hip arthroscopic surgery studies using a large database.[19]

With the date of surgery as the index date, common diagnostic indicators and conservative interventions were collected at 6 months preoperatively and 12 months postoperatively using CPT codes (Appendix Table A1). Revision hip arthroscopic surgery, conversion to THA, lumbosacral surgery, and abdominal surgery were included to capture procedures that could indicate a failure of the index surgery to satisfactorily relieve symptoms. The concern was that patients who underwent abdominal or lumbosacral surgery shortly after the index arthroscopic surgery were not properly diagnosed before the initial arthroscopic procedure was performed. Preoperative and postoperative PT, IA hip injections, epidural/facet lumbosacral injections, and pain medications (opioids, nonsteroidal anti-inflammatory drugs [NSAIDs], and skeletal muscle relaxants) were also identified and analyzed using CPT codes, National Drug Code data, and medication names.

Baseline demographic data, insurance type, urban or rural regional designation indicating where the patient lived at the time of surgery, and comorbidities were identified. Age was measured in years at index surgery, and age squared was included in the regression models because of a significant nonlinear trend in this variable's effect on postoperative interventions. Sex was dichotomized as male or female. Comorbidities were binary and identified based on International Classification of Diseases, Ninth Revision (ICD-9), codes (Appendix Table A1). Insurance type was categorized as commercial/private or government funded (Medicaid or Medicare). Patients with dual Medicaid/Medicare enrollment ($n = 11$) were excluded from the analysis.

Descriptive statistics, including means, standard deviations, frequencies, and percentages, were used to describe the sample. To identify factors that were associated with the outcomes, multivariate logistic regression was used, and odds ratios (ORs) and P values were reported in the regression table. The significance level was set at .05 for all analyses using Stata statistical software (v 14; StataCorp).

RESULTS

The analyzed sample included 3443 patients who underwent hip arthroscopic surgery between January 1, 2013, and December 31, 2015. Patients were excluded from the final analysis for the following reasons: lacked 1-year

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Ethical approval for this study was waived by the University of Utah Institutional Review Board.

TABLE 1
Patient Demographics (N = 1283)

	Patient Cohort, n (%)	Utah, %[a]
Sex		
Male	544 (42.4)	50.3
Female	739 (57.6)	49.7
Age at surgery, mean ± SD (range) or median, y	43.3 ± 17.4 (14-87)	30.5
Region		
Rural	147 (11.5)	9.4
Urban	1136 (88.5)	90.5
Type of insurance		
Medicaid/Medicare	140 (10.9)	21.0
Private	1143 (89.1)	67.8

[a]Representative percentages or median (for age) in the state of Utah.[38,39,42]

TABLE 2
Comorbidities

	Patient Cohort, %	Utah, %[a]
Depression	23.3	21.1
Smoking	11.9	9.6
Obesity	11.6	25.6
Diabetes	10.0	7.7

[a]Representative percentages in the state of Utah.[40]

follow-up data after index surgery (n = 1030), were not continuously enrolled in insurance during the study period (n = 1028), were missing demographic data (n = 68), or were younger than 14 years at the time of index surgery (n = 34).

A total of 1283 patients who underwent primary hip arthroscopic surgery, 57.6% (n = 739) female and 42.4% (n = 544) male, were included in the final analysis (Table 1). Patients were more likely to have private insurance than Medicare or Medicaid (89.1% vs 10.9%, respectively) and live in urban rather than rural regions (88.5% vs 11.5%, respectively). Common comorbidities, identified by ICD-9 codes, included depression (23.3%), smoking (11.9%), obesity (11.6%), and diabetes (10.0%) (Table 2).

Of the patients included, 7.8% underwent revision arthroscopic surgery, and 2.1% converted to THA within 1 year of hip arthroscopic surgery. Additionally, 2.4% and 1.2% of patients underwent lumbosacral surgery and abdominal surgery, respectively, within 1 year of hip arthroscopic surgery (Table 3).

Injections were prevalent in the preoperative and postoperative settings (46.7% and 34.3%, respectively). IA hip injections were most common, with 45.1% and 29.5% of patients receiving at least 1 injection preoperatively and postoperatively, respectively. Lumbosacral epidural or facet joint injections increased from 1.6% preoperatively to 4.8% postoperatively (Table 4).

Preoperative PT occurred in 32.0% of patients. Extended postoperative PT occurred in 29.6% and 12.8% of patients

TABLE 3
Additional Surgical Interventions

	n (%)
Revision hip arthroscopic surgery	100 (7.8)
Total hip arthroplasty	27 (2.1)
Lumbosacral surgery	30 (2.4)
Abdominal surgery	15 (1.2)

at 4 to 6 months and 10 to 12 months, respectively. Pain medications were routinely prescribed preoperatively, with 34.4% of patients receiving opioids, 26.3% receiving NSAIDs, 10.4% receiving steroids, and 9.6% receiving skeletal muscle relaxants. Continued postoperative use of prescription opioids and NSAIDs, in particular, remained common, with 18.7% of patients still receiving opioids and 14.3% receiving NSAIDs at 4 to 6 months and 16.5% and 12.0% of patients receiving opioids and NSAIDs at 10 to 12 months, respectively (Table 4).

Both demographics and comorbidities demonstrated significant associations with postoperative interventions. As previously mentioned, the effect of age on postoperative interventions was nonlinear. Age (OR, 0.89; $P < .001$) and age squared (OR, 1.01 [95% CI, 1.000128-1.00167]; $P = .02$) indicated that as patients aged, they were significantly less likely to undergo revision arthroscopic surgery, but a threshold effect occurred at age 60 years, after which patients were significantly more likely to undergo revision arthroscopic surgery. Older age was associated with increased odds of conversion to THA (OR, 1.03 [95% CI, 1.0076-1.0613]; $P = .01$), lumbosacral surgery (OR, 1.03 [95% CI, 1.0043-1.0615]; $P = .02$), and abdominal surgery (OR, 1.38; $P = .01$). Male patients were more likely than female patients to undergo both revision arthroscopic surgery (OR, 1.59; $P = .04$) and conversion to THA (OR, 2.25; $P = .05$). Obese patients were significantly more likely to convert to THA (OR, 3.40; $P = .02$), and diabetic patients were significantly more likely to undergo lumbosacral surgery (OR, 3.60; $P = .01$).

Preoperative opioid use was the only medication found to be associated with increased odds of revision arthroscopic surgery (OR, 1.64; $P = .05$), THA (OR, 2.70; $P = .03$), and lumbosacral surgery (OR, 2.44; $P = .04$). The utilization of preoperative conservative treatments such as PT and injections was not significant (Table 5).

DISCUSSION

Hip arthroscopic surgical indications are multifactorial and rely on a comprehensive patient evaluation. This study demonstrated that (1) there were preoperative patient variables, including age and sex, that affected prognosis; (2) preoperative interventions, including PT and IA injections, did not influence revision or conversion rates; (3) patients with obesity, diabetes, and opioid use were associated with higher revision and conversion rates; and (4) a subset of patients potentially required additional surgical interventions based on underlying comorbidities.

TABLE 4
Preoperative and Postoperative Conservative Interventions[a]

	≤6 mo Preoperatively	2-3 mo Postoperatively	4-6 mo Postoperatively	7-9 mo Postoperatively	10-12 mo Postoperatively	Overall Postoperative Period
Injections (overall)	599 (46.7)	117 (9.1)	155 (12.1)	145 (11.3)	118 (9.2)	440 (34.3)
Intra-articular hip injection	578 (45.1)	101 (7.9)	133 (10.4)	129 (10.1)	97 (7.6)	379 (29.5)
Epidural/facet lumbosacral injection	21 (1.6)	16 (1.3)	22 (1.7)	16 (1.3)	21 (1.6)	61 (4.8)
Physical therapy						
Yes	411 (32.0)	709 (55.3)	380 (29.6)	223 (17.4)	164 (12.8)	994 (77.5)
No	872 (68.0)	574 (44.7)	903 (70.4)	1060 (82.6)	1119 (87.2)	289 (22.5)
Prescriptions						
Opioid	441 (34.4)	297 (23.2)	240 (18.7)	233 (18.2)	211 (16.5)	1007 (78.5)
NSAID	337 (26.3)	196 (15.3)	183 (14.3)	163 (12.7)	154 (12.0)	647 (50.4)
Steroid	134 (10.4)	72 (5.6)	70 (5.5)	67 (5.2)	162 (4.8)	239 (18.6)
Skeletal muscle relaxant	123 (9.6)	65 (5.1)	80 (6.2)	67 (5.2)	84 (6.6)	184 (14.3)

[a]Data are reported as n (%). NSAID, nonsteroidal anti-inflammatory drug.

TABLE 5
Results of Multivariate Logistic Regression[a]

	Revision Hip Arthroscopic Surgery		Total Hip Arthroplasty		Lumbosacral Surgery		Abdominal Surgery	
	OR	*P* Value	OR	*P* Value	OR	*P* Value	OR	*P* Value
Age	0.89	<.001[b]	1.03	.01[b]	1.03	.02[b]	1.38	.01[b]
Age squared	1.01	.02[b]	N/A		N/A		0.99	.01[b]
Sex								
Male	1.59	.04[b]	2.25	.05[b]	1.25	.57	0.58	.34
Female	Reference							
Type of insurance								
Private	1.75	.24	1.38	.65	1.17	.76	0.09	<.001[b]
Medicaid/Medicare	Reference							
Region								
Urban	1.23	.59	N/A	N/A	1.33	.66	0.51	.33
Rural	Reference							
Comorbidities								
Depression	1.35	.27	1.23	.65	1.46	.37	0.09	.03[b]
Diabetes	0.90	.84	0.25	.12	3.60	.01[b]	0.58	.64
Obesity	0.71	.44	3.40	.02[b]	0.80	.67	1.69	.54
Smoking	0.99	.99	0.96	.95	1.52	.37	0.46	.38
Preoperative injections								
Yes	1.18	.52	0.71	.46	2.05	.10	0.63	.42
No	Reference							
Preoperative physical therapy								
Yes	1.20	.45	0.89	.79	0.98	.97	1.11	.86
No	Reference							
Preoperative prescriptions								
Opioid	1.64	.05[b]	2.70	.03[b]	2.44	.04[b]	2.53	.10
NSAID	0.69	.19	0.52	.21	1.31	.51	0.68	.54
Steroid	1.57	.17	1.23	.74	1.75	.25	1.04	.96
Skeletal muscle relaxant	0.99	.97	0.72	.60	1.41	.49	0.90	.89

[a]The age-squared variable was not statistically significant in total hip arthroplasty and lumbosacral surgery. Thus, we excluded the age-squared variable in these 2 regressions. N/A, not applicable; NSAID, nonsteroidal anti-inflammatory drug; OR, odds ratio.
[b]Significant at $\alpha = .05$.

A prior large, population-based study documented an increased risk of conversion to THA within 2 years of arthroscopic surgery among patients with osteoarthritis, obesity, or treatment in a low-volume hip arthroscopic surgery institution.[35] Age and sex have also been implicated, with increased conversion to THA after hip

arthroscopic surgery occurring in older patients and female patients.[25,36] However, other data have suggested that female and male patients younger than 45 years have equivalent outcomes.[14] Age and articular cartilage health appear to have a critical role; among 8.7% of patients who converted to THA within 24 months, 17.1% were between 50 and 59 years old, and 16.5% were older than 60 years.[36] Over 99% of these patients had preoperative osteoarthritis, regardless of age.[36] Conversely, improved outcomes after hip arthroscopic surgery in older populations, despite an elevated conversion rate,[10] have highlighted this controversy.

In our cohort, age and sex significantly correlated with postoperative revision hip arthroscopic surgery and conversion to THA. The age of 60 years was the threshold above which the risk for revision hip arthroscopic surgery significantly increased, in contrast to published data that suggested a 40-year age threshold.[19,34] We believe that this increased age threshold reflects an improved understanding of the importance of articular cartilage health in hip arthroscopic surgery decision making. On the other hand, conversion to THA displayed an age-based linear trend, with patients being more at risk for eventual conversion as they increased in age. This likely indicates the progressive nature of osteoarthritis that may ultimately influence the failure of the index arthroscopic procedure.[9,18,19,35,36] These data suggest a correlation of articular cartilage health to the revision rate. Prior studies[2,5,6,31] have suggested this preliminary relationship, but further research is necessary. Future prognostic studies should consider including magnetic resonance imaging or other specific measures of articular cartilage health.

Interestingly, male sex demonstrated higher rates of arthroscopic revision and conversion to THA (OR, 1.59 and 2.25, respectively). This contrasts with previous data[33,36] documenting worse outcomes in female patients but no sex difference in patients younger than 45 years.[45] It is possible that male and female patients differ in their desire to undergo surgery, perceived acceptable level of functional impairment, and risk aversion. Women undergoing orthopaedic procedures have documented worse preoperative functional status compared with men, suggesting an advanced disease at the time of the index procedure.[16] Male patients after total knee arthroplasty reported decreased 36-Item Short Form Health Survey physical scores, while female patients had lower general health scores, thus suggesting that physical and mental health might be more interrelated for female patients.[44] Male patients also had greater postoperative improvement in social function, physical role function, pain scores, energy, and mental health.[12,27] Thus, it may be possible that male patients inherently seek and benefit from earlier surgical interventions and that female patients delay before pursuing surgery and may benefit less.

Diabetic patients undergoing hip arthroscopic surgery had a greater risk of subsequent lumbosacral surgery, and obese patients were more likely to have conversion to THA. Patients in these categories could benefit from counseling to optimize glucose control and weight loss before surgery, which may affect this revision rate. A 1.2% subset of patients underwent additional abdominal surgery, suggesting that multiple causes of hip pain exist and are not always identified before hip arthroscopic surgery. Finally, preoperative opioid use was significantly associated with revision arthroscopic surgery, conversion to THA, and lumbosacral surgery. Implementing alternative pain management strategies before and after hip arthroscopic surgery may reduce these postoperative revision rates.

Our data revealed no relationship between preoperative PT or IA injections and revision surgery or extended postoperative medical care. These data may suggest that some patients who undergo hip arthroscopic surgery may have an anatomic issue that is not correctable via preoperative PT. While it is likely that patients who responded to PT and did not undergo surgery were not included in our analysis, we believe that this should make the 32.0% of the patients who had preoperative PT a more selective population that theoretically may have a more optimal postoperative course. However, this was not found. Rather, the lack of significant differences in the aforementioned variables between patients who did or did not undergo preoperative PT should represent a worst-case scenario in which patients who had no preoperative PT were compared with those who did. The lack of difference suggests that patients with underlying mechanical pathomorphology may not respond to preoperative PT and that surgical indications should be based on other factors such as history, physical examination results, and radiographic findings, among others.

A study by Mansell et al[24] in 2018 found no significant difference between patients with FAI allocated to surgery versus rehabilitation, suggesting a primary role for PT in FAI. However, their study had an unusually high rate of crossover, an underpowered "as-treated" analysis, and very small improvements in patient-reported outcomes after surgery inconsistent with previous literature,[13] making the results difficult to interpret. Our data suggest that while PT plays a role in preoperative management, it does not ultimately significantly influence outcomes in terms of the need for revision surgery or other intervention. Given this, it does not seem that PT has a primary role in managing this particular abnormality, and it is worth considering if PT should be focused during postoperative care. This could potentially reduce costs overall, avoid limiting PT visits prematurely secondary to insurance restrictions, and solve the issue of PT failure influencing surgical indications. We suggest that PT may be best allocated to postoperative recovery and advocate for re-evaluation of insurance coverage criteria that mandate preoperative PT.

Interestingly, preoperative IA injections did not significantly correlate with increased revision surgery or extended postoperative interventions. While it is possible that patients who received a negative response to IA injections did not undergo surgery and thus were not included, this would increase the difference between the IA and non-IA injection cohorts, but no significant correlation existed. Our data support previous data that documented a limited prognostic benefit to the ubiquitous use of IA injections.[22] Nevertheless, the selective use of preoperative diagnostic IA injections may remain important for patients with increased complexity and multiple pain generators, in

which a negative response to injections helps steer them from surgical interventions.

The type of insurance was not significantly related to the need for revision hip arthroscopic surgery, THA, or lumbosacral surgery. Those with private insurance had an OR of 1.75 to undergo revision hip arthroscopic surgery ($P = .24$), an OR of 1.38 to undergo THA ($P = .65$), and an OR of 1.17 to undergo lumbosacral surgery ($P = .76$). The trend appeared to be that those with private insurance were more likely to eventually need an additional procedure, although this was not significant. There were significantly decreased odds of undergoing abdominal surgery with private insurance (OR, 0.09; $P < .001$). The reason for this relationship was not abundantly clear, although it is reasonable to surmise that those with public insurance have a wider range of health disparities and medical concerns and ultimately experience different postoperative hospital courses, including an increased length of stay.[11] The relationship between public insurance and overall outcome is a complex topic and one that we did not seek to address in this study. Further investigation is clearly warranted regarding whether type of insurance serves as an overall indicator of patient health status as well as the role that type of insurance plays in determining clinical outcomes.

Limitations

Our data are affected by the inherent limitations that exist with a large database analysis.[28] The APCD relies on the accuracy of CPT and ICD-9 coding by surgeons and billers in Utah, and coding errors may affect the accuracy of these data. Patients captured included those who were continuously insured and had claims information at 6 months before and 12 months after surgery. Following data beyond the 1-year mark postoperatively could provide even more insight into revision surgery and treatment utilization. However, our ability to capture data at 6 months preoperatively and 12 months postoperatively should include the majority of early failures and complications.

Furthermore, we restricted our data search to patients aged $\geq$14 years, and thus, these data may not be applicable to very young populations. However, hip arthroscopic surgery is rarely indicated in skeletally immature populations, and thus, we believe that our data remain generalizable. Uninsured patients and patients with fee-for-service Medicare may represent a unique subset with different outcomes that we were unable to capture within the scope of our research. However, our ability to include commercial insurance payers, Medicaid, and Medicare Advantage should provide reasonable generalizability of these results to the majority of patients. It is possible that patients may have moved to Utah State immediately before or shortly after their index surgery, which may affect data accuracy. However, the APCD is not restricted by state but rather by insurance carrier. Given this, procedures that were performed in a different state but collected by the same insurance provider would be included, thereby limiting the frequency of these events.

In addition, we were unable to evaluate individual cases, including the specific details of imaging and arthroscopic surgery. Thus, subtleties such as dysplasia and early osteoarthritis seen at the time of arthroscopic surgery could not be collected. Subtleties among variables such as degree of obesity and severity of diabetes could also not be determined because of the binary nature of ICD-9 coding. Additionally, our 1-year follow-up inevitably did not include failures and revisions that occur later than this time period. Our database does not evaluate the surgical volume of providers, as this was not available. Finally, we did not have data on whether the "index" procedure may have been a revision of a surgical procedure performed before the data set query. Despite the aforementioned limitations, the large sample size and 3-year data capture provide the unique ability to risk-stratify many patient variables. Finally, it is not possible to identify laterality of the surgical procedure (both index and revision) utilizing CPT and ICD-9/10 codes. This is a limitation in that we did not know with certainty that the revision procedure was performed on the ipsilateral limb. Our assumption, given the practices of our institution, is that a revision procedure on the ipsilateral side is more likely than an additional index procedure on the contralateral side.

CONCLUSION

A relationship analysis among patient demographic and postoperative variables allows the development of a preoperative surgical algorithm to optimize outcomes and guide patient expectations. Patient selection for hip arthroscopic surgery should consider other causes of hip pain, including intra-abdominal abnormalities and lumbosacral spine disease. Patients aged 40 to 60 years and especially those over 60 years may benefit from advanced preoperative imaging to evaluate articular cartilage health. Our findings encourage a comprehensive preoperative assessment including HbA1c and body mass index, and particular focus should be placed on opioid usage identification and nonopioid pain strategies. The identification of factors that may increase future revision will hopefully improve patient outcomes and reduce revisions and extended postoperative medical care.

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APPENDIX

TABLE A1
ICD-9 and CPT Codes and Descriptions[a]

Code	Description
ICD-9	
296.0-296.99	Episodic mood disorders
309.0-309.9	Adjustment reaction disorders
311.0	Depressive disorder, not elsewhere classified
250.0-250.93	Diabetes mellitus
278.0-278.8	Overweight, obesity, and other hyperalimentation
305.1	Tobacco use disorder
V15.82	Personal history of tobacco use
CPT	
Surgical: hip	
27130	Arthroplasty, acetabular and proximal femoral prosthetic replacement (total hip arthroplasty), with or without autograft or allograft
29861	Hip arthroscopic surgery with removal of loose or foreign body
29862	Hip arthroscopic surgery with chondroplasty
29914	Hip arthroscopic surgery with femoroplasty
29915	Hip arthroscopic surgery with acetabuloplasty
29916	Hip arthroscopic surgery with labral repair
29999	Unlisted arthroscopic surgery
Surgical: general surgery	
27299	Other procedures on pelvis or hip joint
49505	Repair of initial inguinal hernia, age $\geq$5 years; reducible
49568	Implantation of mesh or other prosthesis for open incisional or ventral hernia repair or mesh for closure of debridement for necrotizing soft tissue infection
49659	Unlisted laparoscopy procedure, hernioplasty, herniorrhaphy, herniotomy
49999	Unlisted procedure, abdomen, peritoneum, and omentum
Surgical: gynecological/ urological/colorectal	
45560	Repair procedures on colon and rectum
52000	Endoscopy-cystoscopy, urethroscopy, cystourethroscopy procedures on bladder
52005	Cystourethroscopy, with ureteral catheterization, with or without irrigation, instillation, or ureteropyelography, exclusive of radiological service
52204	Cystourethroscopy, with biopsy(s)
52276	Cystourethroscopy, with direct vision internal urethrotomy
52281	Cystourethroscopy, with calibration and/or dilation of urethral stricture or stenosis, with or without meatotomy, with or without injection procedure for cystography, male or female
52310	Cystourethroscopy, with removal of foreign body, calculus, or ureteral stent from urethra or bladder (separate procedure); simple
52317	Litholapaxy: crushing or fragmentation of calculus by any means in bladder and removal of fragments; simple or small (<2.5 cm)
52318	Litholapaxy: crushing or fragmentation of calculus by any means in bladder and removal of fragments; complicated or large (>2.5 cm)
52335	Cystourethroscopy with ureteroscopy and/or pyeloscopy
52336	Cystourethroscopy with ureteroscopy and/or pyeloscopy, with removal or manipulation of calculus (including ureteral stent)
52337	Cystourethroscopy with ureteroscopy and/or pyeloscopy, with lithotripsy (including ureteral stent)
53200	Biopsy of urethra
53210	Total urethrectomy, female
53215	Total urethrectomy, male
53410	Urethroplasty, 1-stage, of male anterior urethra
54500	Biopsy of testis, needle
54505	Biopsy of testis, incisional
54530	Orchiectomy, radical, for tumor; inguinal approach
54600	Reduction (surgical) of testis torsion
54800	Biopsy of epididymis, needle
54900	Epididymovasostomy (unilateral)
55400	Vasovasostomy
55530	Excision of varicocele or ligation of spermatic veins for varicocele
55700	Needle biopsy of prostate, single or multiple

(continued)

TABLE A1 (continued)

Code	Description
55859	Transperineal catheter placement into prostate for brachytherapy
57240	Anterior colporrhaphy, repair of cystocele with or without repair of urethrocele
57250	Posterior colporrhaphy, repair of rectocele with or without perineorrhaphy
57260	Combined anteroposterior colporrhaphy
57265	Combined anteroposterior colporrhaphy, with enterocele repair
57267	Insertion of mesh or other prosthesis for repair of pelvic floor defect, each site (anterior, posterior compartment), vaginal approach
57268	Repair of enterocele, vaginal approach
57270	Repair of enterocele, abdominal approach
57280	Colpopexy, abdominal approach
57282	Colpopexy, vaginal; extraperitoneal approach (sacrospinous, iliococcygeus)
57283	Colpopexy, vaginal; intraperitoneal approach (uterosacral, levator myorrhaphy)
57284	Paravaginal defect repair (including repair of cystocele, if performed); open abdominal approach
57285	Paravaginal defect repair (including repair of cystocele, if performed); vaginal approach
57288	Sling operation for stress incontinence (eg, fascia or synthetic)
57295	Revision (including removal) of prosthetic vaginal graft; vaginal approach
57423	Laparoscopic paravaginal defect repair (including repair of cystocele, if performed)
57425	Laparoscopic sacrocolpopexy
57426	Laparoscopic revision (including removal) of prosthetic vaginal graft
58263	Vaginal hysterectomy, for uterus $\leq$250 g; with removal of tube(s), and/or ovary(s), with repair of enterocele
58270	Vaginal hysterectomy, for uterus $\leq$250 g; with repair of enterocele
58280	Vaginal hysterectomy, with total or partial vaginectomy; with repair of enterocele
58292	Vaginal hysterectomy, for uterus >250 g; with removal of tube(s) and/or ovary(s), with repair of enterocele
58294	Vaginal hysterectomy, for uterus >250 g; with repair of enterocele
58541	Laparoscopy, surgical, supracervical hysterectomy, for uterus $\leq$250 g
58542	Laparoscopy, surgical, supracervical hysterectomy, for uterus $\leq$250 g; with removal of tube(s) and/or ovary(s)
58543	Laparoscopy, surgical, supracervical hysterectomy, for uterus >250 g
58544	Laparoscopy, surgical, supracervical hysterectomy, for uterus >250 g; with removal of tube(s) and/or ovary(s)
58548	Laparoscopy, surgical, with radical hysterectomy, with bilateral total pelvic lymphadenectomy and para-aortic lymph node sampling (biopsy), with removal of tube(s) and ovary(s), if performed
58550	Laparoscopy, surgical, with vaginal hysterectomy, for uterus $\leq$250 g
58552	Laparoscopy, surgical, with vaginal hysterectomy, for uterus $\leq$250 g; with removal of tube(s) and/or ovary(s)
58553	Laparoscopy, surgical, with vaginal hysterectomy, for uterus >250 g
58554	Laparoscopy, surgical, with vaginal hysterectomy, for uterus >250 g; with removal of tube(s) and/or ovary(s)
58570	Laparoscopy, surgical, with total hysterectomy, for uterus $\leq$250 g
58571	Laparoscopy, surgical, with total hysterectomy, for uterus $\leq$250 g; with removal of tube(s) and/or ovary(s)
58572	Laparoscopy, surgical, with total hysterectomy, for uterus >250 g
58573	Laparoscopy, surgical, with total hysterectomy, for uterus >250 g; with removal of tube(s) and/or ovary(s)
76872	Ultrasound, transrectal
Surgical: lumbosacral	
0195T	Arthrodesis, presacral interbody technique, disc space preparation, discectomy, without instrumentation, with image guidance (including bone graft, when performed); L5-S1 interspace
0196T	Arthrodesis, presacral interbody technique, disc space preparation, discectomy, without instrumentation, with image guidance (including bone graft, when performed); L4-L5 interspace
0200T	Percutaneous sacral augmentation (sacroplasty), unilateral injection(s) (including use of balloon or mechanical device, when used), $\geq$1 needles (including imaging guidance and bone biopsy, when performed)
0201T	Percutaneous sacral augmentation (sacroplasty), bilateral injections (including use of balloon or mechanical device, when used), $\geq$2 needles (including imaging guidance and bone biopsy, when performed)
0202T	Posterior vertebral joint arthroplasty (eg, facet joint replacement) (including facetectomy, laminectomy, foraminotomy, and vertebral column fixation, injection of bone cement, when performed), including fluoroscopy, single level, lumbar spine
0219T	Placement of posterior intrafacet implant(s), unilateral or bilateral, including imaging and placement of bone graft(s) or synthetic device(s), single level: cervical

(continued)

TABLE A1 (continued)

Code	Description
0220T	Placement of posterior intrafacet implant(s), unilateral or bilateral, including imaging and placement of bone graft(s) or synthetic device(s), single level: thoracic
0221T	Placement of posterior intrafacet implant(s), unilateral or bilateral, including imaging and placement of bone graft(s) or synthetic device(s), single level: lumbar
0222T	Placement of posterior intrafacet implant(s), unilateral or bilateral, including imaging and placement of bone graft(s) or synthetic device(s): each additional vertebral segment
0274T	Percutaneous laminotomy/laminectomy (interlaminar approach) for decompression of neural elements (with or without ligamentous resection, discectomy, facetectomy, and foraminotomy), any method, under indirect image guidance (eg, fluoroscopic, CT) with or without use of endoscope, single or multiple levels, unilateral or bilateral; cervical or thoracic
0275T	Percutaneous laminotomy/laminectomy (interlaminar approach) for decompression of neural elements (with or without ligamentous resection, discectomy, facetectomy, and foraminotomy), any method, under indirect image guidance (eg, fluoroscopic, CT) with or without use of endoscope, single or multiple levels, unilateral or bilateral; lumbar
0309T	Arthrodesis, presacral interbody technique, including disc space preparation, discectomy, with posterior instrumentation, with image guidance (including bone graft, when performed), lumbar, L4-L5 interspace
22100	Partial excision of posterior vertebral component (eg, spinous process, lamina or facet) for intrinsic bony lesion, single vertebral segment; cervical
22101	Partial excision of posterior vertebral component (eg, spinous process, lamina or facet) for intrinsic bony lesion, single vertebral segment; thoracic
22102	Partial excision of posterior vertebral component (eg, spinous process, lamina or facet) for intrinsic bony lesion, single vertebral segment; lumbar
22103	Partial excision of posterior vertebral component (eg, spinous process, lamina or facet) for intrinsic bony lesion, single vertebral segment; each additional segment
22110	Partial excision of vertebral body, for intrinsic bony lesion, without decompression of spinal cord or nerve root(s), single vertebral segment; cervical
22112	Partial excision of vertebral body, for intrinsic bony lesion, without decompression of spinal cord or nerve root(s), single vertebral segment; thoracic
22114	Partial excision of vertebral body, for intrinsic bony lesion, without decompression of spinal cord or nerve root(s), single vertebral segment; lumbar
22116	Partial excision of vertebral body, for intrinsic bony lesion, without decompression of spinal cord or nerve root(s), single vertebral segment; each additional vertebral segment
22206	Osteotomy of spine, posterior or posterolateral approach, 3 columns, 1 vertebral segment (eg, pedicle/vertebral body subtraction); thoracic
22207	Osteotomy of spine, posterior or posterolateral approach, 3 columns, 1 vertebral segment (eg, pedicle/vertebral body subtraction); lumbar
22208	Osteotomy of spine, posterior or posterolateral approach, 3 columns, 1 vertebral segment (eg, pedicle/vertebral body subtraction); each additional vertebral segment
22210	Osteotomy of spine, posterior or posterolateral approach, 1 vertebral segment; cervical
22212	Osteotomy of spine, posterior or posterolateral approach, 1 vertebral segment; thoracic
22214	Osteotomy of spine, posterior or posterolateral approach, 1 vertebral segment; lumbar
22216	Osteotomy of spine, posterior or posterolateral approach, 1 vertebral segment; each additional vertebral segment
22220	Osteotomy of spine, including discectomy, anterior approach, single vertebral segment; cervical
22222	Osteotomy of spine, including discectomy, anterior approach, single vertebral segment; thoracic
22224	Osteotomy of spine, including discectomy, anterior approach, single vertebral segment; lumbar
22226	Osteotomy of spine, including discectomy, anterior approach, single vertebral segment; each additional vertebral segment
22532	Arthrodesis, lateral extracavitary technique, including minimal discectomy to prepare interspace (other than for decompression); thoracic
22533	Arthrodesis, lateral extracavitary technique, including minimal discectomy to prepare interspace (other than for decompression); lumbar
22534	Arthrodesis, lateral extracavitary technique, including minimal discectomy to prepare interspace (other than for decompression); thoracic or lumbar, each additional vertebral segment
22548	Arthrodesis, anterior transoral or extraoral technique, clivus-C1-C2 (atlas-axis), with or without excision of odontoid process
22551	Arthrodesis, anterior interbody, including disc space preparation, discectomy, osteophytectomy, and decompression of spinal cord and/or nerve roots; cervical below C2

(continued)

TABLE A1 (continued)

Code	Description
22552	Arthrodesis, anterior interbody, including disc space preparation, discectomy, osteophytectomy, and decompression of spinal cord
22554	Arthrodesis, anterior interbody technique, including minimal discectomy to prepare interspace (other than for decompression); cervical below C2
22556	Arthrodesis, anterior interbody technique, including minimal discectomy to prepare interspace (other than for decompression); thoracic
22558	Arthrodesis, anterior interbody technique, including minimal discectomy to prepare interspace (other than for decompression); lumbar
22585	Arthrodesis, anterior interbody technique, including minimal discectomy to prepare interspace (other than for decompression); each additional interspace
22586	Arthrodesis, presacral interbody technique, including disc space preparation, discectomy, with posterior instrumentation, with image guidance (including bone graft, when performed), L5-S1 interspace
22590	Arthrodesis, posterior technique, craniocervical (occiput-C2)
22595	Arthrodesis, posterior technique, atlas-axis (C1-C2)
22600	Arthrodesis, posterior or posterolateral technique, single level; cervical below C2
22610	Arthrodesis, posterior or posterolateral technique, single level; thoracic (with or without lateral transverse technique)
22612	Arthrodesis, posterior or posterolateral technique, single level; lumbar (with or without lateral transverse technique)
22614	Arthrodesis, posterior or posterolateral technique, single level; each additional vertebral segment
22630	Arthrodesis, posterior interbody technique, including laminectomy and/or discectomy to prepare interspace (other than for decompression), single interspace; lumbar
22632	Arthrodesis, posterior interbody technique, including laminectomy and/or discectomy to prepare interspace (other than for decompression), single interspace; each additional interspace
22633	Arthrodesis, combined posterior or posterolateral technique with posterior interbody technique, including laminectomy and/or discectomy sufficient to prepare interspace
22634	Arthrodesis, combined posterior or posterolateral technique with posterior interbody technique, including laminectomy and/or discectomy sufficient to prepare interspace (other than for decompression), single interspace and segment; each additional interspace and segment
22800	Arthrodesis, posterior, for spinal deformity, with or without cast; $\leq$6 vertebral segments
22802	Arthrodesis, posterior, for spinal deformity, with or without cast; 7-12 vertebral segments
22804	Arthrodesis, posterior, for spinal deformity, with or without cast; $\geq$13 vertebral segments
22808	Arthrodesis, anterior, for spinal deformity, with or without cast; 2-3 vertebral segments
22810	Arthrodesis, anterior, for spinal deformity, with or without cast; 4-7 vertebral segments
22812	Arthrodesis, anterior, for spinal deformity, with or without cast; $\geq$8 vertebral segments
22818	Kyphectomy, circumferential exposure of spine and resection of vertebral segment(s) (including body and posterior elements); 1-2 segments
22819	Kyphectomy, circumferential exposure of spine and resection of vertebral segment(s) (including body and posterior elements); $\geq$3 segments
22830	Exploration of spinal fusion
22840	Posterior nonsegmental instrumentation (eg, Harrington rod technique, pedicle fixation across 1 interspace, atlantoaxial transarticular screw fixation, sublaminar wiring at C1, facet screw fixation)
22850	Removal of posterior nonsegmental instrumentation (eg, Harrington rod)
22852	Removal of posterior segmental instrumentation
22855	Removal of anterior segmental instrumentation
22859	Insertion of intervertebral biomechanical device to intervertebral disc space or vertebral body defect without interbody arthrodesis, each contiguous defect
22867	Insertion of interlaminar/interspinous process stabilization/distraction device, without fusion (including image guidance, when performed), with open decompression, lumbar; single level
22868	Insertion of interlaminar/interspinous process stabilization/distraction device, without fusion (including image guidance, when performed), with open decompression, lumbar; second level
22869	Insertion of interlaminar/interspinous process stabilization/distraction device, without open decompression or fusion (including image guidance, when performed), lumbar; single level
22870	Insertion of interlaminar/interspinous process stabilization/distraction device, without open decompression or fusion (including image guidance, when performed), lumbar; second level
22899	Unlisted procedure, spine
63001	Laminectomy, with exploration and/or decompression of spinal cord and/or cauda equina, without facetectomy, foraminotomy, or discectomy (eg, spinal stenosis), 1 or 2 vertebral segments; cervical
63003	Laminectomy, with exploration and/or decompression of spinal cord and/or cauda equina, without facetectomy, foraminotomy, or discectomy (eg, spinal stenosis), 1 or 2 vertebral segments; thoracic

(continued)

TABLE A1 (continued)

Code	Description
63005	Laminectomy, with exploration and/or decompression of spinal cord and/or cauda equina, without facetectomy, foraminotomy, or discectomy (eg, spinal stenosis), 1 or 2 vertebral segments; lumbar, except for spondylolisthesis
63011	Laminectomy, with exploration and/or decompression of spinal cord and/or cauda equina, without facetectomy, foraminotomy, or discectomy (eg, spinal stenosis), 1 or 2 vertebral segments; sacral
63012	Laminectomy, with removal of abnormal facets and/or pars interarticularis, with decompression of cauda equina and nerve roots for spondylolisthesis, lumbar (Gill-type procedure)
63015	Laminectomy, with exploration and/or decompression of spinal cord and/or cauda equina, without facetectomy, foraminotomy, or discectomy (eg, spinal stenosis), >2 vertebral segments; cervical
63016	Laminectomy, with exploration and/or decompression of spinal cord and/or cauda equina, without facetectomy, foraminotomy, or discectomy (eg, spinal stenosis), >2 vertebral segments; thoracic
63017	Laminectomy, with exploration and/or decompression of spinal cord and/or cauda equina, without facetectomy, foraminotomy, or discectomy (eg, spinal stenosis), >2 vertebral segments; lumbar
63020	Laminotomy (hemilaminectomy), with decompression of nerve root(s), including partial facetectomy, foraminotomy, and/or excision of herniated intervertebral disc, including open and endoscopically assisted approaches; 1 interspace, cervical
63030	Laminotomy (hemilaminectomy), with decompression of nerve root(s), including partial facetectomy, foraminotomy, and/or excision of herniated intervertebral disc, including open and endoscopically assisted approaches; 1 interspace, lumbar
63035	Laminotomy (hemilaminectomy), with decompression of nerve root(s), including partial facetectomy, foraminotomy, and/or excision of herniated intervertebral disc, including open and endoscopically assisted approaches; each additional interspace, cervical or lumbar
63040	Laminotomy (hemilaminectomy), with decompression of nerve root(s), including partial facetectomy, foraminotomy, and/or excision of herniated intervertebral disc, re-exploration, single interspace; cervical
63042	Laminotomy (hemilaminectomy), with decompression of nerve root(s), including partial facetectomy, foraminotomy, and/or excision of herniated intervertebral disc, re-exploration, single interspace; lumbar
63050	Laminoplasty, cervical, with decompression of spinal cord, ≥2 vertebral segments
63055	Transpedicular approach, with decompression of spinal cord, cauda equina, and/or nerve root(s) (eg, herniated intervertebral disc), single segment; thoracic
63056	Transpedicular approach, with decompression of spinal cord, cauda equina, and/or nerve root(s) (eg, herniated intervertebral disc), single segment; lumbar (including transfacet or lateral extraforaminal approach) (eg, far lateral herniated intervertebral disc)
63057	Transpedicular approach, with decompression of spinal cord, cauda equina, and/or nerve root(s) (eg, herniated intervertebral disc), single segment; each additional segment, thoracic or lumbar
63064	Costovertebral approach, with decompression of spinal cord or nerve root(s) (eg, herniated intervertebral disc), thoracic; single segment
63066	Costovertebral approach, with decompression of spinal cord or nerve root(s) (eg, herniated intervertebral disc), thoracic; each additional segment
63075	Discectomy, anterior, with decompression of spinal cord and/or nerve root(s), including osteophytectomy; cervical, single interspace
63076	Discectomy, anterior, with decompression of spinal cord and/or nerve root(s), including osteophytectomy; cervical, each additional interspace
63077	Discectomy, anterior, with decompression of spinal cord and/or nerve root(s), including osteophytectomy; thoracic, single interspace
63078	Discectomy, anterior, with decompression of spinal cord and/or nerve root(s), including osteophytectomy; thoracic, each additional interspace
63081	Vertebral corpectomy (vertebral body resection), partial or complete, anterior approach, with decompression of spinal cord and/or nerve root(s); cervical, single segment
63082	Vertebral corpectomy (vertebral body resection), partial or complete, anterior approach, with decompression of spinal cord and/or nerve root(s); cervical, each additional segment
63085	Vertebral corpectomy (vertebral body resection), partial or complete, transthoracic approach, with decompression of spinal cord and/or nerve root(s); thoracic, single segment
63086	Vertebral corpectomy (vertebral body resection), partial or complete, transthoracic approach, with decompression of spinal cord and/or nerve root(s); thoracic, each additional segment
63087	Vertebral corpectomy (vertebral body resection), partial or complete, combined thoracolumbar approach, with decompression of spinal cord, cauda equina, or nerve root(s), lower thoracic or lumbar; single segment

(continued)

TABLE A1 (continued)

Code	Description
63088	Vertebral corpectomy (vertebral body resection), partial or complete, combined thoracolumbar approach, with decompression of spinal cord, cauda equina, or nerve root(s), lower thoracic or lumbar; each additional segment
63090	Vertebral corpectomy (vertebral body resection), partial or complete, transperitoneal or retroperitoneal approach, with decompression of spinal cord, cauda equina, or nerve root(s), lower thoracic, lumbar, or sacral; single segment
63091	Vertebral corpectomy (vertebral body resection), partial or complete, transperitoneal or retroperitoneal approach, with decompression of spinal cord, cauda equina, or nerve root(s), lower thoracic, lumbar, or sacral; each additional segment
63101	Vertebral corpectomy (vertebral body resection), partial or complete, lateral extracavitary approach, with decompression of spinal cord and/or nerve root(s) (eg, for tumor or retropulsed bone fragment); thoracic, single segment
63102	Vertebral corpectomy (vertebral body resection), partial or complete, lateral extracavitary approach, with decompression of spinal cord and/or nerve root(s) (eg, for tumor or retropulsed bone fragment); lumbar, single segment
63103	Vertebral corpectomy (vertebral body resection), partial or complete, lateral extracavitary approach, with decompression of spinal cord and/or nerve root(s) (eg, for tumor or retropulsed bone fragment); thoracic or lumbar, each additional segment
63170	Laminectomy with myelotomy (eg, Bischof or DREZ type), cervical, thoracic, or thoracolumbar
63172	Laminectomy with drainage of intramedullary cyst/syrinx; to subarachnoid space
63173	Laminectomy with drainage of intramedullary cyst/syrinx; to peritoneal or pleural space
63180	Laminectomy and section of dentate ligaments, with or without dural graft, cervical; 1-2 segments
63182	Laminectomy and section of dentate ligaments, with or without dural graft, cervical; >2 segments
63185	Laminectomy with rhizotomy; 1-2 segments
63190	Laminectomy with rhizotomy; >2 segments
63191	Laminectomy with section of spinal accessory nerve
63194	Laminectomy with cordotomy, with section of 1 spinothalamic tract, 1 stage; cervical
63200	Laminectomy with release of tethered spinal cord, lumbar
63250	Laminectomy for excision or occlusion of arteriovenous malformation of spinal cord; cervical
63251	Laminectomy for excision or occlusion of arteriovenous malformation of spinal cord; thoracic
63252	Laminectomy for excision or occlusion of arteriovenous malformation of spinal cord; thoracolumbar
63265	Laminectomy for excision or evacuation of intraspinal lesion other than neoplasm, extradural; cervical
63267	Laminectomy for excision or evacuation of intraspinal lesion other than neoplasm, extradural; lumbar
63268	Laminectomy for excision or evacuation of intraspinal lesion other than neoplasm, extradural; sacral
63270	Laminectomy for excision of intraspinal lesion other than neoplasm, intradural; cervical
63271	Laminectomy for excision of intraspinal lesion other than neoplasm, intradural; thoracic
63272	Laminectomy for excision of intraspinal lesion other than neoplasm, intradural; lumbar
63286	Laminectomy for biopsy/excision of intraspinal neoplasm; intradural, intramedullary, thoracic
63300	Vertebral corpectomy (vertebral body resection), partial or complete, for excision of intraspinal lesion, single segment; extradural, cervical
63308	Vertebral corpectomy (vertebral body resection), partial or complete, for excision of intraspinal lesion, each additional segment
Physical therapy	
92507	Treatment of speech, language, voice, communication, and/or auditory processing disorder; individual
97001	Physical therapy evaluation
97010	Hot or cold pack application
97012	Mechanical traction
97014	Electrical stimulation (unattended)
97016	Vasopneumatic devices
97022	Whirlpool
97026	Infrared
97032	Electrical stimulation (manual) (15 minutes)
97033	Iontophoresis (15 minutes)
97035	Ultrasound (15 minutes)
97039	Unlisted modality (specify type and time if constant attendance)
97110	Therapeutic exercises to develop strength and endurance, range of motion, and flexibility (15 minutes)
97112	Neuromuscular re-education of movement, balance, coordination, kinesthetic sense, posture, and/or proprioception for sitting and/or standing activities (15 minutes)
97113	Aquatic therapy with therapeutic exercises (15 minutes)
97116	Gait training (including stair climbing) (15 minutes)

(continued)

TABLE A1 (continued)

Code	Description
97124	Massage, including effleurage, petrissage, and/or tapotement (stroking, compression, percussion) (15 minutes)
97140	Manual therapy techniques (eg, connective tissue massage, joint mobilization and manipulation, and manual traction) (15 minutes)
97150	Group therapeutic procedure(s) ($\geq$2 participants)
97250	Myofascial release (no longer a CPT code but billable under California workers' compensation system in lieu of 97140)
97530	Dynamic activities to improve functional performance, direct (one-on-one) with patient (15 minutes)
97535	Self-care/home management training (eg, activities of daily living and compensatory training, meal preparation, safety procedures, and instructions in use of assistive technology devices/adaptive equipment), direct one-on-one contact (15 minutes)
98960	Education and training for patient self-management by a qualified, nonphysician health care professional using a standardized curriculum, face-to-face with individual patient (could include caregiver/family) (30 minutes)
Injection	
20610	Arthrocentesis, aspiration, and/or injection; major joint or bursa (hip)
20611	Arthrocentesis, aspiration, and/or injection; major joint or bursa (hip): ultrasound guided
77002/77002-26	Fluoroscopic guidance of needle

[a]CPT, Current Procedural Terminology; CT, computed tomography; ICD-9, International Classification of Diseases, Ninth Revision.