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TITLE: Athletic Trainers as Outpatient Rehabilitation Providers: An Analysis of Role, Value, and Insurance Reimbursement in a Large Academic Healthcare System

Chelsea L Martin,[1,2] Joseph Greene,[3] David R Bell,[4] Stephanie Kliethermes,[4] Jacob Naylor,[1,5] Kristin Kucera[1,2]

1. Department of Epidemiology, University of North Carolina at Chapel Hill, Chapel Hill, NC
2. National Center for Catastrophic Sport Injury Research, University of North Carolina at Chapel Hill, Chapel Hill, NC
3. OrthoVise LLC, Madison, WI
4. Departments of Kinesiology and Orthopedics and Rehabilitation, University of Wisconsin – Madison, Madison, WI
5. Medical Center of Excellence, United States Army, Fort Sam Houston, TX

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Corresponding Author:
Dr. Chelsea Martin, PT, DPT, SCS
336-309-5017
martinlc@unc.edu

Mr. Joseph Greene, MS, ATC
joegreene@orthovise.com

Dr. David R Bell, PhD
drbell2@wisc.edu

Dr. Stephanie Kliethermes, PhD
Kliethermes@ortho.wisc.edu

Dr. Jacob Naylor, PT, DPT, OCS, CSCS
naylorja@unc.edu

Dr. Kristen Kucera, PhD, MSPH, ATC
kkucera@email.unc.edu

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ABSTRACT

Context: Athletic trainers (ATs) are healthcare professionals who provide care across multiple settings, including outpatient rehabilitation. Given the increase in healthcare utilization in the general population, ATs may provide necessary rehabilitation services to treat common musculoskeletal conditions.
Objective: Describe patient populations, conditions, healthcare utilization, and billing practices of ATs practicing in an outpatient orthopedic setting from January 2010 to December 2024.
Design: Retrospective Cohort Study
Setting: University-based healthcare system.
Participants: Patients in outpatient orthopedic rehabilitation.
Methods: Episode of Care (EOC) data were extracted from health insurance claims. Median and interquartile range (IQR) were reported for patient age, number of visits per EOC, Current Procedural Terminology (CPT) codes billed, and charges per visit. Diagnoses associated with the EOC were by taxonomy, nature of injury, and body region categories using International Classification of Disease (ICD) version 9/10 codes. Frequencies, proportions and 95% confidence intervals (95%CI) were reported for taxonomy, nature of injury, body region, and surgical cases.
Results: ATs were primary providers for 7,789 EOCs. Median patient age was 37 years [IQR: 19, 51] with the majority of patients being female (4,189; 54%, 95%CI: 53%-55%). The knee and shoulder were the most common body regions treated (knee: 2,993, 26%, (95%CI: 25%, 27%); shoulder: 1,863, 16%, (95%CI: 15%-17%)]. 17% of EOCs indicated presence of a surgical procedure. EOCs comprised a median number of 3 visits [IQR: 2, 6] with 6 median CPT codes [IQR: 2,6] billed, resulting in median EOC charges of $1,291 [IQR: $782, $2,099]. EOCs that were isolated to the inclusion of AT billable procedural codes resulted in $13.5 million in charges and $10.8 million in reimbursements over 15 years.
Conclusions: ATs provided primary rehabilitative care to common musculoskeletal conditions particularly of the knee and shoulder. Similar billing practices as other allied health professionals were observed based on CPT codes billed and median charges per visit.

KEY WORDS: Outpatient orthopedics, billing practices, musculoskeletal injury, health care utilization

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Key Points:

1. This study provides preliminary insight into the role that athletic trainers play in providing care in the outpatient rehabilitation setting.
2. Athletic trainers provide care for a myriad of musculoskeletal conditions, particularly middle-aged patients with pain-related conditions at the knee and shoulder.
3. Athletic trainers demonstrated comparable number of visits, procedural codes billed, and associated costs compared to other allied health professionals.

INTRODUCTION

Musculoskeletal disorders and injuries are a leading contributor of disability and healthcare expenditures and encompass conditions that affect bones, joints, muscle, and connective tissues.[1] In the United States, musculoskeletal disorders impact 1 in 2 adults, equating to $980 billion annually for treatment and lost wages.[2,3] From 2006 to 2013, musculoskeletal injuries rose from 61% to 89% of all injuries, resulting in health care expenditures such as physician visits, surgical procedures, pain medication, and rehabilitation services.[2]

Outpatient rehabilitation services are one of the most cost-effective approaches for musculoskeletal conditions.[4,5] They are often led by allied health professionals such as physical therapists (PTs), PT assistants, and athletic trainers (ATs). ATs, in particular, practice under the direction of, and in collaboration with, physicians across a myriad of settings, including outpatient rehabilitation.[6,7] ATs have been instrumental in providing rehabilitation services to meet the rising demand for treating musculoskeletal conditions in outpatient rehabilitation settings. Within these settings, ATs are tasked with providing care for the management of a multitude of musculoskeletal conditions including initial patient evaluations, exercise selection and progression, passive and active modalities, and manual therapy services.[7,8] Although commercial insurance payers are increasingly recognizing services billed by ATs, Medicare and most Medicaid programs do not recognize ATs as billable providers.[9] Given rehabilitation provider shortages in underserved areas such as rural and inner city areas, ATs may play a crucial role in providing conservative, non-invasive services for musculoskeletal conditions.[10,11]

The state of XXXXXXXXX XX Healthcare system is a statewide system serving more than 800,000 patients annually across all specialties and services.[12] The XX Health System has

utilized ATs as direct providers of outpatient rehabilitation for nearly 23 years. In this setting, ATs work alongside but independent of physical therapists (PTs) to deliver rehabilitative care. Since 2001, the XX Health system has employed ATs in outpatient rehabilitation clinics where they oversee and bill for evaluations and subsequent treatments of patients referred by physician providers. Discerning services, billing practices, and healthcare utilization costs for common conditions of these ATs may provide insight on the value and roles that ATs can provide in XXXXX and other states.

One way to discern conditions treated and healthcare costs of AT services provided in outpatient rehabilitation settings is through the extraction and analysis of medical claims data.[13,14] Medical claims data have been used effectively to inform decision-making of policymakers, insurance providers, and payers through the tracking of utilization and resources costs for treating musculoskeletal conditions.[13,14] To date, medical claims data have not been used to assess the value and utilization of ATs in outpatient rehabilitation settings through cost and condition analysis. Therefore, the primary purpose of this study is to describe common conditions, patient characteristics, and body regions treated by ATs over nearly 15 years in a large university-based healthcare system. A secondary purpose of this study is to describe healthcare utilization and billing practices of ATs. This study may inform other healthcare systems nationally on the value and utilization of ATs as allied health professionals within the outpatient rehabilitation setting.

METHODS

Study Design

This is a retrospective cohort study of de-identified health insurance claims billed by ATs in outpatient rehabilitation settings in the XX Health system (XX Health) from January 1st, 2010 to December 17th, 2024. XX Health is a large integrated university health system that provides services to more than 800,000 patients. This study received ethics approval from the XXXX Internal Review Board at the XXXXX (IRB#: 2023-0646).

Data Extraction and Episode of Care Definition

AT services were identified using billable Current Procedural Terminology (CPT) codes (97005 – 97799), and the provider type at the initial evaluation (i.e., Athletic Training).[15] The AT claims for each patient were consolidated into episodes of care (EOC). Each EOC was assigned a unique EOC identifier. EOC was defined by the provider at the level of the EOC. The EOC included visits that began on the date of the first evaluation code documented by a licensed AT and ended on the last visit that was billed.[15,16] Only in-office visits (i.e., office visit, appointment) and telemedicine (i.e., telemedicine, telemedicine – audio/telephone) were included. EOCs that contained more than one evaluation code were considered a re-evaluation, rather than the start of a new episode.[15] EOCs were also excluded if duplicate unique EOC identifiers were identified. In order to ensure right truncation did not occur where the EOC would potentially still be ongoing towards the end of the study time frame, EOCs were excluded if the last visit occurred within 60 days of the end of the study period. **Figure 1** provides an illustration of study inclusion and exclusion criteria.

Additional data extracted included patient characteristics (i.e., age, sex), payor (i.e., reclassified into private insurance, self-pay, workers compensation, Medicare, Medicaid,

TRICARE at initial evaluation), and CPT codes. Cost related variables extracted include total charges, payments, and reimbursement rates per EOC.

<Figure 1. Flow Chart for Athletic Trainer (AT) Provided Therapy Services Study Inclusion>

Diagnosis Definitions

To discern the type of diagnoses treated by ATs, the International Classification of Disease (ICD), 9th or 10th Revision listed at the initial evaluation was used. If both an ICD 9 and 10 diagnosis code was listed (i.e., represented by the time period of transition from ICD 9 to 10 codes in 2015), the ICD 10 code was used. The ICD codes listed were then categorized using the U.S. Army Public Health Center (APHC) standardized taxonomy of injury,[17] which APHC recommends for use in military and civilian populations.[17] The taxonomy was used to organize initial evaluation ICD 9 or 10 codes into injury mechanism (i.e., acute musculoskeletal injury, acute non-musculoskeletal, cumulative musculoskeletal, cumulative non-musculoskeletal, unspecified/multiple injuries), injury nature (i.e., contusion/superficial, dislocation, fracture, musculoskeletal tissue damage-other, nerve, sprain/joint damage, strain/tear, systemwide/multiple sites or systems/unspecified, other tissue damage), body region (i.e., spine/back, torso, upper extremity, lower extremity, other), and body segment (head/neck-other, neck, upper back, middle back, lower back, spine/back-other, chest, pelvis, trunk-other, shoulder, upper arm, elbow, lower arm, forearm, wrist, hand/finger, arm-other, hip, upper leg, knee, lower leg, ankle, foot/toes, leg-other, unspecified).[17] Following application of the taxonomy system, ICD codes not represented in the taxonomy were visually inspected and coded

into the taxonomy system by the research team. The U.S. Army Public Health Center (APHC) standardized taxonomy of injury and the manually imputed codes can be accessed at: https://osf.io/t97fw/?view_only=0b2b34b88eec4c58bebabce2b0c8e7e1. Two separate investigators (XXX, XXX) with 18 years of combined outpatient rehabilitation experience as PTs, coded the remaining ICD codes into the taxonomy system separately to assess agreement. Consensus was reached on any discrepancies via discussion and input from a third investigator (XXX), a researcher and certified athletic trainer.

Statistical Analysis

Standard descriptive statistics, were used to describe patient demographics and EOC characteristics. Median and interquartile range (IQR) for patient age. Frequencies and proportions with corresponding 95% confidence intervals (CI) were reported for age categorization (i.e., <18 years old, 18-39 years old, 40-64 years old, 65+ years old), patient sex (i.e., female, male), surgical cases (ICD9/ICD10 codes: V54.9, V54.89, V45.89, Z98.890, Z98.89, Z51.89, Z48.89, Z4789, Z471), payor type at the first visit, injury mechanism, nature of injury, body region, and body segment. Patients could seek care for multiple body segments over the duration of the EOC. To account for this, once the standardized matrices were applied, included diagnoses were filtered for first unique body segment per EOC for analysis. Visual heat maps were also created to assess visual distributions of the nature of injury by body segment. For the cost analysis, median and interquartile range (IQR) were reported for number of visits per EOC, CPT codes billed, and charges per visit. CPT codes that comprised total EOC costs were inclusive of all procedural codes during the EOC. Therefore, EOC costs from other non-AT related procedural codes during the duration of care could have been captured. To account for

this, cost analysis was performed by EOCs where only procedural codes billable by ATs were present (97005 – 97799, 20560-20561, 20999). Total charges and reimbursement for all EOCs were calculated for the study time frame. Across all tables, if a cell contained <5 individuals, the cell count and proportion was suppressed and not reported to ensure de-identification. All analyses were performed in R 4.3.2 R Core Team (2023). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL https://www.R-project.org/. All data analysis code can be accessed at https://osf.io/t97fw/?view_only=0b2b34b88eec4c58bebabce2b0c8e7e1 per recommendations of Open Science Practices.[18,19]

RESULTS

Over the nearly 15 year study time frame, ATs provided outpatient orthopaedic rehabilitation services for 7,789 EOCs, representing 6,378 unique patients over 40,976 visits. The median age of patients was 37 years [IQR 19, 51], with the largest proportion of patients between 40 to 64 years old [3,428; 44% (95%CI: 43%-45%)]. A larger proportion of EOCs were for females [4,189; 54% (95%CI: 53%-55%)] (**Table 1**). When considering insurance payer type, 95% of EOCs were represented by private/commercial, health maintenance organizations or preferred provider organization insurance plans. (**Table 1**).

<Table 1. Patient Demographics and Payor Type per Episode of Care>

Injury Characteristics, Body Regions, and Diagnosis Treated

The lower extremity was the most commonly treated body region [Overall: 8,001; 70.0%, (95%CI: 69.2%-70.9%)] followed by the upper extremity [overall: 2,248; 19.7%, (95%CI: 18.9%-20.4%)] (Table 2). The knee and the shoulder were the most commonly treated body segments overall [knee: 2,993; 26.2%, (95%CI: 25.4%, 27.0%); shoulder: 1,863; 16.3%, (95%CI: 15.6%, 17.0%)] and by age group (**Table** 2) and were most commonly classified as cases representing general musculoskeletal tissue damage or other unspecified condition (**Figure 2**).

<Table 2. Injury Mechanism, Injury Type, Body Region and Segment Treated>

<Figure 2. Heat Map of Proportions for Nature of Injury by Body Region>

The most common non-procedural ICD 9 or 10 codes billed were knee pain [530; 4.6%, (95%CI: 4.2%-5.0%)], muscle weakness [516; 4.5%, (95%CI: 4.1%-4.9%)], and shoulder pain [302; 2.6% (95%CI: 2.3%-2.9%)]. 17.4% of EOCs [1,355; (95%CI: 16.6%-18.2%)] contained an ICD 9/10 surgical procedure code. **Supplemental File 1** provides a detailed breakdown of all unique ICD codes billed for each unique body region identified per EOC.

Cost Analysis

EOCs consisted of a median number of 3 visits [IQR: 2, 6] with a median number of 6 CPT codes [IQR: 4, 11] per EOC. These numbers remained consistent when isolating EOCs to those containing only AT billable procedural codes. Per EOC, the resulting median charges were nearly $1,291 [IQR: $782 , $2,099] resulting in a reimbursement rate of $1,003 [IQR: $543, $1,770] (Table 3). Over the study time frame, ATs billed for $14.3 million in charges resulting in

$11.4 million in total reimbursements. When isolating the cost analysis to EOCs containing only AT billable procedural codes, median charges [$1,287, IQR: $779, $2,068] and reimbursement rates ($999; IQR: $541, $1,744) were similar to all EOCs combined [median charges: $1,291, IQR: $782, $2,099; reimbursement rates: $1,003, IQR: $543, $1,770]. When summed across the study time frame, EOCs that were isolated to the inclusion of AT billable procedural codes resulted in $13.5 million in charges and a total reimbursement rate of $10.8 million (Table 3).

<Table 3. Cost Analysis Overall and by CPT Code Types>

DISCUSSION

Prior health care utilization studies have investigated common diagnoses and health care utilization of rehabilitation professionals, but have lacked findings inclusive of ATs as billable providers in outpatient orthopedic settings.[6,7] Our study adds to this body of literature by reporting on the instrumental role that ATs provide in rehabilitation services to meet the rising demand for treating musculoskeletal conditions in outpatient rehabilitation settings. Patient characteristics by EOC demonstrated that female patients between the ages of 40 to 64 were the most commonly treated patients consistent with other study findings on healthcare usage.[1,23] ATs treated a myriad of injury types and diagnoses, with the most common injuries being cumulative microtraumatic injury mechanisms that were non-specified tissue damage. These injuries were most commonly at the shoulder and the knee. Cost analysis revealed comparable number of visits and CPT codes billed per visit compared to previous literature among similar providers (i.e., PTs, occupational therapists)[15] and a total reimbursement rate surpassing $10 million during the nearly 15 year study time frame.

Patient Characteristics

This study found that patients between the ages of 39 to 64 years of age irrespective of sex, and those who were female irrespective of age represented the highest proportion of patients who were treated by ATs during the EOCs. Notably, ATs did not see a large proportion of patients over the age of 65 years old. This is likely driven by the large proportion of Medicare insured patients, an insurance provider that does not currently recognize ATs as billable providers. This likely restricts access to this patient population who would have been treated by other billable providers such as PTs. Given this policy restriction, ATs treated the largest proportion of patients between the ages of 40 to 64 years old. In the US, individuals between the age of 45 to 64 years of age comprise 37% of the top 10% of health care utilizers based on expenditures.[20] A prior Centers for Disease Control and Prevention health survey from 2019 to 2020 found the highest percentage of adults that have received care from allied health services, including speech, rehabilitative, or occupational therapy, were similar between the ages 50 to 64 years.[21] Furthermore, over 58% of the workforce is between the age of 35 to 64 years of age.[22]

Health care utilization has been known to increase with age and for females for multifactorial reasons, including the increased prevalence of chronic conditions, increasing prevalence of joint conditions and symptomology, and different pain intensity and experiences.[1] Across the lifespan, prior studies have demonstrated that motor performance decreases with age and disproportionately impacts females, potentially due to differences in occupational or recreational exposure.[23] Musculoskeletal conditions, if left untreated may have negative consequences that directly impact the workforce through lost wages and decreased productivity,[2,3] and negatively impact quality of life and reduce function.[24,25] Given that this study demonstrated the largest proportion of patients treated fell within this age group and were female, ATs play a crucial role in providing conservative treatment approaches to maintain and

improve function in this population as health care utilization continues to increase over time in outpatient rehabilitation settings.[26]

Injury Characteristics, Body Regions, and Diagnosis Treated

Over half of all EOCs include treatment by an AT for knee and shoulder pain. A prior systematic review demonstrated that exercise has moderate to strong evidence to effectively reduce pain, improve function, and reduce medical costs across a multitude of musculoskeletal conditions that ATs are qualified to treat.[27] Across the globe, the knee and the shoulder are the second and third most common body segments affected by pain.[28] At the knee, common conditions such as osteoarthritis (and related symptomology) have a global incidence of 203 per 10,000 person years.[29] Similarly, shoulder pain incidence is also high with a global incidence reported between 7.7 to 62 per 1000 persons per year.[30] Our study found that ATs played a role in treating these common pain related conditions as demonstrated by the body region analysis and corresponding ICD 9/10 codes billed. Interestingly, less than 2% of EOCs that ATs treated were low back or related spine conditions. Low back pain is the leading musculoskeletal condition in the most commonly treated age groups among other studies.[15,31,32] In a prior healthcare utilization study among PTs in two midwestern states, spine conditions were over a third of all EOCs for non-Medicare insurers.[15] Although a different coding matrix was used (i.e., ICD-9-Clinical Modification) limiting a direct comparison by body segment, the substantial difference in the treatment of spine conditions among studies is notable. This suggests that ATs may play a specific role in the types and complexity of conditions treated compared to PTs. Spinal and neurologic or nerve related conditions may represent more complex treatment scenarios requiring longer follow-up, increased frequency of oversight, or referral to specialized

neurologic professionals.[3] These findings may suggest that ATs play a significant role in proximal limb conditions as the primary allied health provider, whereas more complex diagnoses such as neurological and spine conditions and older patient populations (i.e., 65+ years) are more frequently seen by PTs given current legislative restrictions. Further research that links co-morbidity data and patient reported outcomes is necessary to further inform this finding.

Cost Analysis

To the best of our knowledge, this is the first study to perform a cost analysis of AT services provided in outpatient rehabilitation settings. Cost analysis revealed similar numbers of visits and CPT codes billed per visit compared to previous literature among similar providers such as PTs across an EOC.[15] In a prior study by Pendergrast et al., using similar insurance claims data from 2003 to 2007, PTs treated patients over an EOC across all conditions for a median of 4 (IQR: 6) or 5 (IQR: 8)visits per EOC for self-referred and physician referred conditions, respectively.[15] Similarly estimated median chargers per EOC for PT treatments in an EOC only claims demonstrated a similar median total charges ($341.76; IQR: $476.62) as the current study;[15] however caution is warranted for direct comparisons due to difference in study time frame and potential for inflation differences. Given a total reimbursement rate surpassing $10 million for facilities as well as similar charge comparisons to allied health professionals, ATs may provide essential care based on cost specific healthcare considerations.

Limitations

This study is not without limitations. First, although the coding matrix used is a standardized matrix (Army Public Health Center's validated taxonomy of injury) that has been recommended for use in non-military populations,[17,33] multiple ICD codes were not represented that were commonly seen in this civilian setting. Thus, we applied a modified version of this

taxonomy by emplacing ICD codes not originally included. Steps were taken to cross-validate categorization into the matrix to minimize classification error. Related, injury nature categorization resulted in majority of codes being classified into non-specific categories (i.e., MSK tissue damage other; Multiple Injuries/Systemwide, Unspecified), limiting the interpretation of this specific categorization. Second, the definition of EOC was defined by the provider at the level of the EOC (versus the visit level). Due to this, it is possible that patients at any point may have been treated by another provider type for single visits which may lead to an unspecified bias in the cost analysis for all variables. Third, multiple ICD codes representing multiple different body segments could be billed for at the first visit or added later in the EOC. EOCS that included multiple unique body segments (i.e., ankle, shoulder) would have been represented in the injury characteristic analysis, but bilateral cases for the same body segment may not have been captured leading to the possibility of underestimating the number of body segments treated across all EOCs. Third, payor type was established at the provider level; current legislation only allows for ATs to bill for non-government related insurance providers. 38 EOCs (0.5% of all EOCs) were listed as a government based plan. It is highly likely that this charge/insurance discrepancy was identified and charges were reversed, or the particular patient was transitioning insurance plans and was seen by a PT following the transition. However, this dataset does not allow for direct verification, and 99.5% of all payors were in line with expected non-government plans. Finally, we were not able to extract patient co-morbidities or patient-reported functional outcomes. These variables in future research may provide a more holistic picture on the complexity of the patient population treated by ATs and provide a holistic assessment of value-based care that inform future policy.

In summary, this study demonstrates the role that ATs serve in a large university healthcare system to provide important outpatient rehabilitative care to patients with a myriad of musculoskeletal conditions, particularly middle-aged patients with pain-related conditions at the knee and shoulder. Although prior healthcare cost analysis is limited in rehabilitation settings, this study demonstrated comparable number of visits, procedural codes billed, and associated costs compared to other allied health professionals. Further patient complexity and functional outcome related studies are necessary to further inform the value and role of ATs in the outpatient rehabilitation setting.

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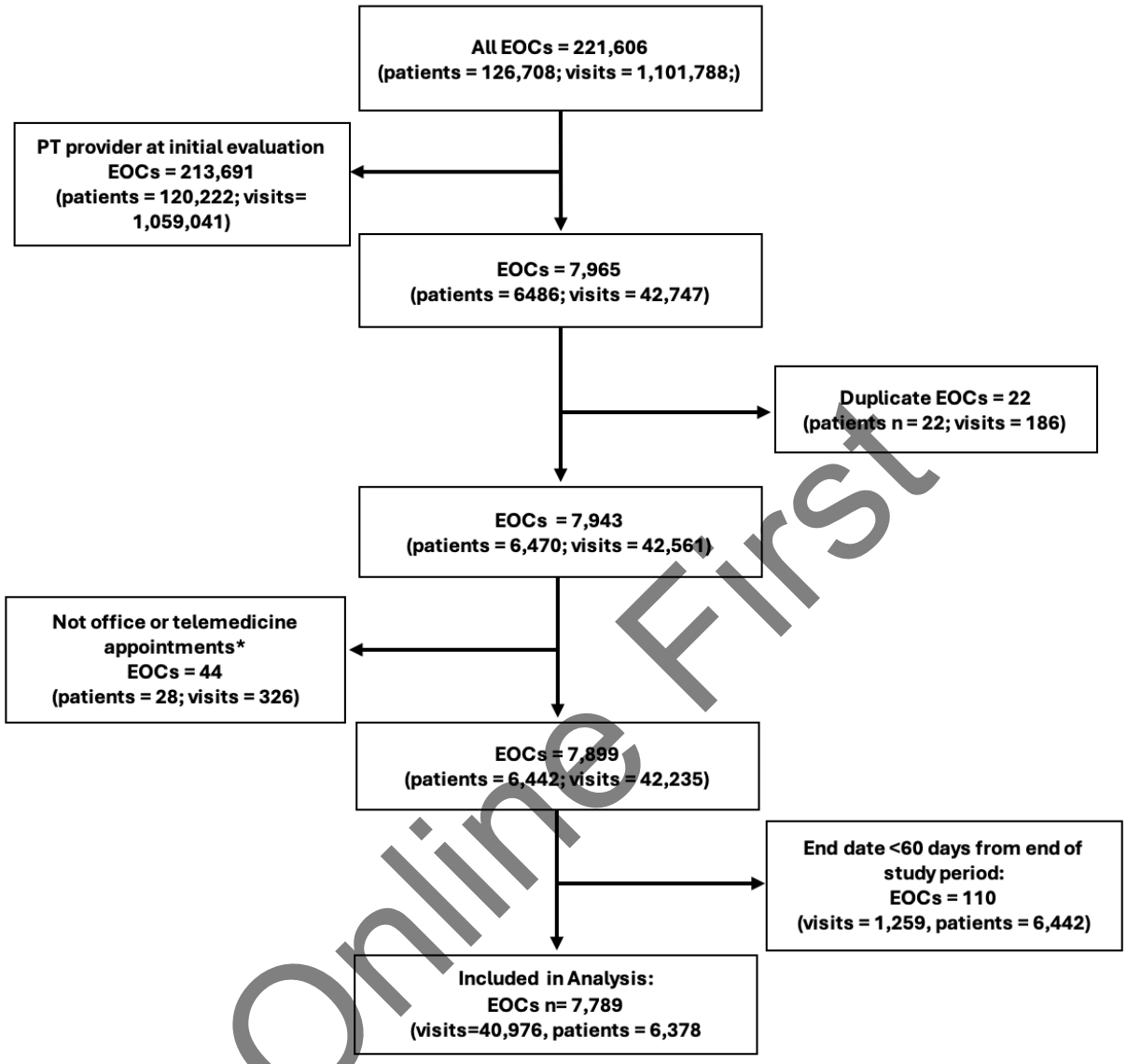
Figure 1. Flow Chart for Athletic Trainer (AT) Provided Therapy Services Study Inclusion



Abbreviations: EOC: episode of care; PT: physical therapist

Table 1. Patient Demographics and Payor Type per Episode of Care

Variable	Number of EOCs, Proportion	(95% CI)
Patient Age, median [IQR]	37 [19, 51]	
<18 years old	1,738; 22.3%	(21.4%, 23.2%)
18-39 years old	2,486; 31.9%	(30.9%, 33.0%)
40-64 years old	3,428; 44.0%	(42.9%, 45.1%)
65+ years old	137, 1.8%	(1.5%, 2.0%)
Patient Sex		
Female	4,189; 53.8%	(52.7%, 54.9%)
Male	3,600; 46.2%	(45.1%, 47.3%)
Surgical Case[a]		
No	6,434; 82.6%	(81.8%, 83.4%)
Yes	1,355; 17.4%	(16.6%, 18.2%)
Payor Type		
HMO/PPO Plans	7,186, 92.3%	(91.6%, 92.8%)
Commercial/Private	209, 2.7%	(2.3%, 3.1%)
Workers Compensation	261, 3.4%	(3%, 3.8%)
Government	38, 0.5%	(0.4%, 0.7%)
Unspecified	95, 1.2%	(1%, 1.5%)
Total Episodes of Care	**7,789**[1]	

95% CI: 95% confidence interval; HMO: Health Maintenance Organization; PPO: Preferred Provider Organization;

[a] Surgical case based on presence of surgical care codes (ICD9/ ICD10 codes: V54.9, V54.89, V45.89, Z98.890, Z98.89, Z51.89, Z48.89, Z4789, Z471)

Table 2. Count, Proportion (95% CIs) for Injury Mechanism, Nature of Injury, Body Region, and Segment Treated

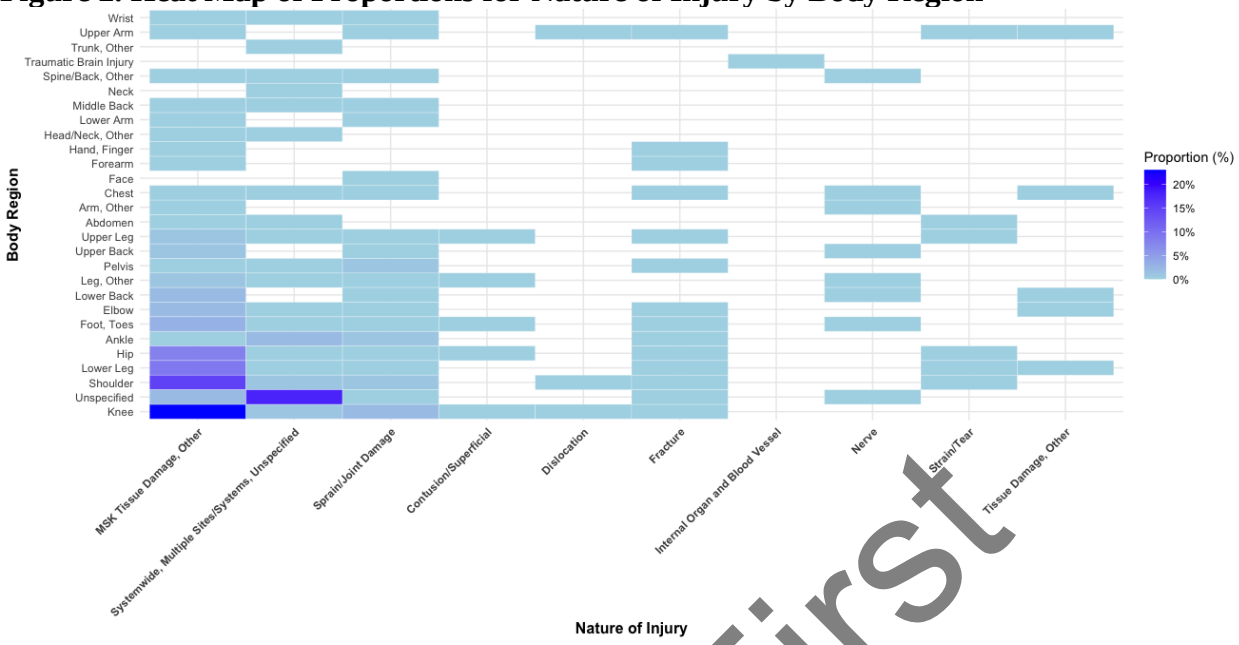
Categorization	Overall, number of diagnoses, proportion (95% CI)
Injury Mechanism	
Acute Musculoskeletal	720; 6.3%, (5.9%, 6.7%)
Acute Non-Musculoskeletal	30; 0.3%, (0.2%, 0.4%)
Cumulative Musculoskeletal	7519; 65.8%, (64.9%, 66.7%)
Cumulative Non-Musculoskeletal	26; 0.2%, (0.1%, 0.3%)
Operative/Medical Complications	54; 0.5%, (0.3%, 0.6%)
Unspecified/Multiple Injuries	3076; 26.9%, (26.1%, 27.7%)
Nature of Injury	
Contusion/Superficial	9; 0.1%, (0.0%, 0.1%)
Dislocation	37; 0.3%, (0.2%, 0.4%)
Fracture	82; 0.7%, (0.6%, 0.9%)
Internal Organ and Blood Vessel	<5
MSK Tissue Damage, Other	7875; 68.9%, (68.1%, 69.8%)
Nerve	45; 0.4%, (0.3%, 0.5%)
Sprain/Joint Damage	724; 6.3%, (5.9%, 6.8%)
Strain/Tear	27; 0.2%, (0.1%, 0.3%)
Systemwide, Multiple Sites/Systems, Unspecified	2618; 22.9%, (22.1%, 23.7%)
Tissue Damage, Other	7; 0.1%, (0%, 0.1%)
Body Region	
Head and Neck	49; 0.4%, (0.3%, 0.5%)

Lower Extremities	8001; 70.0%, (69.2%, 70.9%)
Other	492; 4.3%, (3.9%, 4.7%)
Spine and Back	348; 3.0%, (2.7%, 3.4%)
Torso	287; 2.5%, (2.2%, 2.8%)
Upper Extremities	2248; 19.7%, (18.9%, 20.4%)
Body Segment	
Abdomen	45; 0.4%, (0.3%, 0.5%)
Ankle	347; 3.0%, (2.7%, 3.4%)
Arm, Other	33; 0.3%, (0.2%, 0.4%)
Chest	23; 0.2%, (0.1%, 0.3%)
Elbow	270; 2.4%, (2.1%, 2.6%)
Face	<5
Foot, Toes	390; 3.4%, (3.1%, 3.7%)
Forearm	9; 0.1%, (0%, 0.1%)
Hand, Finger	<5
Head/Neck, Other	46; 0.4%, (0.3%, 0.5%)
Hip	929; 8.1%, (7.6%, 8.6%)
Knee	2993; 26.2%, (25.4%, 27%)
Leg, Other	209; 1.8%, (1.6%, 2.1%)
Lower Arm	<5
Lower Back	198; 1.7%, (1.5%, 2%)
Lower Leg	1123; 9.8%, (9.3%, 10.4%)
Middle Back	32; 0.3%, (0.2%, 0.4%)

Neck	<5
Pelvis	223; 2.0%, (1.7%, 2.2%)
Shoulder	1863; 16.3%, (15.6%, 17.0%)
Spine/Back, Other	55; 0.5%, (0.4%, 0.6%)
Traumatic Brain Injury	<5
Trunk, Other	6; 0.1%, (0.0%, 0.1%)
Unspecified	2312; 20.2%, (19.5%, 21.0%)
Upper Arm	36; 0.3%, (0.2%, 0.4%)
Upper Back	60; 0.5%, (0.4%, 0.7%)
Upper Leg	187; 1.6%, (1.4%, 1.9%)
Wrist	28; 0.2%, (0.2%, 0.3%)

95% CI: 95% confidence interval; Cells were suppressed that included counts less than 5 individuals to ensure de-identification

Figure 2. Heat Map of Proportions for Nature of Injury by Body Region



Body segment and nature of injury categorized using a validated coding matrix; denominator for proportion calculations: n= 11,425 distinct body region codes over 7,789 episodes of care for 6,378 patients.

Table 3. Cost Analysis Overall and by CPT Code Types

Variable	All CPT Codes in the EOC EOC = 7,789* Median [IQR]	AT Treatment Specific Billed CPT Codes EOC = 7,476* Median [IQR]	Inclusion of all Billed CPT Codes EOC = 313 Median [IQR]
Per Episode of Care (EOC) Cost Analysis[a]			
Episode Visit Count	3.0 [2.0, 6.0]	3.0 [2.0, 6.0]	6.0 [3.0, 12.0]
Billed Visit Count	3.0 [2.0, 6.0]	3.0 [2.0, 6.0]	6.0 [3.0, 12.0]
Billed Codes Count	6 [4, 11]	6 [4, 11]	9 [5, 18]
Charges	$1,291 [782, 2,099]	$1,287 [779 - 2,068]	$1,839 [1,044, 3,386]
Charges per Visit	$365 [308, 478]	$368 [309, 486]	$323 [281, 378]
Reimbursement Rate	$1,003 [543, 1,770]	$999 [541, 1,744]	$1,388 [687, 2,928]
Reimbursement Rate per Visit	$305 [218, 395]	$308 [219, 397]	$265 [178, 326]
Total Study Period Cost Analysis			
Total Visits	40,981	38,216	2,765
Total Charges	$14,328,132	$13,482,491	$845,641
Total Reimbursement Rate	$11,455,444	$10,776,033	$679,411

[a]Median (Interquartile Range); EOC: episode of care; CPT: Current Procedural Terminology; *36 episodes of care reported no charges overall and among AT Treatment Specific Billed CPT **Codes**

Supplemental File 1: Most common ICD codes billed, filtered by first occurrence of each unique body region by EOC and including non-MSK codes (i.e., surgical or rehabilitation code procedures that would not have been coded into the matrices)

ICD 9/10 Code descriptor	Count	Proportion, 95% Confidence Interval
Overall	11447	100% (100%, 100%)
Knee pain	530	4.6% (4.2%, 5%)
Muscle weakness	516	4.5% (4.1%, 4.9%)
Shoulder pain	302	2.6% (2.3%, 2.9%)
Muscular weakness	242	2.1% (1.9%, 2.4%)
Right hip pain	179	1.6% (1.3%, 1.8%)
Pain in joint, shoulder region	176	1.5% (1.3%, 1.8%)
Quadriceps weakness	165	1.4% (1.2%, 1.7%)
Muscle strength reduced	161	1.4% (1.2%, 1.6%)
Pain, joint, knee, right	161	1.4% (1.2%, 1.6%)
Hip pain	156	1.4% (1.2%, 1.6%)
Muscle weakness (generalized)	154	1.3% (1.1%, 1.6%)
Scapular dysfunction	151	1.3% (1.1%, 1.5%)
Right knee pain, unspecified chronicity	149	1.3% (1.1%, 1.5%)
Left knee pain, unspecified chronicity	142	1.2% (1%, 1.4%)
Left hip pain	139	1.2% (1%, 1.4%)
Pain, joint, knee, left	112	1% (0.8%, 1.2%)
Chronic pain of right knee	108	0.9% (0.8%, 1.1%)
Chronic right shoulder pain	106	0.9% (0.8%, 1.1%)
Ankle pain	105	0.9% (0.7%, 1.1%)
Pain in joint, lower leg	104	0.9% (0.7%, 1.1%)
Right shoulder pain, unspecified chronicity	98	0.9% (0.7%, 1%)
Right leg weakness	97	0.8% (0.7%, 1%)
Pain, joint, shoulder region, right	90	0.8% (0.6%, 0.9%)
Pain in limb	89	0.8% (0.6%, 0.9%)
Left leg weakness	88	0.8% (0.6%, 0.9%)
Pain in joint, pelvic region and thigh	87	0.8% (0.6%, 0.9%)
Acute pain of right knee	83	0.7% (0.6%, 0.9%)
Chronic pain of left knee	77	0.7% (0.5%, 0.8%)
Right knee pain	77	0.7% (0.5%, 0.8%)
Acute pain of left knee	76	0.7% (0.5%, 0.8%)
Left knee pain	75	0.7% (0.5%, 0.8%)
ACL tear	73	0.6% (0.5%, 0.8%)
Right foot pain	73	0.6% (0.5%, 0.8%)
Chronic left shoulder pain	70	0.6% (0.5%, 0.8%)
Pain in both knees, unspecified chronicity	66	0.6% (0.4%, 0.7%)
Knee pain, right	64	0.6% (0.4%, 0.7%)
Muscle tightness	63	0.6% (0.4%, 0.7%)

Right shoulder pain	63	0.6% (0.4%, 0.7%)
Left foot pain	62	0.5% (0.4%, 0.7%)
Left shoulder pain, unspecified chronicity	62	0.5% (0.4%, 0.7%)
Pain in joint, ankle and foot	61	0.5% (0.4%, 0.7%)
Decreased range of motion of ankle	60	0.5% (0.4%, 0.7%)
Knee pain, left	60	0.5% (0.4%, 0.7%)
Acute pain of right shoulder	58	0.5% (0.4%, 0.6%)
Chronic pain of both knees	58	0.5% (0.4%, 0.6%)
Shoulder weakness	57	0.5% (0.4%, 0.6%)
Right elbow pain	56	0.5% (0.4%, 0.6%)
Bilateral hip pain	52	0.5% (0.3%, 0.6%)
DJD (degenerative joint disease) of knee	52	0.5% (0.3%, 0.6%)
Right ankle pain, unspecified chronicity	51	0.4% (0.3%, 0.6%)
Left ankle pain, unspecified chronicity	49	0.4% (0.3%, 0.5%)
Acute pain of left shoulder	48	0.4% (0.3%, 0.5%)
Achilles tendonitis	47	0.4% (0.3%, 0.5%)
Low back pain	47	0.4% (0.3%, 0.5%)
Pain, joint, shoulder region, left	47	0.4% (0.3%, 0.5%)
Shoulder pain, left	47	0.4% (0.3%, 0.5%)
Left shoulder pain	46	0.4% (0.3%, 0.5%)
Shoulder pain, right	46	0.4% (0.3%, 0.5%)
Acute left ankle pain	42	0.4% (0.3%, 0.5%)
Decreased strength of lower extremity	39	0.3% (0.2%, 0.4%)
Lateral epicondylitis of elbow	39	0.3% (0.2%, 0.4%)
Patellofemoral stress syndrome	37	0.3% (0.2%, 0.4%)
Plantar fasciitis	37	0.3% (0.2%, 0.4%)
Acute right ankle pain	36	0.3% (0.2%, 0.4%)
Knee instability, right	36	0.3% (0.2%, 0.4%)
Right calf pain	34	0.3% (0.2%, 0.4%)
Right leg pain	33	0.3% (0.2%, 0.4%)
Achilles tendon pain	30	0.3% (0.2%, 0.4%)
Bilateral knee pain	30	0.3% (0.2%, 0.4%)
Decreased range of motion of right ankle	30	0.3% (0.2%, 0.4%)
Decreased strength involving knee joint	30	0.3% (0.2%, 0.4%)
Hip pain, left	30	0.3% (0.2%, 0.4%)
Right thigh pain	30	0.3% (0.2%, 0.4%)
Knee instability, left	28	0.2% (0.2%, 0.3%)
Pain in right shin	28	0.2% (0.2%, 0.3%)
Rotator cuff syndrome	28	0.2% (0.2%, 0.3%)
Decreased range of motion	27	0.2% (0.1%, 0.3%)
Decreased range of motion of left ankle	27	0.2% (0.1%, 0.3%)
Scapular dyskinesis	27	0.2% (0.1%, 0.3%)
Elbow pain	26	0.2% (0.1%, 0.3%)

Heel pain, bilateral	26	0.2% (0.1%, 0.3%)
Knee joint pain	26	0.2% (0.1%, 0.3%)
Pain, joint, ankle and foot, right	26	0.2% (0.1%, 0.3%)
Left elbow pain	25	0.2% (0.1%, 0.3%)
Pain of left calf	25	0.2% (0.1%, 0.3%)
Chondromalacia of patella	24	0.2% (0.1%, 0.3%)
Chronic pain of right ankle	24	0.2% (0.1%, 0.3%)
Gait abnormality	24	0.2% (0.1%, 0.3%)
Left ankle pain	24	0.2% (0.1%, 0.3%)
Left leg pain	24	0.2% (0.1%, 0.3%)
Limitation of joint motion	24	0.2% (0.1%, 0.3%)
Disorders of bursae and tendons in shoulder region, unspecified	23	0.2% (0.1%, 0.3%)
IT band syndrome	23	0.2% (0.1%, 0.3%)
Inversion sprain of ankle	23	0.2% (0.1%, 0.3%)
Shoulder instability, right	23	0.2% (0.1%, 0.3%)
Ankle pain, left	22	0.2% (0.1%, 0.3%)
Bilateral anterior knee pain	22	0.2% (0.1%, 0.3%)
Hip pain, right	22	0.2% (0.1%, 0.3%)
Knee instability	22	0.2% (0.1%, 0.3%)
Left buttock pain	22	0.2% (0.1%, 0.3%)
Neck pain	22	0.2% (0.1%, 0.3%)
Pain in shin, right	22	0.2% (0.1%, 0.3%)
Pain, joint, ankle and foot, left	22	0.2% (0.1%, 0.3%)
Shoulder instability, left	22	0.2% (0.1%, 0.3%)
Calf pain	21	0.2% (0.1%, 0.3%)
Chronic pain of both shoulders	21	0.2% (0.1%, 0.3%)
Chronic pain of left ankle	21	0.2% (0.1%, 0.3%)
Decreased ROM of ankle	21	0.2% (0.1%, 0.3%)
Decreased ROM of right shoulder	21	0.2% (0.1%, 0.3%)
Impaired strength of hip muscles	21	0.2% (0.1%, 0.3%)
Pain in left shin	21	0.2% (0.1%, 0.3%)
Pain of knee joint on movement	21	0.2% (0.1%, 0.3%)
Patellar instability of left knee	21	0.2% (0.1%, 0.3%)
Right arm weakness	21	0.2% (0.1%, 0.3%)
Ankle stiffness, left	20	0.2% (0.1%, 0.3%)
Ankle stiffness, right	20	0.2% (0.1%, 0.3%)
Bilateral shoulder pain, unspecified chronicity	20	0.2% (0.1%, 0.3%)
Iliotibial band syndrome	20	0.2% (0.1%, 0.3%)
Knee effusion, right	20	0.2% (0.1%, 0.3%)
Left arm weakness	20	0.2% (0.1%, 0.3%)
Swelling of knee joint, unspecified laterality	20	0.2% (0.1%, 0.3%)
Adhesive capsulitis of shoulder	19	0.2% (0.1%, 0.2%)
Cervicalgia	19	0.2% (0.1%, 0.2%)

Decreased ROM of left knee	19	0.2% (0.1%, 0.2%)
Swelling	19	0.2% (0.1%, 0.2%)
Achilles tendinitis	18	0.2% (0.1%, 0.2%)
Weakness of right lower extremity	18	0.2% (0.1%, 0.2%)
Bilateral ankle pain, unspecified chronicity	17	0.1% (0.1%, 0.2%)
Coordination impairment	17	0.1% (0.1%, 0.2%)
Hamstring muscle strain	17	0.1% (0.1%, 0.2%)
Joint pain of ankle and foot, right	17	0.1% (0.1%, 0.2%)
Left thigh pain	17	0.1% (0.1%, 0.2%)
Patellar tendinitis	17	0.1% (0.1%, 0.2%)
Right ankle pain	17	0.1% (0.1%, 0.2%)
Decreased ROM of right knee	16	0.1% (0.1%, 0.2%)
Patellar instability of right knee	16	0.1% (0.1%, 0.2%)
Shoulder instability	16	0.1% (0.1%, 0.2%)
Back pain	15	0.1% (0.1%, 0.2%)
Impaired strength of shoulder muscles	15	0.1% (0.1%, 0.2%)
Pain, joint, hip, right	15	0.1% (0.1%, 0.2%)
Right ankle instability	15	0.1% (0.1%, 0.2%)
Right groin pain	15	0.1% (0.1%, 0.2%)
Thigh pain, musculoskeletal, left	15	0.1% (0.1%, 0.2%)
Bilateral foot pain	14	0.1% (0.1%, 0.2%)
Decreased ROM of left shoulder	14	0.1% (0.1%, 0.2%)
Knee pain, bilateral	14	0.1% (0.1%, 0.2%)
Lumbago	14	0.1% (0.1%, 0.2%)
Pain, joint, shoulder, left	14	0.1% (0.1%, 0.2%)
Pain, joint, shoulder, right	14	0.1% (0.1%, 0.2%)
Right buttock pain	14	0.1% (0.1%, 0.2%)
Thigh pain, musculoskeletal, right	14	0.1% (0.1%, 0.2%)
Acute postoperative pain of knee	13	0.1% (0.1%, 0.2%)
Ankle instability	13	0.1% (0.1%, 0.2%)
Ankle weakness	13	0.1% (0.1%, 0.2%)
Impingement syndrome of shoulder	13	0.1% (0.1%, 0.2%)
Knee effusion, left	13	0.1% (0.1%, 0.2%)
Pain of right heel	13	0.1% (0.1%, 0.2%)
Pain, joint, ankle, right	13	0.1% (0.1%, 0.2%)
Pain, joint, hip, left	13	0.1% (0.1%, 0.2%)
Right anterior knee pain	13	0.1% (0.1%, 0.2%)
Abnormal gait	12	0.1% (0%, 0.2%)
Bilateral low back pain without sciatica, unspecified chronicity	12	0.1% (0%, 0.2%)
DJD (degenerative joint disease) of hip	12	0.1% (0%, 0.2%)
Decreased strength of upper extremity	12	0.1% (0%, 0.2%)
Elbow pain, right	12	0.1% (0%, 0.2%)
Lateral epicondylitis	12	0.1% (0%, 0.2%)

Leg pain, posterior, left	12	0.1% (0%, 0.2%)
Leg pain, posterior, right	12	0.1% (0%, 0.2%)
Pain of left heel	12	0.1% (0%, 0.2%)
Pain of left hip joint	12	0.1% (0%, 0.2%)
Right arm pain	12	0.1% (0%, 0.2%)
Weakness of right leg	12	0.1% (0%, 0.2%)
Acute pain of both knees	11	0.1% (0%, 0.2%)
Ankle pain, right	11	0.1% (0%, 0.2%)
Arthralgia of both knees	11	0.1% (0%, 0.2%)
Bicipital tenosynovitis	11	0.1% (0%, 0.2%)
Decreased range of motion of left shoulder	11	0.1% (0%, 0.2%)
Decreased strength	11	0.1% (0%, 0.2%)
Hip joint pain	11	0.1% (0%, 0.2%)
Joint pain of ankle and foot, left	11	0.1% (0%, 0.2%)
Pain in the shins	11	0.1% (0%, 0.2%)
Pain of right hip	11	0.1% (0%, 0.2%)
Patellar tendonitis	11	0.1% (0%, 0.2%)
Rotator cuff (capsule) sprain	11	0.1% (0%, 0.2%)
Sprain of medial collateral ligament of knee	11	0.1% (0%, 0.2%)
Weakness of left hip	11	0.1% (0%, 0.2%)
Acute ankle pain, unspecified laterality	10	0.1% (0%, 0.1%)
Decreased range of motion of right shoulder	10	0.1% (0%, 0.1%)
Foot pain, left	10	0.1% (0%, 0.1%)
Foot pain, right	10	0.1% (0%, 0.1%)
Instability of left shoulder joint	10	0.1% (0%, 0.1%)
Left groin pain	10	0.1% (0%, 0.1%)
Leg pain, right	10	0.1% (0%, 0.1%)
Other joint derangement, not elsewhere classified, shoulder region	10	0.1% (0%, 0.1%)
SI (sacroiliac) joint dysfunction	10	0.1% (0%, 0.1%)
Swelling of joint of right knee	10	0.1% (0%, 0.1%)
Calf muscle weakness	9	0.1% (0%, 0.1%)
Chronic bilateral low back pain without sciatica	9	0.1% (0%, 0.1%)
Chronic right hip pain	9	0.1% (0%, 0.1%)
Decreased range of motion (ROM) of left knee	9	0.1% (0%, 0.1%)
Hip pain, bilateral	9	0.1% (0%, 0.1%)
Left ankle instability	9	0.1% (0%, 0.1%)
Leg pain, bilateral	9	0.1% (0%, 0.1%)
Muscle weakness of lower extremity	9	0.1% (0%, 0.1%)
Pain of both hip joints	9	0.1% (0%, 0.1%)
Recurrent left knee instability	9	0.1% (0%, 0.1%)
Swelling of joint of left knee	9	0.1% (0%, 0.1%)
Weakness of both hips	9	0.1% (0%, 0.1%)

Calf pain, right	8	0.1% (0%, 0.1%)
Chronic left hip pain	8	0.1% (0%, 0.1%)
Decreased range of motion of ankle, unspecified laterality	8	0.1% (0%, 0.1%)
Hip impingement syndrome	8	0.1% (0%, 0.1%)
Instability of knee joint	8	0.1% (0%, 0.1%)
Instability of right shoulder joint	8	0.1% (0%, 0.1%)
LBP (low back pain)	8	0.1% (0%, 0.1%)
Left anterior knee pain	8	0.1% (0%, 0.1%)
Medial tibial stress syndrome	8	0.1% (0%, 0.1%)
Pain in joint, forearm	8	0.1% (0%, 0.1%)
Pain in joint, upper arm	8	0.1% (0%, 0.1%)
Peroneal tendinitis	8	0.1% (0%, 0.1%)
Plantar fascial fibromatosis	8	0.1% (0%, 0.1%)
Post-operative pain	8	0.1% (0%, 0.1%)
Shoulder impingement	8	0.1% (0%, 0.1%)
Weakness of left lower extremity	8	0.1% (0%, 0.1%)
Weakness of shoulder	8	0.1% (0%, 0.1%)
Achilles bursitis or tendinitis	7	0.1% (0%, 0.1%)
Ankle joint pain	7	0.1% (0%, 0.1%)
Calf pain, left	7	0.1% (0%, 0.1%)
Chronic heel pain, left	7	0.1% (0%, 0.1%)
Chronic right SI joint pain	7	0.1% (0%, 0.1%)
Degenerative joint disease of knee	7	0.1% (0%, 0.1%)
Elbow pain, left	7	0.1% (0%, 0.1%)
Foot pain	7	0.1% (0%, 0.1%)
Foot pain, bilateral	7	0.1% (0%, 0.1%)
Great toe pain, left	7	0.1% (0%, 0.1%)
Groin pain	7	0.1% (0%, 0.1%)
Impingement syndrome of right shoulder	7	0.1% (0%, 0.1%)
Instability of shoulder joint	7	0.1% (0%, 0.1%)
Knee problem	7	0.1% (0%, 0.1%)
Knee swelling, right	7	0.1% (0%, 0.1%)
Medial epicondylitis of elbow	7	0.1% (0%, 0.1%)
Myofascial pain	7	0.1% (0%, 0.1%)
Other disorder of muscle, ligament, and fascia	7	0.1% (0%, 0.1%)
Other joint derangement, not elsewhere classified, lower leg	7	0.1% (0%, 0.1%)
Pain in joint of right elbow	7	0.1% (0%, 0.1%)
Pain in shin	7	0.1% (0%, 0.1%)
Patellofemoral pain syndrome	7	0.1% (0%, 0.1%)
Shoulder impingement syndrome	7	0.1% (0%, 0.1%)
Shoulder pain, bilateral	7	0.1% (0%, 0.1%)
Swelling of left knee joint	7	0.1% (0%, 0.1%)
Thoracic spine pain	7	0.1% (0%, 0.1%)

Trochanteric bursitis	7	0.1% (0%, 0.1%)
Weakness of left leg	7	0.1% (0%, 0.1%)
Acute left-sided low back pain without sciatica	6	0.1% (0%, 0.1%)
Ankle instability, left	6	0.1% (0%, 0.1%)
Ankle joint stiffness, right	6	0.1% (0%, 0.1%)
Anterior knee pain, left	6	0.1% (0%, 0.1%)
Anterior knee pain, right	6	0.1% (0%, 0.1%)
Biceps tendonitis	6	0.1% (0%, 0.1%)
Bilateral calf pain	6	0.1% (0%, 0.1%)
Bilateral chronic knee pain	6	0.1% (0%, 0.1%)
Decreased proprioception of joint of foot, left	6	0.1% (0%, 0.1%)
Decreased range of motion (ROM) of right knee	6	0.1% (0%, 0.1%)
Decreased range of motion of hip	6	0.1% (0%, 0.1%)
Hamstring strain	6	0.1% (0%, 0.1%)
Hip joint painful on movement, left	6	0.1% (0%, 0.1%)
Iliotibial band syndrome of left side	6	0.1% (0%, 0.1%)
Pain in joint of left elbow	6	0.1% (0%, 0.1%)
Pain in joint of left knee	6	0.1% (0%, 0.1%)
Pain of left hip	6	0.1% (0%, 0.1%)
Pain of right thigh	6	0.1% (0%, 0.1%)
Patellar dislocation	6	0.1% (0%, 0.1%)
Patellar pain	6	0.1% (0%, 0.1%)
Patellar subluxation	6	0.1% (0%, 0.1%)
Piriformis syndrome	6	0.1% (0%, 0.1%)
Plantar fasciitis, bilateral	6	0.1% (0%, 0.1%)
Recurrent right knee instability	6	0.1% (0%, 0.1%)
Sciatica	6	0.1% (0%, 0.1%)
Stress fracture of tibia or fibula	6	0.1% (0%, 0.1%)
Upper back pain	6	0.1% (0%, 0.1%)
Weakness of right hip	6	0.1% (0%, 0.1%)
Wrist pain	6	0.1% (0%, 0.1%)
ACL tear, left, initial encounter	5	0% (0%, 0.1%)
Achilles tendinitis of left lower extremity	5	0% (0%, 0.1%)
Acute bilateral ankle pain	5	0% (0%, 0.1%)
Acute bilateral low back pain without sciatica	5	0% (0%, 0.1%)
Acute post-operative pain	5	0% (0%, 0.1%)
Ankle sprain	5	0% (0%, 0.1%)
Biceps tendinitis on right	5	0% (0%, 0.1%)
Biceps tendinopathy	5	0% (0%, 0.1%)
Bilateral elbow joint pain	5	0% (0%, 0.1%)
Bilateral shoulder pain	5	0% (0%, 0.1%)
Chronic pain of right hip	5	0% (0%, 0.1%)
DJD (degenerative joint disease), ankle and foot	5	0% (0%, 0.1%)

Decreased muscle strength	5	0% (0%, 0.1%)
Decreased proprioception of joint of foot, right	5	0% (0%, 0.1%)
Decreased range of motion of left knee	5	0% (0%, 0.1%)
Groin pain, right	5	0% (0%, 0.1%)
Hip joint painful on movement, right	5	0% (0%, 0.1%)
Hypertrophy, fat pad, infrapatellar	5	0% (0%, 0.1%)
Impaired proprioception	5	0% (0%, 0.1%)
Instability of knee joint, left	5	0% (0%, 0.1%)
Instability of right knee joint	5	0% (0%, 0.1%)
Left arm pain	5	0% (0%, 0.1%)
Left-sided low back pain with left-sided sciatica, unspecified chronicity	5	0% (0%, 0.1%)
Left-sided low back pain without sciatica, unspecified chronicity	5	0% (0%, 0.1%)
Leg weakness, bilateral	5	0% (0%, 0.1%)
Muscular pain	5	0% (0%, 0.1%)
Musculoskeletal thigh pain, left	5	0% (0%, 0.1%)
Neck pain on left side	5	0% (0%, 0.1%)
Pain in joint of right shoulder region	5	0% (0%, 0.1%)
Pain in left lower leg	5	0% (0%, 0.1%)
Pain of right shoulder joint on movement	5	0% (0%, 0.1%)
Patellar instability	5	0% (0%, 0.1%)
Patellar instability, left	5	0% (0%, 0.1%)
Right knee DJD	5	0% (0%, 0.1%)
Sacral dysfunction	5	0% (0%, 0.1%)
Sacroiliac joint dysfunction	5	0% (0%, 0.1%)
Shoulder pain, acute, left	5	0% (0%, 0.1%)
Strain of hip flexor	5	0% (0%, 0.1%)
Swelling of ankle joint, unspecified laterality	5	0% (0%, 0.1%)
Swelling of right knee joint	5	0% (0%, 0.1%)
Tibial plateau fracture	5	0% (0%, 0.1%)

1,066 ICD codes suppressed to ensure patients remain deidentied due to <5 patients having the ICD code documented