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Characteristics of Patient Encounters for Athletic Training Students During Clinical Education: A Report From the Association for Athletic Training Education Research Network

Cailee E. Welch Bacon, PhD, ATC*†; Julie M. Cavallario, PhD, ATC‡; Stacy E. Walker, PhD, ATC§; R. Curtis Bay, PhD||; Bonnie L. Van Lunen, PhD, ATC‡

*Department of Athletic Training, ||Department of Interdisciplinary Health Sciences, and †School of Osteopathic Medicine in Arizona, A.T. Still University, Mesa; ‡College of Health Sciences, Old Dominion University, Norfolk, VA; §School of Kinesiology, Ball State University, Muncie, IN

Context: To enhance the quality of patient care, athletic training students (ATSs) should experience a wide variety of clinical practice settings, interact with diverse patient populations, and engage with patients who have a wide variety of conditions. It is unclear in what ways, if any, ATSs have diverse opportunities during clinical experiences.

Objective: To describe the characteristics of patient encounters (PEs) ATSs engaged in during clinical experiences.

Design: Multisite panel design.

Setting: Twelve professional athletic training programs (5 bachelor's, 7 master's).

Patients or Other Participants: A total of 363 ATSs from the athletic training programs that used E*Value software to document PEs during clinical experiences.

Main Outcome Measure(s): During each PE, ATSs were asked to log the clinical site at which the PE occurred (*college or university, secondary school, clinic,* or *other*), the procedures performed during the PE (eg, knee evaluation, lower leg flexibility or range of motion, cryotherapy), and the patient's diagnosis, with the *International Classification of Diseases, Tenth Revision* code (eg, S83.512A knee sprain, anterior cruciate ligament).

Results: A total of 30 630 PEs were entered by 338 ATSs across 278 unique clinical settings. More than 80% of PEs occurred in college or university and secondary school settings. More than half of the diagnoses were categorized as affecting the lower body region. Examination and evaluation procedures and application of therapeutic modality procedures each contributed approximately 27% of procedures.

Conclusions: It was surprising that ATSs were not gaining experience in all clinical practice settings in which athletic trainers commonly practice. Our data suggest that students may be consigned to working with patients who have more frequently occurring injuries, which may not prepare them for the realities of autonomous clinical practice. These findings indicate that directed efforts are needed to ensure that ATSs are provided opportunities to engage with diverse patient populations who have a variety of conditions in an array of clinical site types during their clinical experiences.

Key Words: clinical experience, clinical site, diverse patient populations, athletic training services

Key Points

- Three-quarters of patient encounters logged by athletic training students occurred within the college or university and secondary school settings, yet as of 2021, only 43% of certified athletic trainers were employed in these settings.
- The patient population demographics, percentages of diagnoses managed, and percentages of procedures performed by athletic training students in this study did not align with the available evidence on the practice patterns of athletic trainers, suggesting that the patient encounters students engage in during clinical experiences may not adequately prepare them for clinical practice.
- Widespread patient-encounter tracking provides a multitude of benefits, including the ability to (1) conduct quality improvement initiatives to assess the patient populations with whom students can engage and (2) evaluate the need to incorporate other clinical education opportunities, such as standardized patients and simulation scenarios.
- Athletic training students can also use patient-encounter tracking to identify personal strengths and weaknesses to guide future professional development as well as to create a patient care portfolio that can be used during the employment process to demonstrate strengths in managing a given patient population.

Across health professions, clinical education is included to promote student learning through direct patient contact. Clinical education has served as the criterion standard for health care education programs to allow for clinical decision-making opportunities.[1,2] Early patient interactions in health care education

are beneficial in helping to encourage active roles, bringing theory taught in the classroom into clinical practice and building students' confidence.[3–6] Models of clinical education that encompass components such as the site type, preceptor-to-student ratio, and timing when it occurs in the curriculum vary widely, and no singular model has proven to be superior thus far.[7]

In athletic training, clinical experiences have been identified as opportunities for students to have realistic and meaningful opportunities to apply the knowledge and skills they have acquired in the classroom.[1] The authenticity of patient interactions and the existence of a positive, realistic learning environment have been lauded as 2 of the many pedagogical benefits of athletic training clinical education for decades.[1,8] During this time, however, many changes have occurred to clinical experience requirements in athletic training education. Students are now required to have sufficient clinical experience, under the supervision of an athletic trainer (AT) or physician, to gain appreciable skills in the treatment of emergent, behavioral health, musculoskeletal, neurologic, endocrine, dermatologic, cardiovascular, respiratory, and gastrointestinal conditions, among others.[9] Students are further expected to interact with patient panels that expose them to patients of various ages, genders, socioeconomic status, and levels of physical activity and competition to prepare them for the complexity of athletic training practice.[9] Unfortunately, across most health professions, it is clear that despite the requirements for significant and diverse clinical experiences, a gap exists between the knowledge acquired in the classroom and the application of knowledge and skills in clinical experiences.[2]

Historically, athletic training students (ATSs) have measured their clinical experience in hours spent at clinical sites, though researchers[10,11] have demonstrated that, in some cases, more than half the time spent at clinical experience was unengaged, and the amount of time spent in clinical education did not reflect performance on the credentialing examination. In medical education, patient volume during residency, not the number of accumulated hours, was the influential aspect of clinical experiences relative to residents' scores on the standardized in-training examination, with each additional 50 patients encountered resulting in a predictable 1% increase in score.[12] Although the authors[10,11] of preliminary research have highlighted some beneficial aspects of clinical experiences, hours spent in clinical experience alone do not provide the information needed to demonstrate that students have gained experience with the necessary patient panels or health conditions.

Additional information is needed to explore the details related to the quality and quantity of patient encounters (PEs) for students and how these affect students' abilities to function autonomously as competent practitioners. Therefore, the purpose of our study was to examine the characteristics of PEs that occurred during professional ATSs' clinical experiences.

METHODS

Design

We used a multisite panel design to track PE data entered in the E*Value software platform (MedHub) by professional ATSs during 1.5 calendar years. Before the start of this study, institutional review board approval was obtained from the sponsoring institutions as well as from the individual participating institutions when warranted.

Participants

We recruited program directors from Commission of Accreditation of Athletic Training Education–accredited professional athletic training programs (ATPs), and to be eligible to participate, the following inclusion criteria had to be met: (1) used E*Value for at least 1 year before the study, (2) required students to track PEs (case logging) in E*Value during clinical experiences, and (3) have a Board of Certification (BOC) 3-year aggregate first-time pass rate of greater than 85%. Twelve of 15 eligible programs (5 bachelor's, 7 master's) agreed to participate.

Informed consent forms were signed by the program directors (n = 12), and 363 students from these programs volunteered to participate. All PEs recorded by students occurred as a part of their organized clinical experience each semester. Before data collection, 1 member of the research team worked with each program director to ensure that the Case Logs Module in the program's E*Value account included all of the necessary data fields.

Instrumentation

Data were collected via the Case Logs Module in E*Value. The Case Logs Module permits students to securely log data specific to clinical experiences, PEs, patient procedural opportunities (input related to procedures and *International Classification of Diseases, Tenth Revision* (ICD-10) codes [https://www.cms.gov/Medicare/Coding/ICD-10]), and use of the core competencies via custom questions. For each PE, students entered the type of encounter (ie, actual PE, practice encounter with peer or preceptor, didactic practice scenario, or immersive or nonimmersive), patient demographics (ie, gender [man, woman, transgender] and age [pediatric = <18 years old, adult = >18 years old]), the amount time spent with the patient (15-minute intervals from 0–120 minutes), the type of site at which the PE occurred (ie, college or university, secondary school, clinic, or other), the level of participation the student had in each encounter (ie, observed, assisted, or performed),[13,14] the procedures performed during the PE (eg, ankle injury evaluation, lower leg flexibility/range of motion, or cryotherapy), and the patient's diagnosis, with ICD-10 code (eg, S93.409A sprain or strain, ankle).

Procedures

Before data collection, both programmatic and student-level training sessions were conducted via video conference with each program to ensure that all stakeholders were comfortable with the study procedures and to answer any questions. These training sessions occurred during spring 2018 and fall 2018. Data collection began with only 3 programs in spring 2018 so we could be certain that all study procedures and processes were in place. No adjustments to the data-collection procedures were warranted after the spring 2018 semester, so we included the data from those 3 programs in the final analyses.

At the beginning of the 2018–2019 academic year, all 12 programs began data collection. The program director, clinical education coordinator, or both monitored student

Table 1. Athletic Training Student Exposures by Clinical Experience Setting and Program Type

Clinical Experience Setting	Program Type	Students, No.	Encounters, No.	Encounters by Program Type, %
College or university	Undergraduate	126	3868	72.0
	Graduate	179	16 202	64.1
Secondary school	Undergraduate	45	1228	22.8
	Graduate	131	7115	28.2
Clinic	Undergraduate	29	262	4.9
	Graduate	52	1360	5.4
Other	Undergraduate	7	17	0.3
	Graduate	32	572	2.3

data entry in E*Value and provided reminders to students throughout each semester. Data were downloaded and transferred to the research team every 2 weeks during the year. After the study period (spring 2019), participating programs received a research study honorarium. A detailed description of the study procedures has been published.[14]

Data Analysis

Data entered for all PEs were uploaded into SPSS (version 27; IBM Corp) for analysis. Summary statistics, including means ± SDs, counts, and percentages, were tabulated for the various PE variables. During data analysis, diagnoses and procedures were further reduced into categories. For the diagnoses, each diagnostic code was separated into 1 of 6 categories based on the body region. Because participating programs were permitted to add procedural options for students to record in E*Value, we used a general inductive approach to align the programmatic procedural options with the original 70 procedures provided to all participating programs. During this process, 414 recorded procedures were removed from data analysis because they described an event that, while important for clinical experiences, did not align with providing patient care (eg, *documentation of PE*, *conversation with preceptor about PE*). Finally, each procedure was placed in 1 of 5 categories based on the thematic procedural area.

RESULTS

Data on 30 630 PEs were entered by 338 ATSs across 278 unique clinical experience settings (149 college or university sites, 95 secondary school sites, 23 clinic sites, and 11 other sites) from the 12 participating programs between the beginning of spring 2018 and the end of spring 2019. Demographic variables of the participating programs have been published.[14]

Characteristics of the Clinical Experiences

More than half of the reported PEs occurred in the college or university setting (n = 20 070, 65%), followed by the secondary school setting (n = 8343, 27.2%), clinic (n = 1622, 5.3%), and other (n = 589, 1.9%) settings; missing = 6 (Table 1). A total of 10 999 PEs (35.9%) occurred during immersive clinical experiences, and 274 students (81.1%) recorded at least 1 encounter during an immersive experience, while 18 228 PEs (59.5%) occurred during nonimmersive clinical experiences (1403 missing), and 241 students (71.3%) recorded at least 1 encounter during a nonimmersive experience. Slightly more than half of the PEs were supervised by a male preceptor (n = 16 472, 53.8%) compared with 14 109 PEs (46.1%) supervised by a female preceptor (49 missing).

Characteristics of the PEs

Most PEs recorded were *performed* (n = 21 801, 71.2%) by the ATS, followed by *assisted* (n = 5053, 16.5%) and *observed* (n = 3669, 12.0%); missing = 107. Patient gender was 58.8% men (n = 17 990) and 41.2% women (n = 12 630); transgender = 1, missing = 9, with 27.5% of PEs being pediatric cases (n = 8418) and 72.5% being adult cases (n = 22 205); missing = 7. More than half (n = 18 021, 58.8%) of the encounters recorded were 1 to 15 minutes long; missing = 107 (Figure 1).

Slightly more than 24 500 diagnoses were reported across all PEs recorded (1.2 ± 0.65 diagnoses per encounter). The lower extremity body region accounted for more than half of all diagnoses (57.6%; n = 14 144) and nonorthopaedic diagnoses for the least (3.0%, n = 734; Figure 2). The most common diagnoses were ankle sprain or strain (10.5%, n = 2573), low back pain (4.4%, n = 1069), and knee sprain anterior cruciate ligament (4.3%, n = 1062). The 5 most frequently reported diagnoses per body region by clinical experience setting are displayed in Table 2.

A total of 40 853 patient care procedures were recorded during the 30 630 PEs (1.4 ± 1.1 procedures per encounter). The evaluation and examination procedural category accounted for the most procedures (n = 11 189, 27.4%), closely followed by the application of therapeutic modality category (n = 11 043, 27.0%) and care, treatment, and rehabilitation category (n = 10 388, 25.4%; Figure 3). The most frequent procedures were knee or thigh rehabilitation (n = 3201, 7.8%), massage (n = 3138, 7.7%), and cryotherapy (n = 2933, 7.2%). The 5 most frequently reported procedures per procedural type category by clinical experience setting are shown in Table 3.

DISCUSSION

Participants experienced more than 90% of all PEs in collegiate or university and secondary school settings, regardless of whether the experience was immersive or nonimmersive. Patient diagnoses were similar between the collegiate or university and secondary school settings, and although slight variations existed in the procedures performed in the 2 settings, participants logged relatively homogeneous encounters. The lack of diversity among clinical site settings may affect the types of patients treated during clinical experiences, which is concerning if the goal is to prepare ATSs to treat a wide variety of patients on entering the profession.

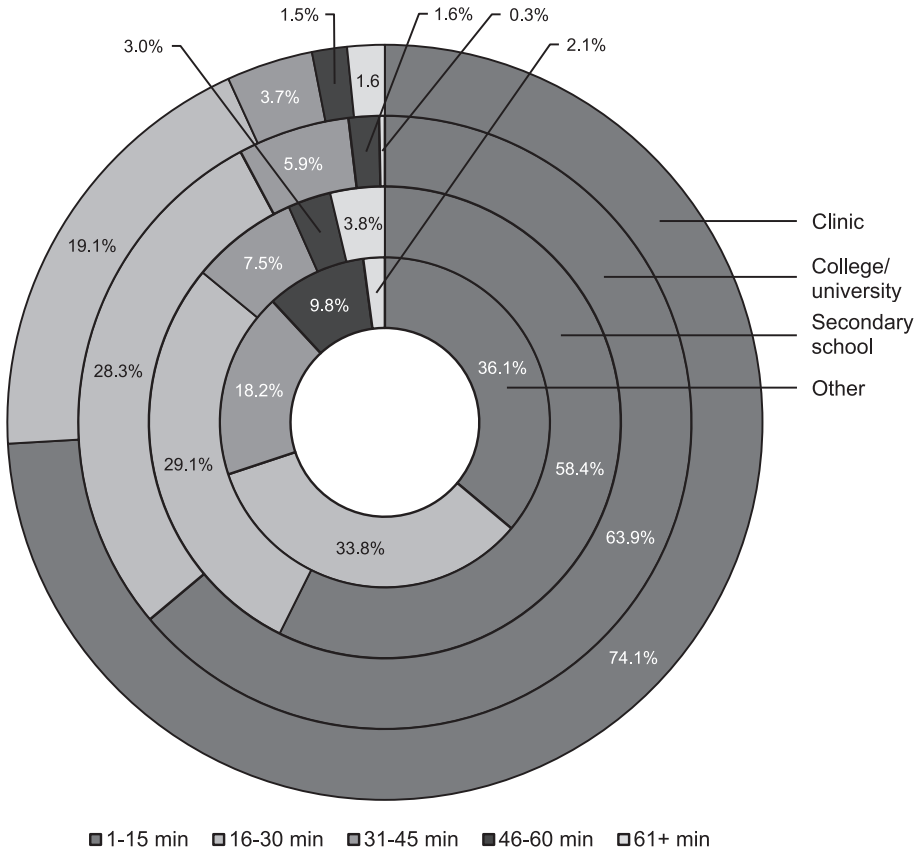

Figure 1. Length of patient encounters reported by setting (%).

Clinical Experience Practice Settings

The BOC tracks the breakdown of all professional settings in which certified ATs are employed. As of December 2021, only 43% of BOC–certified ATs practiced clinically in either the collegiate or university or secondary school settings (BOC, email communication, December 2021). However, three-quarters of the PEs logged by our participants occurred in these 2 practice settings. Other practice settings, such as physician practices, rehabilitation clinics, performing arts, or industrial settings, may offer a much wider range of patient ages and increased exposure to nonsport patient populations and associated conditions, and most importantly, may offer opportunities to engage in care of patients with comorbidities, polypharmacy, or other lifelong conditions that clinicians treating patients in these settings need.[9] Our findings indicate that students might not be gaining enough experience in the clinical settings in which they may ultimately go on to practice after completing their professional education. These results suggest the need to deeply reevaluate the clinical education opportunities provided to students as well as the patient characteristics those clinical education opportunities should involve.

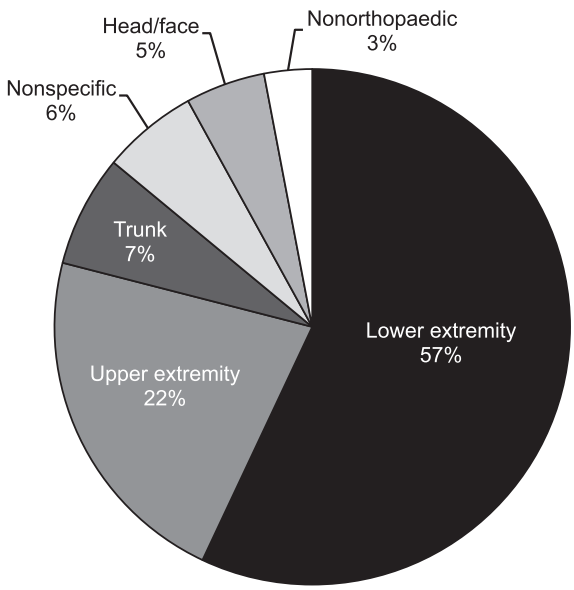

Figure 2. Diagnoses reported by body region (%).

In 2017, the Excellence in Physical Therapist Education Task Force noted that, due to the consistent evidence that physical therapists were ill-prepared to meet evolving societal needs on completion of their entry-level degree preparation, physical therapy clinical education practices needed reform.[15] However, the Task Force also noted that little incentive existed for programs to reform their clinical education structure if licensing examination performance continued to be the only universal measure of effective education and such programs continue to have high rates of graduate licensure success.[15] Furthermore, the report noted that many physical therapy clinical education models have not been updated during the processes of degree elevation, which likely contributes to program graduates who are unable to manage the care of patients across the lifespan.[15] It seems highly plausible, based on the lack of variety

Table 2. Top 5 Diagnoses Reported Per Body Region by Clinical Experience Setting[a] Continued on Next Page

	Diagnosis (ICD-10 Code)							
	Overall (n = 24559)		College or University (n = 15926)		Secondary School (n = 6594)		Clinic (n = 1787)	
Body Region		No. (%)		No. (%)		No. (%)		No. (%)
Upper extremity	Shoulder pain, unspecified (M25.519)	980 (18.4)	Shoulder pain, unspecified (M25.519)	686 (19.4)	Shoulder pain, unspecified (M25.519)	234 (17.3)	Shoulder pain, unspecified (M25.519)	53 (13.5)
	Labral tear, shoulder (S43.439A)	416 (7.8)	Labral tear, shoulder (S43.439A)	345 (9.8)	Sprain or strain, hand or finger (S63.90XA)	129 (9.5)	Labral tear, shoulder (S43.439A)	37 (9.4)
	Sprain or strain, hand or finger (S63.90XA)	365 (6.9)	Sprain or strain, hand or finger (S63.90XA)	225 (6.4)	Sprain or strain, wrist, unspecified (S63.509A)	84 (6.2)	Sprain or strain, rotator cuff (S43.429A)	22 (5.6)
	Sprain or strain, elbow, unspecified (S56.919A)	283 (5.3)	Sprain or strain, elbow, unspecified (S56.919A)	220 (6.2)	Unspecified open wound of the upper limb (S41.009A)	67 (4.9)	Impingement syndrome, shoulder (M75.40)	21 (5.4)
	Sprain or strain, neck (S13.4XXA)	279 (5.2)	Impingement syndrome, shoulder (M75.40)	205 (5.8)	Sprain or strain, neck (S13.4XXA)	60 (4.4)	Arthritis, shoulder (M13.819)	16 (4.1)
Lower extremity	Sprain or strain, ankle (S93.409A)	2573 (18.2)	Sprain or strain, ankle (S93.409A)	1572 (16.7)	Sprain or strain, ankle (S93.409A)	939 (24.7)	Sprain, ACL, knee (S83.512A)	149 (19.0)
	Sprain, ACL, knee (S83.512A)	1062 (7.5)	Sprain, ACL, knee (S83.512A)	693 (7.4)	Knee pain (M25.569)	258 (6.8)	Knee pain (M25.569)	67 (8.5)
	Knee pain (M25.569)	816 (5.8)	Hamstring tendinitis (M77.9)	585 (6.2)	Sprain, ACL, knee (S83.512A)	220 (5.8)	Sprain or strain, ankle (S93.409A)	49 (6.3)
	Sprain or strain, hip or groin (S73.109A)	770 (5.4)	Sprain or strain, unspecified, distal thigh (S83.90XA)	524 (5.6)	Sprain or strain, hip or groin (S73.109A)	216 (5.7)	Meniscal tear, medial, old, knee (M23.205)	35 (4.5)
	Hamstring tendinitis (M77.9)	720 (5.1)	Sprain or strain, hip or groin (S73.109A)	522 (5.5)	Sprain or strain, unspecified, distal thigh (S83.90XA)	170 (4.5)	Arthritis, knee (M13.869)	31 (4.0)
Head or face	Concussion (S06.0X0A)	674 (59.0)	Concussion (S06.0X0A)	279 (54.5)	Concussion (S06.0X0A)	356 (64.6)	Concussion (S06.0X0A)	36 (50.7)
	Other and unspecified open wound of head (S01.90XA)	140 (12.3)	Other and unspecified open wound of head (S01.90XA)	80 (15.6)	Other and unspecified open wound of head (S01.90XA)	57 (10.3)	Otitis media (H66.90)	11 (15.5)
	Concussion, mental confusion without loss of consciousness (S06.0X0A)	99 (8.7)	Concussion, mental confusion without loss of consciousness (S06.0X0A)	42 (8.2)	Concussion, mental confusion without loss of consciousness (S06.0X0A)	50 (9.1)	Contusion of face, scalp, and neck (S00.93XA)	6 (8.5)
	Contusion of face, scalp, and neck (S00.93XA)	83 (7.3)	Contusion of face, scalp, and neck (S00.93XA)	41 (8.0)	Contusion of face, scalp, and neck (S00.93XA)	34 (6.2)	Concussion, mental confusion without loss of consciousness (S06.0X0A)	5 (7.0)
	Postconcussion syndrome (F07.81)	35 (3.1)	Postconcussion syndrome (F07.81)	17 (3.3)	Postconcussion syndrome (F07.81)	17 (3.1)	Concussion, with loss of consciousness (S06.0X9A)	4 (5.6)
Trunk	Pain, low back (M54.5)	1069 (59.6)	Pain, low back (M54.5)	820 (62.9)	Pain, low back (M54.5)	195 (51.0)	Pain, low back (M54.5)	42 (47.7)
	Sprain or strain, unspecified, back (S23.9XXA)	321 (17.9)	Sprain or strain, unspecified, back (S23.9XXA)	226 (17.3)	Sprain or strain, unspecified, back (S23.9XXA)	86 (22.5)	Arthralgia pelvis, hip, or thigh (M25.559)	7 (8.0)
	Contusion, chest or rib (S20.219A)	99 (5.5)	Disc herniation, unspecified (M51.9)	74 (5.7)	Contusion, chest or rib (S20.219A)	43 (11.3)	Scoliosis (M41.20)	7 (8.0)
	Disc herniation, unspecified (M51.9)	82 (4.6)	Contusion, chest or rib (S20.219A)	51 (3.9)	Contusion, back (S30.0XXA)	17 (4.5)	Spinal stenosis (M48.00)	5 (5.7)
	Arthralgia pelvis, hip, or thigh (M25.559)	55 (3.1)	Arthralgia pelvis, hip, or thigh (M25.559)	33 (2.5)	Arthralgia pelvis, hip, or thigh (M25.559)	14 (3.7)	Contusion, chest or rib (S20.219A)	5 (5.7)

Table 2. Continued From Previous Page

	Diagnosis (ICD-10 Code)							
	Overall (n = 24 559)		College or University (n = 15 926)		Secondary School (n = 6594)		Clinic (n = 1787)	
Body Region		No. (%)		No. (%)		No. (%)		No. (%)
Nonorthopaedic	Headache, general (R51)	128 (17.4)	Headache, general (R51)	62 (16.1)	Headache, general (R51)	50 (24.9)	Upper respiratory infection, acute, NOS (J06.9)	36 (25.9)
	Upper respiratory infection, acute, NOS (J06.9)	81 (11.0)	Upper respiratory infection, acute, NOS (J06.9)	39 (10.1)	Heat exhaustion, unspecified (T67.5XXA)	32 (15.9)	Dermatitis, unspecified (L25.9)	21 (15.1)
	Dehydration (E86.0)	63 (8.6)	Dehydration (E86.0)	35 (9.1)	Dehydration (E86.0)	25 (12.4)	Headache, general (R51)	15 (10.8)
	Heat exhaustion, unspecified (T67.5XXA)	59 (8.0)	Influenza (J10.1)	29 (7.5)	Asthma (J45.909)	20 (10.0)	Influenza (J10.1)	9 (6.5)
	Asthma (J45.909)	46 (6.3)	Heat exhaustion, unspecified (T67.5XXA)	26 (6.7)	Shortness of breath (R06.02)	18 (9.0)	Shortness of breath (R06.02)	7 (5.0)
Nonspecific	Encounter for other general examination (Z00.8)	726 (51.1)	Encounter for other general examination (Z00.8)	398 (52.0)	Encounter for other general examination (Z00.8)	159 (51.8)	Encounter for other general examination (Z00.8)	161 (51.4)
	Encounter for general examination without complaint, suspected, or reported diagnosis for general adult health examination without abnormal findings (Z00.00)	173 (12.2)	Encounter for screening, unspecified (Z13.9)	79 (10.3)	Encounter for general examination without complaint, suspected, or reported diagnosis for general adult health examination without abnormal findings (Z00.00)	31 (10.1)	Encounter for general examination without complaint, suspected, or reported diagnosis for general adult health examination without abnormal findings (Z00.00)	88 (28.1)
	Encounter for screening, unspecified (Z13.9)	106 (7.5)	Encounter for general examination without complaint, suspected, or reported diagnosis for general adult health examination without abnormal findings (Z00.00)	71 (9.3)	Encounter for general examination without complaint, suspected, or reported diagnosis for general child health examination without abnormal findings (Z00.129)	22 (7.2)	Encounter for general examination without complaint, suspected, or reported diagnosis for general adult health examination with abnormal findings (Z00.01)	27 (8.6)
	Encounter for general examination without complaint, suspected, or reported diagnosis for general adult health examination with abnormal findings (Z00.01)	67 (4.7)	Encounter for general examination without complaint, suspected, or reported diagnosis for general adult health examination with abnormal findings (Z00.01)	36 (4.7)	Encounter for screening, unspecified (Z13.9)	17 (5.5)	Encounter for screening for musculoskeletal disorder (Z13.82)	10 (3.2)
	Encounter for screening for musculoskeletal disorder (Z13.82)	52 (3.7)	Encounter for screening for musculoskeletal disorder (Z13.82)	28 (3.7)	Encounter for screening for musculoskeletal disorder (Z13.82)	14 (4.6)	Encounter for screening, unspecified (Z13.9)	8 (2.6)

Abbreviations: ACL, anterior cruciate ligament; ICD-10, *International Classification of Diseases*, Tenth Revision (https://www.cms.gov/Medicare/Coding/ICD10); NOS, not otherwise specified.

[a] A total of 252 patient encounters did not identify the clinical experience setting and were therefore removed from this analysis.

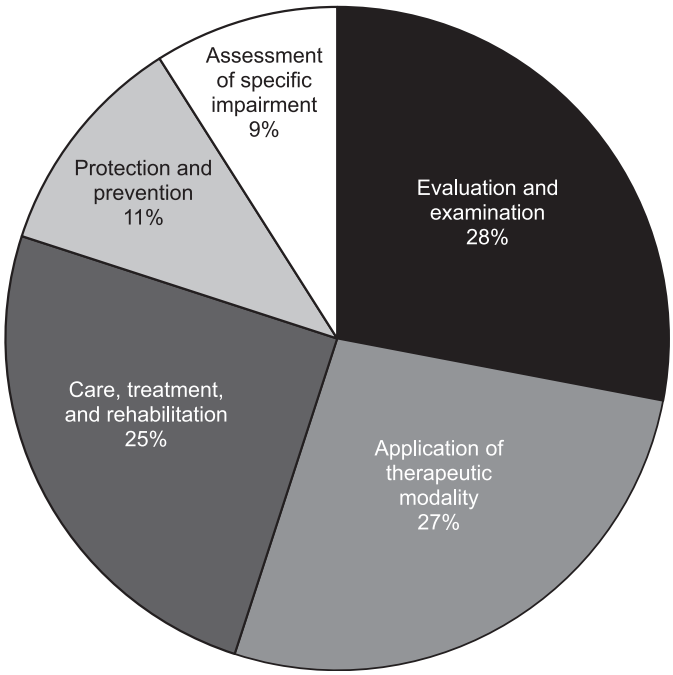

Figure 3. Procedures reported by procedural type category (%).

evident in the clinical practice sites at which our participants were placed, that despite the shift to graduate-level professional athletic training education, programs might not have made significant changes to the model of clinical education, specifically relying on the clinical education sites primarily used during undergraduate education.

The "2020 Standards for Accreditation of Professional Athletic Training Programs"[16] from the Commission on Accreditation of Athletic Training Education requires that programs provide clinical practice opportunities for students in settings where ATs commonly practice but falls short of requiring specific site types, which is consistent with other health care profession clinical education accreditation standards.[17,18] The lack of required clinical settings likely contributes to programs continuing to rely on a homogeneous clinical experience site rotation. Program administrators, although not mandated to exceed the minimal accreditation requirements, should consider the totality of the athletic training clinical practice settings when identifying the clinical site opportunities that would best prepare students for the multifarious practice settings available on completion of their professional education. Furthermore, the combination of additional clinical practice setting opportunities in conjunction with tracking interactions would increase the ability of program administrators to provide customized learning opportunities to prepare students to meet the needs of diverse patient populations.

Patient Diagnoses

Our participants managed lower extremity injuries during more than half of their PEs. Previous researchers in athletic training indicated that concussion diagnoses accounted for 12% of diagnoses, but only 5% of the PEs our participants managed were associated with head or face diagnoses.[19] Additionally, lower extremity diagnoses accounted for about a quarter of those in athletic training practice, yet they represented 57% of the diagnoses recorded by our participants.[19] Data examining the incidence of injury in pediatric and adolescent populations support the more frequent occurrence of lower extremity injury, consistent with our findings; however, those findings showed that lower extremity injury prevalence in patients 10 to 19 years of age ranged from 38% to 51% of injuries, which was still less than that reported by our participants.[20] The same authors found the prevalence of upper extremity injury in patients 10 to 19 years of age ranged from 36% to 51%, far more often than recorded by our participants.[20] Our data suggest that students may be consigned to managing patients with more commonly occurring injuries, such as ankle sprains, and not as regularly included in the management of complex clinical cases, such as rotator cuff tears, concussions, or potentially more chronic health conditions. However, our methods did not require students to document all patient cases that occurred during their clinical experience; thus, we are unable to confirm this supposition.

When we examined the data by clinical site type, it was evident that students saw patients with similar diagnoses at collegiate or university and secondary school clinical sites for all body regions. Even in the clinic setting, lower extremity diagnoses were more than twice as frequent as upper extremity diagnoses. Yet PEs documented in a clinic were the only ones in which students gained experience treating long-term health conditions such as arthritis, spinal stenosis, and scoliosis. Our participants recorded only 16% of PEs at clinic sites. If rehabilitation clinics or physician practice settings were used more often in athletic training clinical education, students would gain considerable experience treating conditions across the lifespan.

Procedures Performed

Even though three-quarters of the PEs reported by our participants were in collegiate or university or secondary school settings, the procedures the students recorded did not necessarily align with the procedures performed by ATs in those settings. For example, Lam et al [20] noted that nearly half of all procedures performed by ATs in secondary school practice settings were evaluations or reevaluations; about one-quarter, therapeutic modality application; and 8%, prevention or protection (strapping).[21] We found that only 28% of the students' PEs involved evaluation and examination procedures; 27%, modality application; and 9%, prevention or protection. This comparison suggests that ATSs are relegated to carrying out low-level tasks, such as taping, bracing, and applying prescribed modalities, rather than being involved in the more critical-thinking and higher-level, decision-making tasks such as examination and diagnosis that are likely occurring at their clinical sites. To ensure that students gain the most from each clinical experience, PE tracking by ATPs could mitigate situations in which preceptors accept students with the intention of engaging them in roles other than those of an ATS. By doing so, program administrators will be able to see what students are doing at each site to make decisions about the effectiveness of the preceptor or value of the site for clinical experiences.

More than half (59%) of the reported PEs in our study fell within the range of 1 to 15 minutes in length. Standard

Table 3. Top 5 Procedures Reported per Procedural Type Category by Clinical Experience Setting[a]

	Setting							
	Overall (n = 40 853)		College or University (n = 26 477)		Secondary School (n = 11 868)		Clinic (n = 1866)	
Procedural Type		No. (%)		No. (%)		No. (%)		No. (%)
Protection and prevention	Ankle injury protection	1809 (40.4)	Ankle injury protection	901 (37.5)	Ankle injury protection	887 (45.6)	Knee injury protection	29 (26.6)
	Foot injury protection	443 (9.9)	Foot injury protection	305 (12.7)	Wrist injury protection	270 (13.9)	Injury or illness prevention	15 (13.8)
	Wrist injury protection	437 (9.8)	Injury or illness prevention	259 (10.8)	Hand or finger injury protection	167 (8.6)	Ankle injury protection	13 (11.9)
	Injury or illness prevention	377 (8.4)	Knee injury protection	194 (8.1)	Knee injury protection	145 (7.5)	Shoulder or upper arm injury protection	11 (10.1)
	Knee injury protection	372 (8.3)	Hand or finger injury protection	185 (7.7)	Foot injury protection	130 (6.7)	Hand or finger injury protection	10 (9.2)
Evaluation and examination	Ankle injury evaluation	1373 (12.3)	General medical evaluation	709 (11.8)	Ankle injury evaluation	611 (15.0)	General medical evaluation	334 (33.6)
	General medical evaluation	1333 (11.9)	Ankle injury evaluation	698 (11.6)	Concussion evaluation	452 (11.1)	Knee (tibiofemoral) joint injury evaluation	112 (11.3)
	Shoulder or upper arm injury evaluation	1019 (9.1)	Shoulder or upper arm injury evaluation	558 (9.3)	Shoulder or upper arm injury evaluation	360 (8.9)	Shoulder or upper arm injury evaluation	93 (9.3)
	Concussion evaluation	864 (7.7)	Knee (tibiofemoral) joint injury evaluation	468 (7.8)	Knee (tibiofemoral) joint injury evaluation	277 (6.8)	Knee (patellofemoral) joint injury evaluation	63 (6.3)
	Knee (tibiofemoral) joint injury evaluation	859 (7.7)	Lumbar spine or sacroiliac injury evaluation	428 (7.1)	Knee (patellofemoral) joint injury evaluation	266 (6.6)	Ankle injury evaluation	54 (5.4)
Assessment of specific impairment	Hip, thigh, or knee flexibility and range of motion	1853 (49.4)	Hip, thigh, or knee flexibility and range of motion	1299 (49.2)	Hip, thigh, or knee flexibility and range of motion	441 (49.3)	Hip, thigh, or knee flexibility and range of motion	95 (50.0)
	Lower leg flexibility and range of motion	677 (18.0)	Lower leg flexibility and range of motion	465 (17.6)	Lower leg flexibility and range of motion	184 (20.6)	Shoulder flexibility and range of motion	52 (27.4)
	Shoulder flexibility and range of motion	654 (17.4)	Shoulder flexibility and range of motion	451 (17.1)	Shoulder flexibility and range of motion	150 (16.8)	Lower leg flexibility and range of motion	22 (27.4)
	Trunk or neck flexibility and range of motion	231 (6.2)	Elbow or forearm flexibility and range of motion	169 (6.4)	Trunk or neck flexibility and range of motion	60 (6.7)	Elbow or forearm flexibility and range of motion	22 (11.6)
	Elbow or forearm flexibility and range of motion	211 (5.6)	Trunk or neck flexibility and range of motion	162 (6.1)	Elbow or forearm flexibility and range of motion	32 (3.6)	Trunk or neck flexibility and range of motion	10 (5.3)
Care, treatment, and rehabilitation	Knee or thigh rehabilitation	3201 (30.8)	Knee or thigh rehabilitation	2180 (30.7)	Knee or thigh rehabilitation	802 (29.3)	Knee or thigh rehabilitation	195 (43.2)
	Foot, ankle, or lower leg rehabilitation	2358 (22.7)	Foot, ankle, or lower leg rehabilitation	1588 (22.4)	Foot, ankle, or lower leg rehabilitation	693 (25.3)	Shoulder or upper arm rehabilitation	78 (17.3)
	Shoulder or upper arm rehabilitation	1471 (14.2)	Shoulder or upper arm rehabilitation	1119 (15.8)	Acute injury care	503 (18.4)	Foot, ankle, or lower leg rehabilitation	37 (8.2)
	Acute injury care	1310 (12.6)	Acute injury care	780 (11.0)	Shoulder or upper arm rehabilitation	260 (9.5)	Acute injury care	23 (5.1)
	Lower extremity injury care	574 (5.5)	Lower extremity injury care	397 (5.6)	Lower extremity injury care	151 (5.5)	Lower extremity injury care	23 (5.1)
Application of therapeutic modality	Massage	3138 (28.4)	Massage	2682 (32.1)	Cryotherapy	1042 (46.7)	Massage	98 (81.0)
	Cryotherapy	2933 (26.6)	Electrotherapy or electrical stimulation	1846 (22.1)	Electrotherapy or electrical stimulation	441 (19.8)	Ultrasound	7 (5.8)
	Electrotherapy or electrical stimulation	2297 (20.8)	Cryotherapy	1820 (21.8)	Massage	313 (14.0)	Cryotherapy	6 (5.0)
	Thermotherapy	1255 (11.4)	Ultrasound	942 (11.3)	Thermotherapy	253 (11.3)	Electrotherapy or electrical stimulation	3 (2.5)
	Ultrasound	1098 (9.9)	Thermotherapy	812 (9.7)	Ultrasound	116 (5.2)	Intermittent compression	3 (2.5)

[a] A total of 642 patient encounters did not identify the clinical experience setting and were removed from this analysis; 407 procedures were categorized as not relevant to patient care and were removed from this analysis.

evaluations may reasonably be conducted during 15-minute interactions; however, it seems likely that, if ATSs were truly being provided the opportunity to conduct rehabilitation programs, longer PE interactions would have been reported. A 2016 survey of physical therapists demonstrated that 99% of patient appointments were $\geq$30 minutes, with nearly half lasting 60 minutes.[21] About 25% of the reported procedures in our study fell into the care, treatment, and rehabilitation categories, but only 9.3% lasted long enough to account for a typical rehabilitation appointment ($\geq$30 minutes).

As noted previously, interactions that involve examination and diagnosis, modality application, or prevention or protection might be completed in $<$15 minutes. Still, in traditional medical facility treatment centers, patients typically expected PEs to last $\leq$20 minutes but described higher levels of satisfaction and perceived improved care when the provider spent more time with them.[22,23] Although ATSs can likely perform certain tasks relatively quickly, it is possible that this impedes their ability to comprehensively address patient-centered care.[14]

The link between the time spent with patients and the types of procedures performed most often suggests that ATSs are assigned to complete less complicated tasks that are quickly performed and likely require less comprehensive patient communication or clinical decision making. Athletic training students may not have been included in the more difficult clinical decision-making opportunities in which their preceptors engaged on a regular basis, which undoubtedly affected their ability to handle such cases on completion of their academic program. Researchers[24] observed that newly credentialed ATs faced challenges regarding their confidence and decision making during the first few months in practice. Additionally, the types of past clinical education experiences have been linked to the ease of the transition into clinical practice.[25]

If ATPs adopt widespread PE tracking, a multitude of benefits can result. First, program administrators could conduct quality improvement initiatives in their own program's clinical education by assessing the patient populations students can engage with and subsequently increase the variety of clinical experience site types to address student needs. Second, in the process of self-assessing their clinical education, program administrators can target additional clinical education options, such as standardized patients and simulation scenarios, to address patient populations or conditions to which students are not exposed during their clinical experiences. Third, the opportunity for students to use PE tracking data to develop patient care portfolios fosters their skills in self-assessing their professional performance and assists in identifying their strengths and weaknesses for future professional development plans. Students can also use patient care portfolios during the employment process to demonstrate their strengths with given patient populations when seeking employment in those settings.

LIMITATIONS AND FUTURE RESEARCH

Our results should be interpreted in the context of the study limitations. Despite efforts to support the understanding of the tool's reporting features, data collection relied on the accuracy of self-reported behaviors of ATSs during clinical experiences. Future investigators should consider triangulating student-reported PEs with preceptors to ensure the reliability of the logged information. Future researchers should also examine the relationship between student-reported PEs and their BOC examination results and perceived levels of confidence in their ability to practice autonomously.

CONCLUSIONS

Using PE logging, programs should be able to determine if students are truly prepared to enter autonomous practice in a variety of practice settings with a variety of patient types. Our current clinical education practices do not appear to be preparing students to practice in a variety of clinical settings, which may severely limit their opportunities to gain experience treating patients across the lifespan. Program administrators should consider revamping their current clinical education structure to include more variety in clinical sites, specifically ensuring that students experience sites outside of high school or collegiate sports. Student-developed patient portfolios would also help students and program administrators demonstrate the variety of patients treated by each student and ensure that students are well prepared to treat patients across the lifespan.

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Address correspondence to Cailee E. Welch Bacon, PhD, ATC, Department of Athletic Training and School of Osteopathic Medicine in Arizona, A.T. Still University, 5850 E Still Circle, Mesa, AZ 85206. Address email to cwelch@atsu.edu.