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A Descriptive Analysis of Patient Outcomes and Experiences at a Student-Run Athletic Training Clinic

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Context: The prevalence of student-run clinics is rising due to educational benefits and the ability to provide cost-effective care to underserved patients. Current literature on the effect of athletic training student-run clinics on patient outcomes and experiences is limited.

Objective: To explore patient-reported outcomes (PROs), patient experiences, and patient demographics in an athletic training student-run clinic.

Design: Mixed-methods study: cross-sectional survey with retrospective analysis of deidentified patient outcomes from November 2017–October 2021.

Setting: Athletic training student-run clinic.

Patients or Other Participants: A total of 388 patients from the university (ie, students and staff) and local community with a variety of musculoskeletal injuries.

Main Outcome Measure(s): Participants completed a packet to provide their responses to demographic items and PRO scales: Disablement in the Physically Active Scale Short Form-8, Numeric Pain Rating Scale, Patient-Specific Functional Scale, and Global Rating of Change Scale at 3 time points. They also completed an electronic patient experience survey after their final visit to the student-run clinic.

Results: Most participants reported clinically significant improvements across all PRO scales: an average improvement of 39.1% in pain, 39.3% in function, and 43.1% in quality of life in <11 days, on average. Furthermore, they described a high level of satisfaction with care and a globally positive experience at the student-run clinic.

Conclusions: Patients experienced clinically significant improvements in pain, function, disablement, and quality of life when receiving care from athletic training students at a student-run clinic. In addition, they indicated a high level of satisfaction with the care provided and a positive overall experience with an athletic training student-run clinic.

Key Words: injury, chronic pain, rehabilitation, education

Key Points

- Clinically significant improvements in pain occurred in 78.6% of participants with acute, 75.2% with subacute, 57.5% with persistent, and 52.1% with chronic injuries within 2 weeks, on average.
- Most participants with acute or subacute injuries reported clinically significant improvements in pain, function, disability, and quality of life in <14 days, on average, when treated by athletic training students.
- Our data are consistent with prior literature suggesting that student-run clinics benefit patients by providing cost-effective treatment to a community and students through beneficial learning opportunities.

Student-run clinics are a supplemental form of health care delivery that have the potential to also serve as an optimal learning environment for health professions students. Students in health professions majors or programs (eg, undergraduate, medical, chiropractic) typically gain experience performing patient examinations, therapeutic interventions, and other components of care under the direct supervision of credentialed clinicians (eg, physicians) in student-run clinics.[1,2] The use of student-run clinics has become more common to support student training in health professions education programs (eg, medical, chiropractic) because the experiences are thought to provide realistic context-based learning as well as opportunities to implement and evaluate effective interprofessional health care delivery, supply evidence-based patient care, and advocate for patient needs.[1,2]

Student-run clinic implementation has also been proposed to produce other benefits for student development and the local community. For example, clinic implementation may result in cost-effective care for underserved and underinsured patients[1,3] while offering students greater opportunities than comparable clinics to interact with diverse patient populations and those with preexisting conditions (eg, obesity, depression).[4] Thus, the use of student-run clinics in various health professions may help alleviate health care disparities in regions with underserved populations[1,5] while providing students with broader and more effective training experiences that can arguably better equip them with the skills and knowledge to care for patients.[1–5]

Although educational benefits and the potential to improve health care accessibility are valuable,[1,2,5] a comprehensive examination of student-run–clinic implementation is necessary. The types of patients who receive care in the clinic, the

quality of care and patient-reported outcomes experienced, and the patient-perceived experiences in student-run clinics are all important data for examining the effect of the clinics. Unfortunately, research assessments of student-run clinics are sparse. Investigators who examined student-run clinics in physical therapy and medical education reported high levels of patient satisfaction with provided care[2,6] and student supervision.[6] In a meta-analysis[2] of student-run clinics in medicine, patients noted comparable quality of care with "regular [insured] care."

General patient outcomes assessments in student-run clinics, as well as outcomes comparison between student and credentialed clinicians, are also lacking. Much of the patient outcomes research comparing clinicians and students has been limited to specific populations or clinics that are not truly student-run clinics. For example, retrospective analyses of patient outcomes in physical therapy indicated that student and professional care resulted in similar outcomes for rehabilitation after total knee[7] or total hip[8] arthroplasties. In contrast, a retrospective review[9] of a patient-outcomes database for a hospital outpatient rehabilitation center demonstrated that treatment from occupational and physical therapy students tended to produce less functional status improvement despite more visits (10.8 versus 9.1 visits) over more days (37.6 versus 27.2 days) than licensed therapists.

In athletic training, the literature on the patient demographics, patient satisfaction, and patient outcomes in student-run clinics is even more sparse. Recently, Berger Lebel et al[10] examined the outcomes of patients treated for low back, lower extremity, and upper extremity injuries by athletic therapy students and concluded that they experienced statistically significant improvements in self-reported function. The results were positive, but the study was limited by the sample size (n = 59), duration (11 months), patients included (eg, patients with chronic pain were excluded), and data collected (eg, Oswestry Disability Index, Lower Extremity Functional Scale, Disablement of the Arm, Shoulder and Hand).

With the potential increased use of student-run clinics in athletic training, it is important to study the implementation of these clinics. The lack of research in athletic training necessitates more information on student-run clinics, including the types of patients treated as well as the effects of student care on patient perceptions (eg, patient satisfaction) and patient outcomes across a larger and more diverse sample. Therefore, the purpose of our study was to explore patient demographics, as well as patient-reported outcomes and patient experiences, in an athletic training student-run clinic over a multiyear period. We hypothesized that students would provide care to a more diverse patient population in such a clinic than if they were in traditional clinical experience settings (ie, athletics model), whereas patients would report improved outcomes (ie, pain, function, disablement) and positive experiences with receiving care in a student-run clinic.

METHODS

Participants and Protocol Procedures

The project was approved by the institutional review board at the University of Idaho. Recruits were patients in an athletic training student-run clinic who provided oral and written consent to participate in the study. Patients who were minors provided assent, and their legal guardians provided consent. Participants acknowledged that the clinic was student run and focused on teaching, learning, and research; each recruit agreed to be treated by a student and to complete the outcomes packet so that their care could be evaluated at the initial visit. Volunteers were excluded if they did not consent to the care being supplied by a student, did not consent to the use of their deidentified patient data, or failed to complete the patient care instrumentation. Patients who did not consent to be involved in the study or who failed to complete the instrumentation continued to receive care in the student-run clinic.

Participation required the reporting of deidentified data via a paper outcomes survey packet at 3 visits and the option to complete an anonymous electronic patient-experience survey at the end of their patient care experience via Qualtrics (Qualtrics, LLC). The patient-outcomes survey packet consisted of a demographic questionnaire, the Disablement in the Physically Active Scale Short Form-8 (DPA SF-8), Numeric Pain Rating Scale (NPRS), Patient-Specific Functional Scale (PSFS), and Global Rating of Change Scale (GRoC). All deidentified data from the patient-outcomes packet were then input into Qualtrics by a staff member in the student-run clinic. Participants were classified in 1 of 4 groups on the basis of a priori definitions: acute injury, subacute injury, persistent injury, or chronic pain (Table 1). Data collection occurred from November 2017 through October 2021.

Table 1. Study Definitions, Terminology, and Classifications

Terminology	Definition[11–13,27]
Acute injury	A musculoskeletal injury that precludes full participation in sport or activity for at least 2 consecutive days (0–72 h postinjury)
Subacute injury	A musculoskeletal injury that precludes full participation in sport or activity for at least 2 consecutive days (3 d to 1 mo postinjury)
Persistent injury	A musculoskeletal injury that has been symptomatic for at least 1 mo
Chronic injury	A musculoskeletal injury that has been symptomatic for ≥1 mo and the pain experienced consistently has not gotten any better with routine treatment or nonnarcotic medication
Extremely low activity	No activity beyond baseline activity (*baseline activity* refers to light-intensity activities [eg, standing, walking, lifting weighted objects] of daily life)
Low activity	Activity beyond baseline but <150 minutes of moderate-intensity exercise per week (*moderate activity* includes activities such as brisk walking, yoga, lifting weights)
Medium activity	Moderate-intensity activity per week of 150–300 minutes
High activity	Moderate-intensity activity per week of >300 minutes

Clinic Setting

The athletic training student-run clinic used for the study was the Integrated Sports Medicine and Rehabilitative Therapy Clinic (ISMaRT Clinic) at the University of Idaho. The clinic was piloted in its current form during the 2016–2017 academic year as a teaching clinic for applied learning, collaboration, teaching, and patient care research.

The ISMaRT Clinic has been operated in its current form since September 2017. Patient care services offered include injury prevention, injury evaluation, injury and postsurgical rehabilitation, pain management, and health and wellness promotion. The patient population of the ISMaRT Clinic is university students (approximately 70%), university faculty and staff (approximately 15%), and local community members (approximately 15%). University patients (ie, faculty, staff, and students) may report directly to the student-run clinic for initial examination or may seek care after being referred to the clinic from the university health center or their personal physician (ie, doctor of medicine or doctor of osteopathic medicine) or chiropractor (doctor of chiropractic). Community members are referred to the clinic by a physician or chiropractor. The ISMaRT Clinic is open for approximately 25 hours per week on a Monday through Friday schedule during the academic year (ie, late August to early December and early January to early May). During the study period (November 2017–October 2021), the ISMaRT Clinic was closed due to COVID-19 from March 2020 through September 2020 and then operated on a reduced patient-load basis per required COVID-19 policy at the university from September 2020 through October 2021 to meet social-distancing requirements.

Patient care appointments are the primary mode of scheduling (ie, phone, email, or in person), but walk-in appointments are accommodated when possible. Initial appointment visits are generally scheduled in 1-hour blocks to allow for completion of patient intake forms and a thorough physical examination. Whereas initial visits are typically focused on the examination and creation of the treatment plan, treatment plans and home-treatment programs may also be initiated at the first visit. Subsequent appointments are generally 1-hour sessions scheduled on a weekly basis (approximately 4–7 days after the prior visit) to allow for reassessment and performance of the treatment plan. Follow-up visits (eg, appointment duration, regularity) vary by patient (eg, patient availability, case complexity) and are generally scheduled until patient discharge or the end of an academic semester.

University students who receive care in the ISMaRT Clinic are not billed (fee for service or insurance reimbursement) for any care provided. In the clinic, athletic training services for university students are supported by a per-semester student fee that is included in tuition charges each semester for full-time enrolled students. The initial student activity fee was $2.43 per student enrolled full time at the university; however, the fee has subsequently increased to $3.98 per student per semester because the services offered in the ISMaRT Clinic continued to grow and the need for care increased. The initial appointment for all other patients is free, but each subsequent visit is billed in a fee-for-service model for university faculty and staff ($10/visit) and community members ($15/visit). The fee rates for university faculty, staff, and community members are intentionally set below the cost of a typical insurance copayment to offer a benefit to the university and local community.

Patient care is provided by professional (ie, entry-level) graduate athletic training students under the supervision and mentorship of a university athletic training faculty or staff member during the student's assigned clinical experiences. Students may be assigned to the ISMaRT Clinic during any of the fall or spring semesters in the program when clinical experience is required. Thus, the professional graduate students providing care may be in their first clinical semester, having previously completed the first semester of didactic coursework (eg, anatomy, evaluation and diagnosis of injuries and illnesses for the lumbar spine and lower extremity, principles of rehabilitation), or in their final semester after completing all necessary didactic coursework. The clinical experiences typically last 8 to 16 weeks during a semester, and each student is assigned patients; the number of patients and autonomy of care increase with student experience and clinical performance. In addition, students may transfer a patient's care to another student at the clinic (eg, when the clinical experience ends before a patient is discharged, a student or patient requests a change). The professional students are responsible for all aspects of care (eg, obtaining the history, performing a physical examination, developing the rehabilitation plan, documentation).

The role of the supervising athletic training faculty is to ensure student and patient safety, confirm that appropriate patient care services are provided, and support student learning. Thus, students are given independence for patient interactions, patient scheduling, treatment plans, and patient care decisions. The supervising faculty oversees the entire patient interaction but only directly interacts with the patient during this period if concerns arise about safety or care decisions or interaction is requested by the student or patient. Initial visits are reviewed by the students and faculty before the patient arrives at the ISMaRT Clinic, and the student separately consults with the supervising faculty to receive approval for the patient care decisions (eg, modality selection, home care program, follow-up appointment scheduling) during the first visit. Subsequent visits include a review of the patient's file and the plan of care with the supervising faculty to develop or alter the care plan for the scheduled appointment. Students may also update the faculty with assessment information (eg, reexamination findings, updated patient outcomes) after the subsequent visit begins, but students are given autonomy to select interventions or make patient care decisions so long as the decisions are appropriate for the patient case.

Patient Demographic and Outcomes Instrumentation

At the initial visit and before the physical examination, participants completed a patient-outcomes packet that consisted of demographic information and patient-outcomes scales with the athletic training student assigned to their case. The student worked with the participant to supply the demographic information (eg, identify appropriate injury category or injury type) and could explain a term or phrase on an outcome scale, as would happen naturally in patient care and has been done in prior research.[11–13] In congruence with earlier investigations,[11–13] participants completed the assessment packet with their attending clinicians at 3 time points: (1) visit 1 (initial appointment); (2) visit 2 (1–7 days after the initial visit for acute and subacute injuries, 5–14 days for persistent or chronic injuries); and (3) visit 3 (1–7 days after the second visit for acute and subacute injuries, 5–14 days for persistent or chronic injuries). After the initial examination and care, the supervising athletic trainer (AT) confirmed

specific demographic packet information (ie, injury category [acute, subacute, persistent, chronic], injury classification [eg, sprain or strain], general injury location [ie, lower extremity, spine, upper extremity, head or face], and specific injury location [eg, head and neck, shoulder and arm]) to support classification accuracy. The AT also verified that the assessment packet was completed at the appropriate time intervals.

Demographic Information Questionnaire

We collected deidentified demographic information consistent with prior studies[11–13] at the initial visit. The collected information consisted of injury type category (ie, acute, subacute, persistent, or chronic), type of injury (eg, arthritis, sprain, postsurgery), general injury location (eg, lower extremity, back), specific injury location (eg, head and neck, shoulder and arm, ankle and foot), athletic status (eg, competitive athlete, recreational athlete), and symptom duration (ie, >24 hours, 24–72 hours, 3 days–1 week, 1–4 weeks, 1–6 months, 6 months–1 year, or >1 year) of the current health condition or complaint. Participants could also provide additional demographic information: age, sex, ethnicity, sport (if applicable), and physical activity level (ie, extremely low, low, medium, or high; Table 1).

Disablement in the Physically Active Scale Short Form-8

The DPA SF-8, a previously demonstrated valid and reliable alternative to the full DPA scale, was used to measure patient perceptions of 2 constructs: physical function (PHY; items 1–4) and quality of life (QOL; items 5–8).[11–13] Participants rated each item on a Likert scale from 1–5, with 1 being *no problem* and 5 being *severe*. Construct scores (ie, PHY and QOL) were obtained by summing the scores of each item in a construct and subtracting 4 points from the summed total; a total summary score was calculated by adding the 2 construct scores. Construct scores ranged from 0 to 16 points, whereas total scores ranged from 0 to 32 points.

The minimal clinically important difference (MCID) for the total scores of 2 points for persistent or chronic injuries and 3 points for acute or subacute injuries was used to signify a clinically significant change on the scale.[13] Full resolution (ie, a score of 0) was deemed clinically relevant; however, a total score of 8 was also set as relevant because earlier authors[11] found that healthy physically active people reported scores ranging from 0 to 12. Furthermore, a score of 8 would equate to patients selecting a Likert response (ie, *does not affect*) indicating their injury or problem did not affect them across all items over the past 24 hours. The PHY and QOL constructs do not have established MCID values; however, minimal detectable change scores have been described as 4.00 points for the PHY construct and 4.68 points for the QOL construct[13]; thus, we assessed the percentage of participants with changes of ≥4 points. Full resolution (ie, a score of 0) was deemed clinically relevant for the construct scores, although a total score of 4 was also set as a relevant score that would equate to patients selecting a Likert response (ie, *does not affect*) indicating their injury or problem did not affect them across all items over the past 24 hours.

Numeric Pain Rating Scale

The NPRS is a validated tool to quantify pain severity using an 11-point scale in which 0 equates to *no pain at all* and 10 equates to *worse pain imaginable*.[14–16] Participants were asked to rate their current, best, and worst pain levels over the past 24 hours using the NPRS. The 3 scores were then averaged to produce a score representing the level of pain over the past 24 hours.[14,15] Condition-specific MCIDs have ranged from 1.0 to 4.0 points on the NRS, with 2-point changes or a 30% reduction recommended as general cut points.[16] Thus, we set an improvement in pain of 30% or more as the criterion for a clinically significant change across visits on the NRPS.[16] Full resolution of the pain severity complaint on the NPRS was also deemed clinically relevant; however, because NPRS scores were averaged, reporting the percentage of scores <1 was also deemed clinically relevant.

Patient-Specific Functional Scale

The PSFS is a validated scale used to evaluate participant perceptions of function with respect to specific physical activities or tasks important to the individual.[16–18] We asked participants to pick 3 important activities that were difficult to do or could no longer be done because of their injury or condition.[16–18] They then rated each activity from 0 (*unable to perform activity*) to 10 (*able to perform activity at the same level as before injury or problem*).[16–18] The MCID values on the PSFS have ranged across conditions from 1.2 to 2.3 points for averaged PSFS scores; musculoskeletal injury MCIDs have been cited as 1.3-point (*small*) to 2.7-point (*large*) changes.[16] An average PSFS score change of 2.0 points has been recommended as an MCID value; thus, a clinically significant change for the PSFS was considered to have occurred with a change score of ≥2 across visits.[16,19] Full restoration of function on the PSFS was set as clinically relevant; yet because averaged PSFS scores were collected, we also deemed reporting the percentage of scores ≥9 as clinically relevant.

Global Rating of Change Scale

The scale, which has been proposed as a criterion standard for change and validated in numerous studies,[16,17,20–23] was used to measures a participant's perceived rating of change during the second and third visits. We used the 15-point scale (–7 = *a very great deal worse*, 0 = *unchanged*, 7 = *a very great deal better*) version of the GRoC.[13] The GRoC, unlike the other scales, was only collected at the second and third visits. A clinically significant change on the GRoC was set at a score of ≥3 based on prior MCID recommendations for the 15-point scale.[24]

Patient Experience Instrumentation

We developed an electronic survey using Qualtrics software to assess the participant experience (eg, satisfaction) in the clinic. The first section of the survey obtained general participant information, including participant status (eg, university student, university faculty or staff), university unit or college (if applicable), how the participant learned about the clinic (eg, family member, referral), factors that influenced the selection of the clinic

Table 2. Participant Demographic Information

Characteristic	Value[a]
Age, y	
Mean ± SD	27.88 ± 11.89
Median	23
Minimum	13
Maximum	70
	No. (%)
Sex	
Male	182 (46.9)
Female	202 (52.1)
Prefer not to report	4 (1.0)
Activity level	
Extremely low	35 (9.0)
Low	104 (26.8)
Medium	153 (39.4)
High	87 (22.4)
Not reported	9 (2.3)
Injury category	
Acute	42 (10.8)
Subacute	117 (30.2)
Persistent	181 (46.6)
Chronic	48 (12.4)
Participant-reported length of symptoms or condition	
<24 h	9 (2.3)
24–72 h	22 (5.7)
3 d–1 wk	58 (14.9)
1–4 wk	76 (19.6)
1–6 mo	71 (18.3)
6 mo–1 y	43 (11.1)
>1 y	109 (28.1)
Ethnicity	
Caucasian or White	323 (83.2)
African American or Black	5 (1.3)
Hispanic	21 (5.4)
Asian	20 (5.2)
Pacific Islander	11 (2.8)
Native American	4 (1.0)
Mixed	3 (0.8)
Not reported	1 (0.2)

[a] Percentages in each category were rounded and may not total 100%.

for care (eg, accessibility, costs, location), appointment scheduling method, and perceived experiences (1 = *terrible*; 5 = *excellent*) with scheduling appointments, their appointment wait time, and clinic staff courtesy. The second section of the survey contained 7 Likert-scale items rating participants' level of agreement on a 1 (*strongly disagree*) to 7 (*strongly agree*) scale for patient perceptions regarding the value of the clinic. The final section of the survey consisted of 3 Likert-scale items (1 = *extremely dissatisfied/extremely unlikely*; 7 = *extremely satisfied/likely*) assessing satisfaction with care provided in the clinic, how likely the participant would be to return to the clinic for care in the future, and how likely the participant would be to refer someone to the clinic.

Data Analysis

Participant data were exported from Qualtrics to SPSS (version 25; IBM Corp) for analysis. Blank or incomplete patient-outcomes survey entries were removed from the data set; all other entries, including incomplete patient-experience survey responses, were included in the analyses. Descriptive statistics were conducted on the data; for Likert-scale questions, minimum, maximum, mean (± SD), and percentages were reported. We calculated the Cohen *d* using SPSS between visits 1 and 2 and between visits 1 and 3 for each outcome scale for the entire sample. Mean percentage improvement was determined for each patient-outcomes scale between visits 1 and 2, visits 2 and 3, and visits 1 and 3 for the entire sample and for each injury category (eg, acute injury or chronic injury) using Excel (version 16.3; Microsoft Corp).

We computed bivariate correlations to assess the relationships between patient-reported outcome measures across time. General guidelines for strength of associations were provided (eg, *negligible*, $r = .00–.10$; *weak*, $r = .10–.39$; *moderate*, $r = .40–.69$; *strong*, $r = .70–.89$; *very strong*, $r = .90–1.00$)[25,26]; however, the recommendations[25,26] include interpreting correlations within the context of the study or question. Thus, correlational values between patient-reported outcomes were assessed on the basis of correlational values (ie, ranges from 0.20–0.80) from prior research[13] for the patient-reported outcome measures used. Therefore, the relationships were judged on the basis of similarity (ie, correlation magnitude and direction) to earlier findings (eg, the DPA PHY and PSFS constructs would have a higher correlation than the DPA PHY and DPA QOL constructs) and whether the strength of the association for each relationship increased over time in a similar fashion. For all inferential analyses, α was set at $\leq .05$.

RESULTS

Participants

A total of 608 student-run–clinic patients met the initial inclusion criteria and agreed to participate in the study. Of those patients, 203 (33.4%) were removed because they did not complete the outcomes packet at a follow-up visit (138 at visit 2 and 65 at visit 3). An additional 17 participants were excluded because the injury classification (ie, injury type and location) data were not confirmed by the supervising AT. Hence, a total of 388 (63.8%) participants completed the outcome packet at follow-ups and were included in the patient-outcomes analyses. Participant demographic information is presented in Table 2, and injury locations and type are shown in Table 3. The mean number of days between visits 1 and 3 was 10.10 ± 4.99 days (range = 2–23 days) for all participants. The mean numbers of days between visits 1 and 2 were 3.89 ± 2.76 days, 4.17 ± 2.56 days, 4.67 ± 3.56 days, and 5.13 ± 2.76 days for patients with acute, subacute, persistent, and chronic pain injuries, respectively. The mean numbers of days between visits 2 and 3 was 4.80 ± 3.90 days, 5.33 ± 2.07 days, 5.21 ± 2.85 days, and 5.68 ± 3.31 days for patients with acute, subacute, persistent, and chronic pain injuries, respectively.

Patient-Outcomes Instrumentation Results

Numeric Pain Rating Scale. The mean cumulative NPRS scores across each visit, as well as mean differences, average percentage of improvement, and Cohen *d* scores are presented in Table 4. At visit 2, of the 388 participants, 16 (4.1%) reported full resolution of pain, 64 (16.5%) endorsed an NPRS cumulative score of >1, 189 (48.7%)

Table 3. Clinician-Reported Injury Locations and Classification

Injury Description	Frequency (%)[a]
Location	
Ankle or foot	59 (15.2)
Knee or leg	73 (18.8)
Hip or thigh	38 (9.8)
Low back or pelvis	68 (17.5)
Trunk or thoracic spine	19 (4.9)
Head or neck	17 (4.4)
Shoulder or arm	49 (12.6)
Elbow or forearm	7 (1.8)
Wrist or hand	13 (3.4)
General musculoskeletal pain	27 (7.0)
Type	
Unspecified musculoskeletal pain	78 (20.1)
Muscle strain	76 (19.6)
Joint sprain	59 (15.2)
Tendinopathy	32 (8.2)
Joint positional fault	28 (7.2)
Neural tension	16 (4.1)
Nonspecific low back pain	14 (3.6)
Dislocation or subluxation	11 (2.8)
Motor control dysfunction	10 (2.6)
Meniscal or labral lesion	7 (1.8)
Postsurgical rehabilitation	7 (1.8)
Vertebral disc injury	6 (1.5)
Tissue extensibility dysfunction	6 (1.5)
Impingement	4 (1.0)
Muscle spasms	4 (1.0)
Fracture	3 (0.8)
Stress fracture	3 (0.8)
Chronic headache	3 (0.8)
Patellofemoral pain syndrome	3 (0.8)
Plantar fasciopathy	3 (0.8)
Scoliosis	3 (0.8)
Bursitis	2 (0.5)
Concussion	2 (0.5)
Contusion	2 (0.5)
Piriformis syndrome	2 (0.5)
Adhesive capsulitis	1 (0.3)
Complex regional pain syndrome	1 (0.3)
Fibromyalgia	1 (0.3)
Osteochondroma	1 (0.3)

[a] Percentages in each category were rounded and may not total 100%.

described a change meeting or exceeding the NPRS MCID requirement, and 259 (66.8%) indicated an improvement in cumulative NPRS scores. At visit 3, of the 388 participants, 33 (8.5%) reported full resolution of pain, 109 (28.1%) endorsed an NPRS cumulative score of <1, 250 (64.4%) described a change meeting or exceeding the NPRS MCID requirement, and 309 (79.6%) indicated an improvement in cumulative NPRS scores. The acute and subacute injury groups reported larger improvements (ie, mean change and mean percentage of improvement) in NRPS scores than the persistent and chronic injury groups; however, most members of each group communicated clinically significant changes in pain scores on the NPRS (Tables 5 and 6).

Patient-Specific Functional Scale. The mean cumulative PSFS scores for participants across each visit, as well as mean differences, average percentage of improvement, and Cohen *d* scores are given in Table 4. At visit 2, of the 388 participants, 10 (2.6%) reported a full restoration of function on the PSFS, 42 (10.8%) endorsed a PSFS cumulative score of ≥ 9, 119 (30.7%) described a change

Table 4. Patient-Reported Outcome Cumulative Group Scores Across Visits

Scale	Visit Mean			Mean Difference ± SD, Visits 1–2	Cohen *d* Value	Average % Improvement, Visits 1–2	Mean Difference ± SD, Visits 1–3	Cohen *d* Value	Average % Improvement, Visits 1–3
	1	2	3						
Disablement in the Physically Active Short Form-8									
Physical construct	8.99 ± 3.32	7.13 ± 3.59	5.80 ± 3.85	1.85 ± 2.97	0.62	20.7	3.2 ± 3.65	0.88	35.5
Quality of life construct	4.00 ± 3.92	2.79 ± 3.57	2.27 ± 3.30	1.22 ± 2.64	0.46	30.3	1.71 ± 2.86	0.60	69.5
Total summary score	12.99 ± 5.89	9.92 ± 6.09	8.07 ± 6.17	3.07 ± 4.51	0.68	23.6	4.92 ± 5.25	0.94	37.9
Numeric Pain Rating Scale	3.23 ± 1.75	2.40 ± 1.65	1.98 ± 1.66	0.82 ± 1.37	0.59	25.7	1.25 ± 1.76	0.71	38.7
Patient-Specific Functional Scale	4.89 ± 2.15	5.97 ± 2.15	6.79 ± 2.26	1.08 ± 1.98	0.55	22.1	1.92 ± 2.41	0.80	38.9
Global Rating of Change Scale	[a]	2.35 ± 3.2	3.45 ± 2.86	[a]	[a]	[a]	[a]		

[a] This score was not calculated because the Global Rating of Change was not collected at visit 1; a 2 corresponds to *a little bit better*, a 3 corresponds to *somewhat better*, and a 4 corresponds to *moderately better* on the scale.

Table 5. Patient-Reported Outcome Group Mean Scores by Injury Category Across Visits

	Group Mean ± SD							
	Acute				Subacute			
	Visit			Mean Change,	Visit			Mean Change,
Scale	1	2	3	Visits 1–3	1	2	3	Visits 1–3
Disablement in the Physically Active Short Form-8								
Physical construct	10.00 ± 2.78	7.07 ± 4.16	4.95 ± 3.99	5.04 ± 3.88	8.88 ± 3.49	6.35 ± 3.55	4.83 ± 3.63	4.04 ± 3.71
Quality of Life construct	2.76 ± 3.36	1.36 ± 2.89	0.79 ± 1.77	1.98 ± 2.87	2.88 ± 3.38	1.83 ± 2.72	1.51 ± 2.36	1.37 ± 2.81
Total summary score	12.76 ± 4.75	8.43 ± 6.10	5.74 ± 4.83	7.02 ± 5.35[a]	11.76 ± 5.60	8.18 ± 5.27	6.35 ± 4.93	5.41 ± 5.38[a]
Numeric Pain Rating Scale	4.50 ± 1.82	2.47 ± 1.87	1.91 ± 1.47	2.55 ± 2.21[a]	3.08 ± 1.53	2.07 ± 1.48	1.35 ± 1.24	1.70 ± 1.67[a]
Patient-Specific Functional Scale	3.98 ± 1.91	6.08 ± 2.53	7.36 ± 2.23	3.33 ± 2.77[a]	5.06 ± 2.14	6.39 ± 2.16	7.29 ± 2.23	2.25 ± 2.62[a]
Global Rating of Change Scale	[c]	4.15 ± 2.74[a]	4.92 ± 2.40[a]	[c]	[c]	3.58 ± 2.72[a]	4.62 ± 2.64[a]	[c]
	Persistent				Chronic			
	Visit			Mean Change	Visit			Mean Change
Scale	1	2	3	Visits 1–3	1	2	3	Visits 1–3
Disablement in the Physically Active Short Form-8								
Physical construct	8.84 ± 3.34	7.47 ± 3.48	6.33 ± 3.86	2.50 ± 3.44	9.06 ± 3.13	7.83 ± 3.28	6.85 ± 3.60	2.21 ± 3.07
Quality of Life construct[b]	4.84 ± 4.24	3.43 ± 3.90	2.80 ± 3.83	2.04 ± 2.99	4.56 ± 3.42	3.90 ± 3.75	3.44 ± 3.37	1.13 ± 2.33
Total summary score	13.68 ± 6.27	10.91 ± 6.34	9.13 ± 6.83	4.55 ± 5.28[a]	13.63 ± 5.52	11.73 ± 5.83	10.29 ± 5.69	3.33 ± 4.01[a]
Numeric Pain Rating Scale	2.93 ± 1.80	2.43 ± 1.59	2.21 ± 1.77	0.72 ± 1.55	3.74 ± 1.57	3.08 ± 1.88	2.67 ± 1.81	1.06 ± 1.39[a]
Patient-Specific Functional Scale	4.84 ± 2.13	5.68 ± 1.99	6.33 ± 2.25	1.60 ± 2.11	5.41 ± 2.05	5.91 ± 2.25	6.46 ± 2.20	1.06 ± 2.11
Global Rating of Change Scale	[c]	1.59 ± 2.96	2.68 ± 2.67	[c]	[c]	0.46 ± 3.64	2.09 ± 2.99	[c]

[a] A mean group change exceeded the minimal clinically important difference across those 2 visits.
[b] A minimal clinically important difference for the Quality of Life and total summary scores has not been identified.
[c] The Global Rating of Change was not calculated because it was not collected at visit 1.

Table 6. Patient-Reported Outcome Group Percentage Improvement by Injury Category Across Visits

	Group, Mean Improvement (%)												Percentage of Group Members Reporting Clinically Significant Changes at Visit 3			
	Acute			Subacute			Persistent			Chronic						
	Visits															
Scale	1–2	2–3	1–3	1–2	2–3	1–3	1–2	2–3	1–3	1–2	2–3	1–3	Acute	Sub-acute	Per-sistent	Chronic
Disablement in the Physically Active Short Form-8																
Physical construct	29.3	30.0	50.5	28.5	23.9	45.6	15.5	15.3	28.4	13.6	12.5	24.4	[a]	[a]	[b]	[b]
Quality of Life construct	50.7	41.9	71.4	36.5	17.5	47.6	29.1	18.4	42.1	14.5	11.8	24.6	[a]	[a]	[b]	[b]
Total summary score	33.9	31.9	55.0	30.4	22.4	46.0	20.2	16.3	33.3	13.9	12.3	24.5	81.0	66.7	71.3	68.8
Numeric Pain Rating Scale	45.1	22.7	57.6	32.8	34.8	56.2	17.1	9.1	24.6	17.6	13.3	28.6	78.6	75.2	57.5	52.1
Patient-Specific Functional Scale	52.8	21.1	84.9	26.3	14.1	44.1	17.4	11.4	30.8	9.2	9.3	19.4	66.7	54.7	42.5	27.1
Global Rating of Change Scale	[b]	18.6	[b]	[b]	29.1	[b]	[b]	68.6	[b]	[b]	354.3	[b]	81.0	82.9	52.5	47.9

[a] Not calculated because a clinically significant change score was not available for these scale constructs.
[b] The Global Rating of Change was not calculated because it was not collected at visit 1.

meeting or exceeding the PSFS MCID requirement, and 246 (63.4%) indicated an improvement in cumulative PSFS scores. At visit 3, of the 388 participants, 31 (8.0%) reported a full restoration of function on the PSFS, 95 (24.5%) endorsed a PSFS cumulative score of $\geq$9, 182 (46.9%) described a change meeting or exceeding the PSFS MCID requirement, and 280 (72.2%) indicated an improvement in cumulative PSFS scores.

Of note, 25 participants reported a cumulative PSFS score $>$8 but $<$10 at baseline; these individuals did not display a change score large enough to reach the MCID value but were included in the denominator for the calculations in the previous paragraph. Of these 25 patients, at visit 3, a total of 19 (76.0%) endorsed improved PSFS scores, 8 (32%) described a PSFS cumulative score of 10 (ie, full restoration of function), and 17 (68%) indicated a PSFS score of $\geq$9. The acute and subacute injury groups reported larger improvements (ie, mean change and mean percentage improvement) in PSFS scores than the persistent and chronic injury groups; however, large portions of the acute, subacute, and persistent groups demonstrated clinically significant changes in pain scores on the PSFS (Tables 5 and 6).

Disablement in the Physically Active Scale Short Form-8. The mean cumulative DPA SF-8 summary scores for participants across each visit as well as mean differences, average percentage of improvement, and Cohen *d* scores are depicted in Table 4. At visit 2, 11 (2.8%) of the 388 participants reported a score of 0, and 179 (46.1%) endorsed a DPA SF-8 summary score of $\leq$8, 218 (56.2%) described a change meeting or exceeding the DPA SF-8 summary score MCID requirement, and 273 (70.4%) indicated an improvement in DPA SF-8 summary scores. At visit 3, a total of 41 (10.6%) participants reported a score of 0, whereas 228 (58.8%) endorsed a DPA SF-8 summary score of $\leq$8, 274 (70.6%) described a change meeting or exceeding the DPA SF-8 summary score MCID requirement, and 314 (80.9%) indicated an improvement in DPA SF-8 summary scores. The acute and subacute injury groups reported larger improvements (ie, mean change and mean percentage of improvement) in DPA SF-8 summary scores than the persistent and chronic injury groups; yet most members of each group demonstrated clinically significant changes in the DPA SF-8 summary score (Tables 5 and 6).

The mean cumulative PHY scores for participants across each visit as well as mean differences, average percentage of improvement, and Cohen *d* scores are provided in Table 4. At visit 2, a total of 15 (3.9%) of the 388 participants reported a PHY score of 0, whereas 97 (25.0%) endorsed a score of $\leq$4, 95 (24.5%) described a change score $\geq$4, and 253 (65.2%) indicated improvement on the PHY construct. At visit 3, of the 388 participants, 51 (13.1%) reported a PHY score of 0, whereas 152 (39.2%) endorsed a score of $\leq$4, 163 (42.0%) described a change score $\geq$4, and 303 (78.1%) indicated improvement on the PHY construct. The largest improvements (ie, mean score changes and percentage changes) were in the acute and subacute injury groups (Tables 5 and 6).

The mean cumulative QOL scores for participants across each visit as well as mean differences, average percentage of improvement, and Cohen *d* scores are shown in Table 4. At visit 2, a total of 171 (44.1%) participants reported a QOL score of 0, whereas 290 (74.7%) endorsed a score of $\leq$4, 71 (18.3%) described a change score $\geq$4, and 194 (50.0%) indicated improvement on the QOL construct. At visit 3, a total of 199 (51.3%) participants reported a QOL score of 0, 302 (77.8%) endorsed a score of $\leq$4, 102 (26.3%) described a change score $\geq$4, and 219 (56.4%) indicated improvement on the QOL construct. The largest improvements (ie, mean score changes and percentage changes) were in the acute and subacute injury groups (Tables 5 and 6).

Global Rating of Change Scale. The mean cumulative GRoC scores at visits 2 and 3 are supplied in Table 4. A total of 254 (65.5%) of the 388 participants reported perceiving an improvement in their injury or problem on the GRoC at visit 2, with 190 (49.0%) endorsing scores that exceeded the clinically significant criteria of a GRoC score of $\geq$3. At visit 3, a total of 309 (79.6%) endorsed perceiving an improvement in their injury or problem on the GRoC, with 249 (64.2%) describing scores that exceeded the clinically significant criteria of a GRoC score of $\geq$3. The highest GRoC scores were in the acute and subacute injury groups, whereas the persistent and chronic groups reported the largest increases in GRoC scores between visits 2 and 3 (Tables 5 and 6).

Correlational Analysis. Bivariate correlation results are provided in Table 6. All correlations were statistically significant at $P \leq .001$. Negative correlations were evident with the DPA SF-8 PHY, DPA SF-8 QOL, DPA SF-8

Table 7. Bivariate Correlations Between Patient-Reported Outcome Measures Across Visits

	Physical Construct	Quality of Life Construct	Total Summary Score	Numeric Pain Rating Scale	Patient-Specific Functional Scale	Global Rating of Change Scale
Visit 1[a]						
Physical construct	1			0.500	−0.485	
Quality of Life construct	0.317	1		0.292	−0.248	
Total summary score	0.775	0.845	1	0.477	−0.440	
Numeric Pain Rating Scale				1		
Patient-Specific Functional Scale				−0.284	1	
Global Rating of Change Scale	[b]	[b]	[b]	[b]	[b]	[b]
Visit 2[a]						
Physical construct	1			0.550	−0.521	
Quality of Life construct	0.449	1		0.484	−0.359	
Total summary score	0.852	0.850	1	0.609	−0.519	
Numeric Pain Rating Scale				1		
Patient-Specific Functional Scale				−0.353	1	
Global Rating of Change Scale	−0.270	−0.343	−0.359	−0.407	0.315	1
Visit 3[a]						
Physical construct	1			0.663	−0.648	
Quality of Life construct	0.484	1		0.469	−0.342	
Total summary score	0.883	0.838	1	0.665	−0.592	
Numeric Pain Rating Scale				1		
Patient-Specific Functional Scale				−0.527	1	
Global Rating of Change Scale	−0.474	−0.352	−0.489	−0.530	0.465	1

[a] All correlations were statistically significant at $P \leq .001$ for that visit.
[b] The Global Rating of Change was not calculated because it was not collected at visit 1.

summary, and NPRS scores, whereas positive correlations were noted with the GRoC. Similarly, GRoC scores were negatively correlated with most of the scales (ie, DPA SF-8 PHY, DPA SF-8 QOL, DPA SF-8 summary, and NPRS scores) and positively correlated with the PSFS. Positive results were observed for all other correlations between patient-reported outcome measurements at the 3 visits (Table 7). Positive correlational magnitudes generally increased across the 3 visits: $r = .292$ to .845 at visit 1 to $r = .465$ to .883 at visit 3. Negative correlational magnitudes also increased across the 3 visits: $r = -.248$ to $-.485$ at visit 1 to $r = -.342$ to $-.648$ at visit 3.

Participant Experience Results

A total of 230 participants (university students = 180, 78.6%; university faculty or staff = 25, 10.9%; local community members = 21, 9.2%; other = 3, 1.3%) responded to the anonymous participant-experience survey.

Table 8. Participant-Reported Sources for Learning About the University of Idaho Integrated Sports Medicine and Rehabilitative Therapy Clinic as a Source of Health Care

Source	Frequency (% of Respondents)
Friend	100 (43.5)
Course instructor or professor	36 (15.7)
Physician or chiropractor referral	30 (13.0)
Coworker	23 (10.0)
Family member	9 (3.9)
Advertisement	8 (3.5)
University staff member	5 (2.2)
Student recreation center	4 (1.7)
Student internship in clinic	3 (1.3)
Other health care provider referral	3 (1.3)
Prior appointment in the clinic	2 (0.9)
Walked by clinic for class	2 (0.9)
Employer	1 (0.4)
Other	1 (0.4)

University students, faculty, and staff (n = 205, 89.5%) who responded to the survey were members of 11 academic colleges or units (eg, agricultural and life sciences, art and architecture, engineering, and natural resources) on campus. Participants learned about clinic services through various means (Table 8), and multiple factors led to seeking care in the clinic (Table 9). Initial appointments were primarily scheduled in person (n = 97, 42.2%), through email (n = 65, 28.3%), or over the phone (n = 26, 11.3%); however, walk-in appointments (n = 40, 17.4%) were also common. Overall, participants reported excellent experiences for scheduling their initial appointment, the wait time for their appointment, and the courtesy of the clinic staff during the appointment (Table 10).

Participant feedback also indicated strongly positive patient care experiences in the ISMaRT Clinic. Patients strongly agreed that they were comfortable during their treatment experiences, the student clinicians were knowledgeable and responsive to questions and concerns, and the services provided met all their patient care needs (Table

Table 9. Factors That Led Participants to Select the University of Idaho Integrated Sports Medicine and Rehabilitative Therapy Clinic for Care Over Other Clinics

Factor	Frequency (% of Respondents)
Cost	173 (75.2)
Accessibility	168 (73.0)
Convenience	160 (69.6)
Location	158 (68.7)
Recommendation	135 (58.7)
Atmosphere	53 (23.0)
Curiosity	53 (23.0)
Efficacy of treatments	52 (22.6)
Variety of treatments	46 (22.0)
To participate in student research	17 (7.4)
Other: reputation	1 (0.4)
Other: aid students	1 (0.4)

Table 10. Participant-Reported Experiences in the University of Idaho Integrated Sports Medicine and Rehabilitative Therapy Clinic[a]

Item	Minimum	Maximum	Mean ± SD	% Respondents With a 4	% Respondents With a 5
How would you rate...					
...your experience with scheduling your initial appointment?	3	5	4.79 ± 0.44	18.4	80.3
...your wait time for your appointment?	3	5	4.75 ± 0.50	18.6	78.3
...the courtesy of the clinic staff during your appointment?	4	5	4.93 ± 0.26	7.1	92.9

[a] 1 = *terrible*; 2 = *poor*; 3 = *average*; 4 = *good*; 5 = *excellent*.

11). Furthermore, respondents believed the ISMaRT Clinic was a valuable benefit to the campus community and suggested that further financial resources should be made available to expand its hours of operation and the services provided to patients (Table 11). Finally, high levels of satisfaction were expressed regarding the care supplied in the clinic, and respondents indicated a strong likelihood of returning to the ISMaRT Clinic in the future and referring others to it (Table 12).

DISCUSSION

The purpose of our study was to explore the types of patients treated by athletic training students in a student-run clinic while examining the effect of athletic training student–provided therapy on patient outcomes and the patient experience. Overall, athletic training students at our student-run clinic treated a diverse patient population, which included patients of various ages and with different physical activity levels and injury types and durations. The ISMaRT Clinic and the interactions with students in it were viewed positively: high levels of patient satisfaction (Tables 10–12) were reported, with the university community (eg, friends, course instructors or professors) serving as the primary way patients learned about the ISMaRT Clinic (Table 8). A descriptive analysis of initial patient outcomes demonstrated effective care of a patient population with varied musculoskeletal injuries or problems. Clinically significant improvements in patients' pain (78.6% of the acute group, 75.2% of the subacute group, 57.5% of the persistent group, 52.1% of the chronic group), function (66.7% of the acute group, 54.7% of the subacute group, 42.5% of the persistent group, 27.1% of the chronic group), and QOL (average improvement of 43.1% across all participants) were described over 3 visits in $\leq$14 days on average (Tables 4 and 5).

Context of Patient-Reported Outcomes Changes

Most participants either met the MCID (or minimal detectable change in the case of the PHY and QOL constructs) for each scale or indicated a notable improvement across multiple dimensions (eg, pain and function, QOL) by the third visit. However, despite the multidimensional progress experienced and the overall success of care provided in the ISMaRT Clinic, clinically significant improvements were not apparent for all participants across all patient-reported outcomes scales. Our findings may partially be explained by the nature of the injuries being treated (eg, patients with chronic injuries notoriously do not display improvement with care,[27] postsurgical cases or fracture rehabilitation may be limited by prescribed rehabilitation protocols and healing time frames), the duration of the study (ie, most patients completed 3 visits in <10 days), and the assessment of final outcomes before discharge, which means the reported values are based on incomplete courses of care and healing. Patient-reported outcomes scores for visits 2 and 3 were gathered before the individuals received treatment on that day. At visit 2, patients may have only received a partial initiation of their treatment plan at visit 1 due to the initial examination process and only 1 or 2 treatments before visit 3. Thus, certain participants (eg, those with chronic injuries and those postsurgery) may have had a reduced opportunity to demonstrate measurable change on a patient-reported outcomes scale given their condition and the short duration of the patient-reported outcomes collection portion of the study. In addition, patients may be seen for multiple conditions (eg, nonspecific low back pain and shoulder

Table 11. Participant-Reported Agreement With Statements Exploring Perceived University of Idaho Integrated Sports Medicine and Rehabilitative Therapy Clinic Experiences and Value[a]

Item	Minimum	Maximum	Mean ± SD	% Respondents With a 6	% Respondents With a 7
Please rate your agreement with the following statements...					
The services at the clinic met all of my patient care needs.	1	7	6.64 ± 0.75	23.9	71.7
I was comfortable in the clinic during my treatments.	1	7	6.80 ± 0.57	14.8	83.8
The clinician(s) working with me seemed knowledgeable about my issue.	1	7	6.60 ± 0.70	27.0	67.8
The clinician(s) working with me was/were responsive to my questions and concerns.	1	7	6.79 ± 0.55	18.7	80.9
The clinic is a valuable benefit to the campus community.	1	7	6.89 ± 0.48	8.8	90.8
The university should invest additional financial resources in the clinic to expand the services provided to patients.	1	7	6.59 ± 0.80	21.5	71.5
The university should invest additional financial resources in the clinic to expand the hours of operation for patient appointments.	1	7	6.36 ± 0.99	23.3	61.2

[a] 1 = *strongly disagree*; 2 = *disagree*; 3 = *somewhat disagree*; 4 = *neither agree nor disagree*; 5 = *somewhat agree*; 6 = *agree*; 7 = *strongly agree*.

Table 12. Participant-Reported Satisfaction With Their University of Idaho Integrated Sports Medicine and Rehabilitative Therapy Clinic Experience[a]

Item	Minimum	Maximum	Mean ± SD	% Respondents With a 6	% Respondents With a 7
How satisfied are you with the care you were provided at the clinic?	5	7	6.86 ± 0.38	12.7	86.4
How likely are you to recommend the clinic to a friend, coworker, peer, etc?	5	7	6.89 ± 0.34	9.2	89.9
How likely are you to return to the clinic in the future for your health care needs?	4	7	6.79 ± 0.52	13.2	83.3

[a] 1 = *extremely unsatisfied/unlikely*; 2 = *moderately dissatisfied/unlikely*; 3 = *slightly dissatisfied/unlikely*; 4 = *neither dissatisfied/unlikely nor satisfied/likely*; 5 = *slightly satisfied/likely*; 6 = *moderately satisfied/likely*; 7 = *extremely satisfied/likely*.

pain) at the same time, and improvement in 1 condition may not be enough to affect some of the global measures (eg, GRoC scale) used.

Nevertheless, the overall findings suggest clinically significant improvements were experienced across multiple patient-reported outcomes scales during the 3 visits for various conditions when care was provided by athletic training students in a student-run clinic (Tables 4 and 5). The directions and magnitudes of the patient-reported outcomes' correlational values (ie, the relationships between patient-reported outcomes increased across time) meet expectations and provide further evidence that multidimensional patient improvement occurred across time (Table 6). It is important to note that although participants may have only received 1 or 2 treatments sessions at the ISMaRT Clinic during the data-collection period, they may have also been completing assigned home-treatment programs that were initiated at the first visit. Implementation of home-treatment programs varied based on the patient and condition, and we did not track adherence to these programs.

As expected, the acute and subacute injury groups experienced the most substantial improvements in pain and function. Most patients in these 2 groups reported $\geq$50% improvement and clinically significant changes by visit 3 across all patient-reported outcomes scales used (Table 5). Whereas patient-reported improvement in the acute and subacute groups was likely also occurring as a by-product of natural healing, the speed and magnitude of the improvements support the possibility of benefits occurring from patient care interactions. Similarly, the patients with persistent or chronic pain endorsed improvement, but their rates of improvement were less than those of the acute and subacute injury groups (Table 5). Our findings are not unexpected given the neural structural plasticity and pain circuit changes that occur over time in chronic musculoskeletal pain[28]; reorganization of these pain pathways and brain patterns is needed to rehabilitate chronic injuries, which often takes more time than rehabilitating acute injuries. Thus, the established timeline in this study was not ideal for assessing chronic injury rehabilitation given that the participants in the persistent and chronic pain groups provided outcomes after only 1 or 2 treatments over a short duration (ie, most in the persistent and chronic injury groups completed visit 3 in $<$14 days from visit 1); however, substantial improvements were still identified. We found it interesting that the persistent and chronic injury groups displayed substantially larger increases on some measures of perceived change (eg, GRoC) over the course of treatment (Table 5). Therefore, evidence for the effective treatment of patients with persistent or chronic injuries was apparent in our study, and analysis of patient-reported outcomes for a longer duration may suggest further improvement, which is supported by the patient-experience survey results.

Comparison With Previous Student-Run Clinic Studies

In relation to prior studies,[10,29] our work identified novel findings and similarities regarding data collection and patient-reported outcome measures. The primary difference between our study and other similar papers on outcomes in student-run clinics was sample size: our final sample (n = 388) was 6 to 8 times greater than earlier investigations involving sample sizes of 59 participants[10] and 49 participants.[29] The differences in sample size may reflect a lower dropout rate and a longer data-collection period. Our overall percentage of dropouts and incomplete outcomes packets (36.2%) was notably lower than that of earlier authors, who oberved rates of 47%[29] and 55%,[10] respectively.

Our methods were similar to those of 2 studies[10,29] in clinic structure, environment, billing, and outcomes collection. Differences did occur in the patient-reported outcomes collected and the patient populations treated, because other researchers focused more on region-specific patient-reported outcomes scales[10,29] or on patients experiencing chronic pain and catastrophizing.[29] In addition, differences likely existed in examination procedures, diagnoses, and treatments among clinical sites and clinicians due to the research methods and natural changes in patient care over time. Furthermore, we did not use region-specific patient-reported outcomes scales and instead administered more global measures of disablement (ie, DPA SF-8), perceived pain (ie, NPRS), function (ie, PSFS), and change in condition (ie, GRoC) that were appropriate for all patients. Our approach was meant to allow for more consistent assessments of all outcomes across patients using measures commonly found in clinical practice.

Whereas different patient-reported outcomes scales were used, the patients in all studies demonstrated improvement in perceived function. Berger Lebel et al[10] noted a nearly 19% improvement in function after 6 visits (4.7 ± 1.8 treatments over 48.8 ± 16.1 days), and O'Sullivan and Hickey[29] documented a 10% improvement in function at 6-week follow-up. We saw improvements of 39.3% in function as measured by the PSFS and 35.6% on the PHY construct of the DPA SF-8 among all participants in $<$14 days, on average. Due to the structure of our work, patient visit and outcomes collection intervals varied, and the number of treatments was not standardized; yet changes

in patient-reported function were experienced, with most participants receiving 2 treatment appointments in <11 days, on average.

Differences in patient improvement among investigations could be related to factors such as varied patient populations or patient motivations or biases (eg, cost of care), which could influence patient-reported outcomes responses; therapeutic interventions provided; or changes in patient care (eg, diagnostic procedures) over time (eg, the Hickey et al study was published in 2006). Another explanation could be the structure of our teaching clinic. Our clinic is designed as a teaching and research clinic for professional and postprofessional athletic training students in which expert clinical faculty mentor and assist students in learning clinical practice and testing novel therapeutic interventions. The structure (eg, low cost, care decisions not influenced by third-party reimbursement) and nature (research of novel therapies, teaching clinic) of the clinic may influence patient perspectives in a positive way while supporting efficient and advanced development of professional students for more effective patient care. Despite the differences in study methods, findings of patient-reported improvement were consistent across all 3 studies, indicating that care provided by students in athletic training or therapy or physical therapy student-run clinics can substantially improve patient-reported function.

Due to the differences in outcome measures collected, further comparison across studies is challenging. For example, pain was assessed in global (eg, DPA SF-8) and region-specific scales (eg, Oswestry Disability Index), but individual assessments of pain improvement were not reported consistently. The majority of participants in all classifications (eg, acute, chronic) described clinically significant changes in pain on the NPRS by visit 3 (Table 5); however, the total change and rate of change for pain and function improvement was greater in the acute and subacute injury groups than in the persistent and chronic injury groups. Our findings are similar to those from prior student-run clinic research[10,29] and earlier research on the DPA Scale[27]: patients with acute or subacute pain typically experience greater improvements at measurement intervals than those experiencing chronic pain. When creating the DPA Scale, Vela and Denegar[27] commented that athletes with acute or persistent injuries demonstrated a gradual improvement in total DPA Scale scores over time when treated by licensed clinicians. Nonetheless, participants with acute injuries indicated clinically significant improvement in disablement in fewer days than athletes with persistent injuries. Most of our participants exhibited substantial improvement in both total DPA Scale SF-8 scores and subcomponent (ie, PHY construct and QOL construct) scores; however, the largest improvement in total scores was reported by the acute injury group. We also found larger percentage increases in the QOL construct than in the PHY construct in each injury group (Table 5).

Another challenge in comparing results is the difference in patient populations. For instance, our age range was wider (13–70 years versus 13–30 years in the Vela and Denegar[27] study) and included fewer collegiate athletes. Our participants also had a greater variety of injuries or problems and levels of activity than those in other studies.[7,10,27,29] We assessed acute, subacute, persistent, and chronic injury groups with a variety of conditions (eg, muscle strains, concussions, chronic headaches, fibromyalgia, postsurgical rehabilitation; Table 3) across the entire body. Other authors have been more focused on pain[29] or a single condition (ie, total knee arthroplasty).[7] Despite these differences, our results support the prior findings[7,10,29] that students can provide effective care that improves pain, function, and disability.

Patient Demographics and Community Effect

Consistent with any professional health care education program, athletic training programs require students to complete clinical experiences and demonstrate competency (or progression toward competency) in patient care before graduation.[30] Experiences in student-run clinics offer prime educational opportunities to support student development, meet accreditation standards,[1,2] and supply exposure to a diverse patient population, such as underserved and undertreated populations (eg, people who are obese, underinsured, or uninsured, or have mental health disorders), that may not be available in traditional clinical experiences.[3,4]

The patient population of our student-run clinic, as well as our design (eg, reduced fee-for-service model), supports these types of interactions; students will likely work with many underserved patients who lack access to care because 10.8% of the county lacked health insurance (1.6% above the national level) and 15.3% of the county was in poverty (3% above the national level).[31] Similar to prior research,[10] a substantial number of interactions occurred with patients across the lifespan, including those over the age of 65. The mean age (27.88 ± 11.89 years) of our patients skews lower than that of an earlier study[10] of an athletic therapy student-run clinic (35.8 ± 14.6 years; 54.2% women) because most of our patients were students; yet many of the university students came from rural and underserved communities across the state. Students tended to gain experience working with both male and female patients, across various physical activity levels, and with numerous conditions (Tables 2 and 3),[10] allowing them to care for patients in various occupations across the lifespan presenting with various conditions. Further exploration of patient demographic profiles (eg, marital status, medical diagnosis, disease history, medication use, health insurance status) would provide greater insight into patient diversity, preexisting conditions, and the comorbidities experienced in student-run clinics versus traditional clinical experiences.

Moreover, the ISMaRT Clinic experience allows athletic training students to interact with and affect the university and local communities. Community interactions offer opportunities for students to educate others on the profession of athletic training while demonstrating the benefit of access to ATs. University and local community support can then grow for the ISMaRT Clinic, as evidenced by the patient-experience survey data in our study (eg, 90% of participants agreed that the ISMaRT Clinic was a valuable benefit to the community; Tables 11 and 12). Furthermore, positive patient experiences can generate support for clinic growth and improved funding, as shown by university student support for raising the student fee associated with the ISMaRT Clinic over the course of the study. Our patient-experience data (Table 10) also endorse

this notion because more than 90% of respondents gave strong support to increasing clinic funding for expanding services and operation hours. The findings suggest the ISMaRT Clinic is a valuable educational opportunity for athletic training students that also benefits the university and local community by providing effective care at a reduced cost to varied and underserved populations. Future research is needed to assess community and programmatic benefits and draw conclusions regarding the cost-effectiveness of care.

Limitations and Future Research

A limitation of our work was the large number of student-run–clinic patients excluded from analysis due to failure to complete the patient-reported outcomes packet and incomplete participation in the patient-experience survey. The academic calendar (eg, fall break) and COVID-19 pandemic closure accounted for large portions of the incomplete files that were excluded. Similarly, not every participant completed the patient-experience survey. Patients lost to follow-up due to COVID-19 also accounted for large portions of those who did not complete this survey. Survey completion, however, was voluntary and did not include a participant incentive for completion. Thus, patients may have elected to not fill out the survey for various reasons (eg, response burden, poor clinic experiences), and hence, these data may not fully represent the experiences of all participants who received care during the study period. In addition, the low cost of services for patients (eg, \$10–\$15 per visit versus \$30 per visit[10] or higher out-of-pocket expenses at other facilities) and patient interaction designs (eg, appointments 30–60 minutes long, 1–2 student clinicians assigned to a patient during appointments) could provide a substantial incentive for seeking care in the clinic or help establish patient-clinician relationships that could positively influence the patient experiences captured with patient-reported outcomes or patient-experience surveys.

Another important consideration and possible limitation of this study was the COVID-19 pandemic and its wide-reaching effects. With the onset of the pandemic in January 2020, a portion of the participants experienced new variables that most certainly affected patient care and injury recovery. Specifically, COVID-19 restrictions reduced appointment availability and limited in-person treatment opportunities. Gym and other recreational facility closures during the pandemic also restricted the physical activity resources available to participants. Furthermore, numerous accounts[32,33] described patients who delayed or avoided seeking care from health care facilities for fear of exposure to COVID, which may have had adverse effects on our clinic and study. The stress of the pandemic (eg, fear of sickness, busy hospitals, school closures, inability to work as a "nonessential" employee) increased mental health challenges and may have had an adverse effect on QOL and affected the changes reported on certain patient-reported outcomes scales we used. For example, our participants displayed larger increases in QOL on the DPA SF-8, but how the pandemic influenced quality-of-life scores before, during, or after treatment is unknown. Also unknown is whether changes in quality of life caused by COVID-19 would have been measurable on the DPA SF-8.

In addition, limitations of the collected data should also be considered. The data were collected over a short time, did not follow all participants through to discharge, and did not include a comparison group or clinic to allow assessment of outcomes between students and professional clinicians. We also did not control for the types of injuries, the types of interventions provided to patients, the athletic training student supplying care (eg, student experience, the transition of care from one student to another), or the supervising athletic training faculty member. Patient outcomes may differ based on these variables, and the reported patient outcomes could differ further by natural healing time, injury (eg, outcomes for acute ankle sprains may be better or worse than those for acute hamstrings strains), or clinician skill and experience. Future studies are needed to follow patients throughout the entire treatment course, which would allow for healing-rate comparisons with our data and those in the literature. Future researchers should also collect additional information (eg, treatments used, participant comorbidities or related medical conditions, whether prior treatments have been tried at other clinics) to assist in further exploring the effect of athletic training student-run clinics on patient outcomes and satisfaction, along with specific treatment effectiveness. Finally, we did not compare outcomes of care provided by athletic training students with those of licensed ATs. Whereas prior investigators[7] suggested students provided similar care in a physical therapy setting, more work is needed to examine the clinical effectiveness of athletic training students versus licensed professionals, as well as to determine the long-term health outcomes of student-provided care and the educational and financial effects of an athletic training student-run clinic on students, the university, and the local community.

CONCLUSIONS

When receiving care from athletic training students at a student-run clinic, patients experienced clinically significant improvements in pain, function, disablement, and QOL. Patients also reported a high level of satisfaction with the care given and a positive overall experience with an athletic training student-run clinic. Our data indicated that cost-effective care can be received at an athletic training student-run clinic, which produces educational and community benefits, particularly to local underserved populations.

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