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Sports Medicine Staffing Across National Collegiate Athletic Association Division I, II, and III Schools: Evidence for the Medical Model

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Context: The ratio of clinicians to patients has been associated with health outcomes in many medical contexts but has not been explored in collegiate sports medicine. The relationship between administrative and financial oversight models and staffing is also unknown.

Objective: To (1) evaluate staffing patterns in National Collegiate Athletic Association sports medicine programs and (2) investigate whether staffing was associated with the division of competition, Power 5 conference status, administrative reporting structure (medical or athletic department), or financial structure (medical or athletic department).

Design: Cross-sectional study.

Setting: Collegiate sports medicine programs.

Patients or Other Participants: Representatives of 325 universities.

Main Outcome Measure(s): A telephone survey was conducted during June and July 2015. Participants were asked questions regarding the presence and full-time equivalence of the health care providers on their sports medicine staff. The number of athletes per athletic trainer was determined.

Results: Responding sports medicine programs had 0.5 to 20 full-time equivalent staff athletic trainers (median = 4). Staff athletic trainers at participating schools cared for 21 to 525 athletes per clinician (median = 100). Both administrative and financial oversight from a medical department versus the athletics department was associated with improved staffing across multiple metrics. Staffing levels were associated with the division of competition; athletic trainers at Division I schools cared for fewer athletes than athletic trainers at Division II or III schools, on average. The support of graduate assistant and certified intern athletic trainers varied across the sample as did the contributions of nonphysician, nonathletic trainer health care providers.

Conclusions: In many health care settings, clinician : patient ratios are associated with patient health outcomes. We found systematic variations in clinician : patient ratios across National Collegiate Athletic Association divisions of competition and across medical versus athletics organizational models, raising the possibility that athletes' health outcomes vary across these contexts. Future researchers should evaluate the relationships between clinician : patient ratios and athletes' access to care, care provision, health care costs, health outcomes, and clinician job satisfaction.

Key Words: health policy, medical coverage, full-time equivalent, work-life balance, medical autonomy

Key Points

- The patient load of a collegiate athletic trainer, as measured by the ratio of athletes to athletic trainers, ranged widely from 21 to 525 athletes per athletic trainer (median = 100).
- Athletic trainers' patient loads varied significantly by National Collegiate Athletic Association division of competition and Power 5 conference status. Athletic trainers at Division I and Power 5 schools had lower patient loads than those at Division II or III schools.
- Athletic trainers in sports medicine departments that were financed by or administratively reported to the college's athletics department had higher patient loads, on average, than those in a different organizational structure.

In his seminal model for evaluating health care quality, Donabedian[1] posited that health care quality can be understood as a function of the structural features of the health care environment, processes used in the health care environment, and patients' health outcomes. Structural features include items in the health care environment, such as the number of hospital beds, number and training of different health care providers, and organizational components of the environment, such as administrative and financial oversight models. Process features can be thought

of as the actions taken when providing care: handwashing, following a checklist, and documenting in the electronic health record. The Donabedian model has been widely used to evaluate health care quality across medical contexts.[2]

The relative number of clinicians available to provide care, that is, the ratio of clinicians:patients, is a structural feature of the health care environment that has been associated with improved health care quality and patient outcomes across settings.[3–6] However, evidence is lacking on clinician:patient ratios in the collegiate sports medicine environment. Previous researchers[7–9] have evaluated sports medicine staffing across National Collegiate Athletic Association (NCAA) divisions of competition. Across studies, the number of health care providers on staff varied by division of competition,[8,9] financial resources, or both.[7] In a recent evaluation[8] of staff and facility sizes across NCAA and National Association of Intercollegiate Athletics schools, investigators found a moderate positive correlation between the number of athletes and the number of athletic trainers (ATs) on staff but did not describe variations in this ratio across schools. Identifying variations in the ratio of clinicians : patients in the collegiate sports medicine context will improve our understanding of the structural features of the health care environment that may be salient to health care quality for athletes.

In addition to staffing ratios, administrative reporting structure and financial oversight models are structural aspects of the collegiate sports medicine environment that may affect athlete care. Recent NCAA legislative changes aim to improve the care provided to athletes by recommending that collegiate sports medicine clinicians have autonomy in making medical decisions.[10] One mechanism the legislation suggests for improved autonomy is the use of a medical model of employment and oversight. Although many nuances are evident across institutions, the basic premise of a medical model for athletic health care is that clinicians administratively report to and are financed by a medical institution rather than the athletic department.[11] This structural shift is aimed at reducing conflicts of interest whereby outside pressures may unduly influence clinicians' medical decision making. Authors[12] suggested that clinicians in an athletics model experienced greater pressures from coaches to prematurely return athletes to play after concussion than those in a medical model. Employment models have also been associated with various legal risks to the college or university, with the medical model posing the least legal risk.[13] The administrative reporting structure or financial model of a sports medicine department may be associated with the ratio of clinicians : patients. However, variations in staffing patterns between schools where the sports medicine program falls under the administrative or financial purviews (or both) of the athletics department and schools with other structures have received limited attention.

We conducted a cross-sectional study to describe the ratio of athletes per AT, a measure of patient load. Additionally, we examined whether the patient load varied across divisions of competition, between NCAA Division I Power 5 and Division I non-Power 5 schools, and between schools under a medical administrative structure versus an athletic department administrative structure and (separately) an athletic department financial structure. Based on previous empirical and conceptual work,[8,14] we hypothesized that, on average, Division I schools and schools under a medical administrative and financial supervisory structure would have more clinicians and fewer athletes per clinician.

METHODS

Sampling Frame and Procedure

We included all schools within NCAA Division I Power 5 conferences. Additionally, all other NCAA Division I, II, and III conferences (n = 100) were listed, and simple random cluster sampling (Random.org) was used to select 50% of the conferences for inclusion in the sample (55 conferences in total). Although all schools within the selected conferences were called, the number of schools within each conference ranged from 7 to 18. The publicly available workplace phone number for the head AT, or equivalent position, at all schools was called up to 3 times during June and July of 2015. A telephone survey was used. The institutional review board determined that this study did not constitute research on human subjects and was therefore exempt from review.

Measures

All telephone survey items were reviewed by members of the target population using an iterative feedback process to ensure clarity of items and inclusion of appropriate content.

Role. Respondents were asked their position on the sports medicine team (eg, head AT, team physician, and staff AT)

Organizational and Financial Models. Respondents were asked whether the sports medicine staff administratively reported to the athletics department, a medical department, or a hybrid of those 2 or via some other structure. Similarly, participants were asked whether the sports medicine staff were employees of the athletics department, a medical department, a hybrid of those 2, or some other structure. Answers to these 2 questions were dichotomized into athletics versus nonathletics models.

Students and Trainees. Respondents were asked how many (if any) athletic training students assisted in providing care for their athletes during a given school year, on average. They were also asked how many (if any) other undergraduate students who were not a part of an athletic training curriculum assisted in the athletic training facility (eg, work-study students and sports medicine aides) during a given school year, on average.

Full-Time Equivalent (FTE) Clinicians. Respondents were provided with the following definition of *full-time employee* and *FTE*: "A full-time employee is an individual who works approximately 40 hours per week or more at your university providing athlete care. For the purposes of this survey, if there are multiple individuals who work less than 40 hours per week, you can sum their weekly total hours into a full-time equivalent. For example, 2 individuals who work approximately 20 hours per week could be considered equivalent to 1 full-time employee." They were then asked how many full-time employees or FTE clinicians were in each of the following positions: certified staff ATs, graduate assistant ATs, and certified intern ATs. Additionally, respondents were asked how many FTE physicians were on the sports medicine staff and, separately, how many physicians provided care to their school's athletes on-site. They were then asked whether

they had any other health care providers on staff. If they responded affirmatively, they were specifically asked about the presence and FTE of nurses or nurse practitioners, physical therapists, chiropractors, clinical psychologists, other licensed mental health care professionals, nutritionists, or dieticians and then were allowed to provide information about any additional types of health care providers on staff. A total "other" clinician variable was created by summing responses to the categories of clinicians other than ATs and physicians.

Athletes. Respondents supplied the number of intercollegiate athletes and nonintercollegiate (eg, club and intramural) athletes for whom the medical staff provided care.

Ratio of Athletes : AT. The ratio of athletes per AT serves as a measure of patient load. Two versions of this ratio were created: (1) total intercollegiate athletes divided by FTE staff ATs and (2) total intercollegiate athletes divided by FTE total ATs (the sum of staff, graduate assistant, and certified intern ATs).

Ratio of Staff : Nonstaff ATs. To examine the proportion of ATs who were staff members versus trainees, the following ratio was created: total FTE staff ATs divided by the sum of total FTE graduate assistant ATs and total FTE certified intern ATs.

School Data

Additional information about the schools selected for inclusion was gathered from the Equity in Athletics data available publicly from the United States Department of Education through Title IX disclosures.[15] Variables were total athletes at the school, total athletics revenues, total athletics expenditures, total sports teams at the school, and whether the school had a football team. School information from 2014 to 2015 was used and was available for the vast majority (96.6%) of schools, although not all.

Statistical Analysis

Descriptive statistics were used to describe the range and distribution of health care providers across the sample and across relevant subgroups within the sample. Poisson regression was performed to examine all count variables. For example, we used Poisson regression to evaluate the relationship between patient load (athletes : clinician ratio) and institutional factors, including division, Power 5 status, administrative oversight model, and financial model. Because the outcome of interest was a ratio, an offset was used in the Poisson regression such that the dependent variable was the number of athletes offset by the number of clinicians. We calculated robust standard errors to account for minor violations of the distribution assumption that the variance equaled the mean.[16] Logistic regression was conducted to examine all binary outcome variables. For example, logistic regression was performed to evaluate differences in administrative oversight models (athletics versus nonathletics) among schools in Divisions I, II, and III. Where division of competition was considered a predictor, Division I was chosen as the referent category. With additional analyses, we evaluated the generalizability of the survey. For example, a Pearson χ^2 test was calculated to examine differences in representation by division of competition. Statistical analyses were performed in R (version 3.5.1; R Core Team, Vienna, Austria). An *a priori* $\alpha < .05$ or a 95% confidence interval that did not contain 1 was considered statistically significant.

RESULTS

Sample Characteristics

Respondents and Response Rate. After randomization, 55 conferences (Division I = 17, Division II = 14, Division III = 24) that included a total of 618 schools were selected. Of these schools, 325 (52.6%) answered the telephone questionnaire. Respondents were primarily head ATs (76.9%, n = 250) but also included staff ATs (20.0%, n = 65), graduate assistant ATs (0.9%, n = 3), other sports medicine clinicians on staff (0.9%, n = 3), and an athletic training student (0.3%, n = 1). The results did not meaningfully differ when responses from the graduate assistant ATs, other sports medicine clinicians on staff, and athletic training student were removed. As such, the full set of responses is presented.

Respondents Versus Nonrespondents. Personnel at a majority of Division I schools (65.7%, 132/201) and nearly half (46.5%) of Division II (47.1%, 88/187) and Division III schools (45.6%, 105/230) participated in the telephone interview. Fifty-four of the 55 conferences were represented. Individuals at Division I schools were more likely to respond than those at Division II and III schools ($\chi^2 = 19.60$, $P < .001$). Controlling for division of competition, no differences occurred in the odds of a school responding based on its average total athletes (odds ratio [OR] = 1.00, $P = .96$), total athletics department revenues (OR = 0.96, $P = .75$), total athletics department expenditures (OR = 0.98, $P = .83$), whether the school had a football team (OR = 1.03, $P = .85$), or whether the school was public as opposed to private (OR = 0.90, $P = .56$).

School-Level Characteristics. A slight majority of responding schools were private (55.6%). Institutions fielded 5 to 35 sports teams (median = 16) and had 74 to 1050 intercollegiate athletes (median = 385). Just over two-thirds of responding schools (68.7%) had a football team. More than half of the institutions (58.6%) called on undergraduate athletic training students to assist in providing athlete care. Just under half of schools (48.2%) relied on athletic training aides to assist in the athletic training clinic. A minority of schools' sports medicine staffs (n = 70, 21.6%) cared for club or intramural athletes in addition to intercollegiate athletes. Among the sports medicine staffs that did provide care for club or intramural athletes, an additional 127 athletes, on average, received care.

Financial and Supervisory Models. The majority of responding schools' sports medicine departments were financed by (86%, n = 280) and supervised by (77%, n = 251) the athletics department. More Division III schools were under the administrative supervision of the athletics department than schools in Division I (Division I = 70.5%, Division II = 72.7%, Division III = 89.5%; Division III OR = 3.58; 95% confidence interval [CI] = 1.78, 7.74; $P < .001$); no differences were present across divisions according to whether schools were financed by the athletics department or a medical department (Division I = 86.4%, Division II = 81.8%, Division III = 89.5%).

Table 1. Distribution of Clinicians Across Schools in National Collegiate Athletic Association Divisions I, II, and III and Overall

Group	Median (minimum, maximum)			
	No. of FTE Staff ATs	No. of FTE Total ATs[a]	No. of FTE Sports Medicine Physicians	No. of On-Site Care Physicians
Overall	4.0 (0.5, 20.0)	5.0 (0.5, 34.0)	0.1 (0, 6.0)	3.0 (0, 18.0)
Division I	7.0 (2.0, 20.0)	10.38 (3.0, 34.0)	0.41 (0, 6.0)	5.0 (1, 18.0)
Division II	3.0 (0.5, 10.0)	3.84 (0.5, 11.75)	0.08 (0, 4.0)	2.0 (0, 17.0)
Division III	3.0 (1.0, 12.4)	3.33 (1.0, 12.4)	0.05 (0, 2.73)	2.0 (0, 10.0)

Abbreviations: AT, athletic trainer; FTE, full-time equivalent.

[a] The total AT variable represents the sum of staff ATs, graduate assistant ATs, and certified intern ATs in a school.

Staffing

Full-Time Equivalent ATs. All schools had a certified AT on staff, although the number of FTE ATs varied widely (Table 1). Less than half of schools (41.2%) called on graduate assistant ATs, ranging from 0.5 to 20 FTEs. About 1 in 5 institutions (20.5%) included certified intern ATs on the sports medicine team, ranging from 0.25 to 9 FTEs. The total FTEs of ATs on the sports medicine team (the sum of FTE staff, graduate assistant, and certified intern ATs) ranged from 0.5 FTE to 34.0 FTEs (Table 1).

Ratio of Staff : Nonstaff ATs. A total of 180 schools involved either graduate assistant or certified intern ATs or both. Among these schools, staff : nonstaff (graduate assistant and certified intern) ATs varied from 0.29 to 14.0, with a median value of 2.0. That is, some sports medicine teams had the equivalent of 3.45 FTE nonstaff ATs for each FTE staff AT, whereas other schools had the equivalent of 14.0 FTE staff ATs for 1 FTE graduate assistant or certified intern AT. We identified no differences in the staff : nonstaff ATs across school divisions, Power 5 status, or administrative or financial oversight models.

Full-Time Equivalent Physicians. The vast majority of institutions (92%) had a physician available to provide care to athletes on-site. Respondents from 6 schools were unsure or did not answer this question. Of the remaining 318 schools, 272 (83.6%) indicated that a physician was employed on staff. Schools in Division II were less likely than those in Division I to have a physician on staff (OR = 0.43, $P = .031$).

Non-AT Non-Physician Clinicians. Just over half of responding schools (52.3%, n = 170) included at least 1 clinician beyond ATs and physicians on their sports medicine staffs. Compared with Division I respondents, Division II and III respondents were less likely to have a non-AT non-physician on staff (Division II OR = 0.17 and 95% CI = 0.10, 0.31; Division III OR = 0.19 and 95% CI = 0.11, 0.33). Among the subgroup of schools that included other clinicians on their sports medicine staffs, the combined FTEs of all non-AT non-physician clinicians ranged from 0.01 to 18.5 FTE (median = 0.44 FTE). The sports medicine departments had staff chiropractors at 80 institutions (24.6%), physical therapists at 72 (22.2%), a nutritionist or dietitian at 66 (20.0%), a clinical psychologist at 42 (12.9%), a nurse at 19 (5.8%), and a licensed mental health professional at 16 (4.9%).

Ratio of ATs : Athletes

Descriptive Information on Ratio of Staff ATs : Athletes. The number of staff ATs was positively correlated with the number of collegiate athletes (correlation = 0.51; 95% CI = 0.43, 0.58; $t = 10.6$; $P < .001$). On average, 1 additional FTE staff AT was present for every 84 additional athletes at a school. Staff ATs cared for a median of 100 athletes (Table 2).

Descriptive Information on Ratio of Total ATs : Athletes. When graduate assistant and certified intern ATs were included in the ratio's denominator, the number of athletes per clinician decreased (Table 2) to an average of 80 athletes.

Differences in Ratios of Athletes : Clinicians. The ratios of both athletes:staff ATs and athletes : total ATs varied by division of competition and Power 5 status (Tables 3 and 4). For example, ATs at Division II and III schools cared for 1.94 and 2.45 times the number of patients, respectively, compared with those at Division I schools. Controlling for division of competition and Power 5 status, across both staffing ratios, ATs who were financed by or supervised by the athletics department cared for more patients than those who did not (Tables 3 and 4). For example, across total ATs, athletic department administrative oversight and financial oversight were associated with 1.20 and 1.21 times the number of patients per athletic trainer (95% CI administrative = 1.05, 1.36; 95% CI financial = 1.02, 1.43), respectively, compared with non-athletics administrative or financial oversight.

DISCUSSION

In sports medicine departments that administratively reported to or were financed by a medical institution, as opposed to the athletics department, ATs cared for fewer athletes, on average. Although a researcher[14] of previous

Table 2. Number of Athletes per Athletic Trainer (AT) Across National Collegiate Athletic Association Divisions and Overall

Group	No. of Athletes per Staff AT					No. of Athletes per Any AT[a]				
	Minimum	25th percentile	Median	75th percentile	Maximum	Minimum	25th percentile	Median	75th percentile	Maximum
Overall	21.4	62.8	100.0	140.0	525.0	16.9	45.7	80.0	116.7	300.0
Division I	21.4	47.0	58.0	81.8	187.5	16.9	33.3	42.7	53.5	144.4
Division II	27.6	93.2	118.3	149.9	525.0	27.6	75.0	100.0	118.8	300.0
Division III	27.4	109.1	137.5	165.9	375.0	27.2	100.0	123.6	150.0	300.0

[a] The Total AT variable represents the sum of staff ATs, graduate assistant ATs, and certified intern ATs in a school.

Table 3. Differences in Ratios of Athletes to Staff Athletic Trainers by National Collegiate Athletic Association School Characteristics[a]

Variable	Estimate	Robust Standard Error	95% Confidence Interval	*P* Value
Division I	REF	REF	REF	REF
Division II	1.76	0.11	1.56, 2.00	<.001
Division III	1.97	0.12	1.75, 2.22	<.001
Power 5	0.70	0.05	0.62, 0.80	<.001
Administrative oversight from athletics department	1.18	0.08	1.03, 1.36	<.001
Financed by athletics department	1.22	0.12	1.01, 1.47	<.001

Abbreviation: REF, referent category.

[a] This table presents the results of 2 Poisson regressions. The first included total athletes as the dependent variable, full-time equivalent staff athletic trainers as an offset, division, Power 5 status, and administrative-oversight model. The second is the same, but the financial-oversight model replaced the administrative-oversight model. Findings for division and Power 5 status were relatively constant across both models; the exact estimates for these variables are presented for the model including administrative oversight. A sample interpretation of an estimate is as follows: "Compared with Division I athletic trainers, Division II ATs cared for 1.76 times the number of athletes, holding other model variables constant." In accordance with Cameron and Trivedi,[16] robust standard errors were used to control for mild violation of the distribution assumption that the variance equals the mean.

conceptual work suggested a relationship between the medical model and a better ratio of clinician:patients, we provide the first empirical support for this relationship. The exact mechanism linking the medical versus athletics model of financial or administrative oversight and staffing patterns is unclear. Earlier authors[17] hypothesized that limited administrative support for improving staffing was one reason why the "Recommendations and Guidelines for Appropriate Medical Coverage of Intercollegiate Athletics" (AMCIA: https://www.nata.org/sites/default/files/amcia-revised-2010.pdf) were not implemented. Administratively reporting to a medical department may remove this barrier and allow for easier hiring of additional clinicians, but further research in this area is warranted. Financially, when the sports medicine budget is derived from the athletics department, many non-health care expenditures may compete for funds, whereas when the budget is provided via a medical model, the level of competition for resources may be less. Alternatively, using a medical model and having better staffing may be concurrent features of schools that place greater value on athletes' health and well-being, with neither staffing nor medical oversight causally dependent on the other. If a causal relationship exists between moving to a medical model and improved staffing, the shift toward the medical model as part of the call for autonomy in medical decision making may have the additional positive consequence of improving staffing.

In line with previous research,[8] nearly all staffing metrics measured in this study varied by division of competition and Power 5 status. The systematic variation in sports medicine staffing raises concern that schools with fewer clinicians and higher ratios of athletes to ATs may be structurally prevented from providing an adequate level of care to such a large number of athletes. It also raises the possibility that athletes face inequitable injury risks based on the school they attend. Previous investigators[18,19] associated AT employment status with reported injury rates in the high school setting. In this study, we found disparities in athletes' access to clinicians, depending on the NCAA division in which they competed, which may ultimately affect the health care they receive.

Staffing may also influence patient care with respect to which evidence-based policies related to athlete health are implemented. Previous authors[20,21] suggested that insufficient staffing may constrain the implementation of concussion-related care policies. In a 2013 survey[20] about concussion-management practices, adding more staff to the sports medicine team was frequently cited as 1 area in need of improvement across schools. Similarly, among NCAA Division II and III institutions, insufficient staffing was cited as a reason for incomplete implementation of

Table 4. Differences in the Ratios of Athletes to Total Athletic Trainers by National Collegiate Athletic Association School Characteristics[a]

Variable	Estimate	Robust Standard Error	95% Confidence Interval	*P* Value
Division I	REF	REF	REF	REF
Division II	1.94	0.11	1.72, 2.17	<.001
Division III	2.45	0.13	2.20, 2.72	<.001
Power 5	0.69	0.04	0.62, 0.78	<.001
Administrative oversight from athletics department	1.20	0.08	1.05, 1.36	<.001
Financed by athletics department	1.21	0.10	1.02, 1.43	<.001

Abbreviation: REF, referent category.

[a] This table presents the results of 2 Poisson regressions. The first included total athletes as the dependent variable, total full-time equivalent athletic trainers (sum of full-time equivalent staff, graduate assistant, and certified intern athletic trainers) as an offset, division, Power 5 status, and administrative-oversight model. The second is the same, but the financial-oversight model replaced the administrative-oversight model. Findings for division and Power 5 status were relatively constant across both models; the exact estimates for these variables are presented for the model including administrative oversight. A sample interpretation of an estimate is as follows: "Compared with Division I athletic trainers, Division II athletic trainers cared for 1.94 times the number of athletes, holding other model variables constant." In accordance with Cameron and Trivedi,[16] robust standard errors were used to control for mild violation of the distribution assumption that the variance equals the mean.

recommended concussion-management practices.[20] Additional research is needed to determine whether differences in sports medicine staffing are related to differences in athletes' access to health care or outcomes.

Another structural feature of the collegiate health care environment that varied across institutions was the contribution of athletic training students, graduate assistant ATs, and certified intern ATs in providing care to athletes. More than half of responding programs involved undergraduate athletic training students in providing care (59%). The reliance on students did not vary by administrative or financial oversight model (administrative: $\chi^2_1 = 0.23$, $P = .63$; financial: $\chi^2_1 = 1.07$, $P = .30$). A similar proportion called on graduate assistant or certified intern ATs or both (55%). Notably, some schools significantly supplemented their staff ATs' clinical care through this mechanism. The differential support supplied by athletic training students, graduate assistant ATs, and certified intern ATs may change as the athletic training professional degree evolves. The effect of having these clinicians-in-training providing health care is unknown. However, across other areas of health care, continuity of care has been associated with a variety of patient health outcomes,[22] and compared with attending physicians' continuity of care, resident physicians' continuity of care was less and their patients had worse health outcomes.[23,24] A heavy reliance on graduate assistant and certified intern ATs may impede continuity of care and affect athlete health outcomes.

The AMCIA provided guidance on appropriate levels of staffing. However, the NCAA has no staffing requirements for NCAA institutions, and no interassociation consensus statements have been published on the topic.[25] Researchers[6] determined that among Division I Football Bowl Subdivision institutions, the AMCIA guidelines were incompletely implemented. Although the reasons for not implementing staffing guidelines vary, they suggested that insufficient administrative or financial support (or both) combined with complex guidelines played significant roles. We used a simpler metric to demonstrate variations in staffing: the ratio of athletes per clinician. This metric may be more easily calculated and more comprehensible to stakeholders in the athletics environment who are involved in staffing decisions. As such, it may be a useful tool for sports medicine clinicians (in addition to the AMCIA guidelines) when communicating about staffing.

The disparity in sports medicine staffing across divisions is likely to affect clinicians as well as athletes. Previous authors[26–29] indicated that insufficient staffing affected clinicians' work-life balance, job satisfaction, and burnout. Diminished accomplishments and misaligned workload expectations have been specifically linked to burnout among ATs.[26] This phenomenon has also been documented in graduate assistant ATs in Division I.[30] The organizational model may also influence clinicians. For example, ATs employed in a medical model worked fewer hours per week and were more highly compensated than those employed in an athletics model.[31] Although the organizational model may serve as a mediator for some of the challenges ATs face,[11,31] the interaction among organizational model, staffing levels, and AT outcomes has not been fully elucidated. In future studies, researchers should evaluate whether absolute staffing or patient-load levels serve as meaningful cutoffs for reducing or eliminating work-life imbalance and burnout, taking into account the effect of the organizational model.

Limitations

Although we conducted random cluster sampling of NCAA conferences, Division I respondents were more predominantly represented. Therefore, the findings may be less generalizable to nonrespondents in Division II and III schools. Furthermore, differences between personnel at responding and nonresponding institutions may have affected our results. Additionally, we examined only the clinicians available to athletes through the sports medicine staff; schools may rely on partnerships with clinicians at the university health services or outside health care clinics to supplement the care provided by the sports medicine staff. Our telephone survey was conducted during the summer months, which may have influenced participation. These data were gathered in 2015, and although we do not anticipate that the associations would be different now, the exact staffing levels may not be accurate in 2020. Finally, even though we demonstrated variations in staffing patterns, we did not investigate the effect of staffing on athlete care. This is an important area for future research.

CONCLUSIONS

Disparities were present in the number of FTE clinicians available to athletes at schools in different divisions of competition. Furthermore, the number of athletes per AT was lower for sports medicine groups that administratively reported to or were financed by a medical department, rather than the athletics department. Across other health care contexts these types of structural predictors were associated with health care quality. Thus, understanding how the average patient load (athletes per AT) affects athlete access to care, care provision, and athlete health outcomes is an important direction for future examination. Investigators should evaluate how empirical metrics of staffing correlate with clinician job satisfaction. Ultimately, collegiate athletes should have equitable access to high-quality health care, and rigorous empirical research should inform policies aimed at achieving this goal.

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