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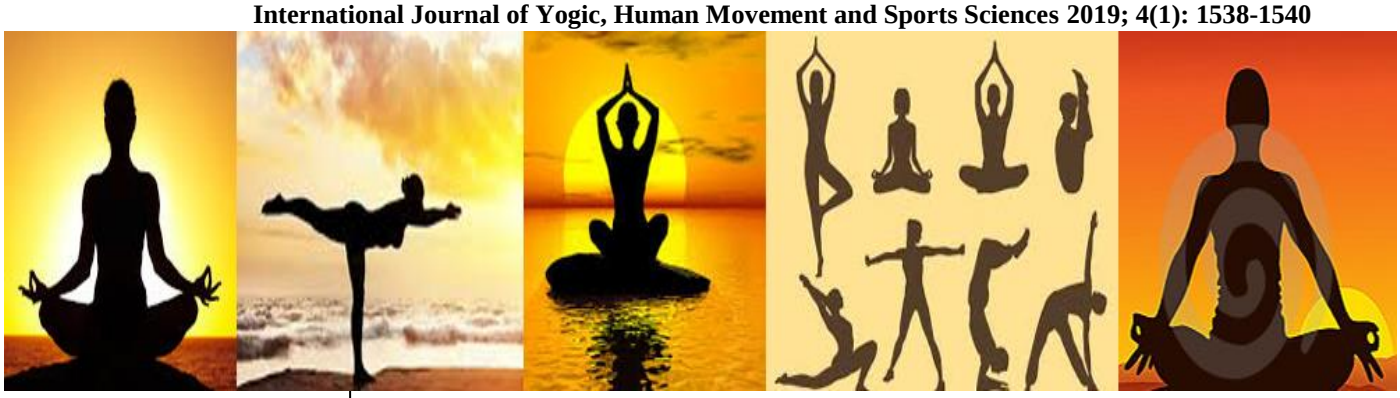

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The athletic training practice-based research network: A national model for point-of-care sports injury and outcomes documentation to improve athlete health and wellness

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Abstract
The present study was conducted to determine The Athletic Training Practice-Based Research Network: A National Model for point-of-care Sports Injury and Outcomes Documentation to Improve Athlete Health and Wellness. Despite significant benefits of sport participation related to the physical, mental, and social development of adolescent athletes, sport-related injuries such as sprains, strains, and concussions are a significant risk in this vulnerable population. This paper discusses that Athletic trainers are highly-educated physical medicine and rehabilitation specialists who are often the first medical professional to assess and treat a sport-related injury or illness including sprains, fractures, concussions, and life-threatening conditions such as exceptional heat illness, spinal cord injury, and cardiac arrest. Under the direction of a physician, athletic trainers provide patient care in a variety of settings including high schools, colleges, military, and industrial facilities. Unlike most healthcare professionals, athletic trainers are readily and easily accessible to their patients.

Keywords: Athletic training, sports injury, health, illness, trainers, research network and documentation etc.

Introduction
Sport participation is common in the U.S. For example, more than 7.8 million children and adolescents participate in interscholastic sports every year. Despite significant benefits of sport participation related to the physical, mental, and social development of adolescent athletes, sport-related injuries such as sprains, strains, and concussions are a significant risk in this vulnerable population. It is estimated that 1.4 million injuries occur every year during interscholastic sport participation, with 57% and 43% occurring in competition and practices, respectively (Comstock *et al*. 2013) [3]. In addition to their high frequency of occurrences, sport-related injuries also place a significant financial burden on the U.S. healthcare system, with costs related to emergency department visits exceeding $1.7 billion annually (Comstock *et al*. 2013) [3]. Moreover, this is likely a severe underestimation of yearly medical costs due to sport-related injuries since it only accounts for services related to initial evaluation and acute management, and not subsequent office visits, surgical interventions, or rehabilitation services.

Sports injury and outcomes documentation
The healthcare professional that is best positioned to offer an insight to the types of treatments provided for common sport-related injuries at the point-of-care is the athletic trainer. Athletic trainers are healthcare professionals who prevent, diagnosis, manage and treat injuries and illnesses arising from physical activities including sports. Athletic trainers are highly-educated physical medicine and rehabilitation specialists who are often the first medical professional to assess and treat a sport-related injury or illness including sprains, fractures, concussions, and life-threatening conditions such as exceptional heat illness, spinal cord injury, and cardiac arrest. Under the direction of a physician, athletic trainers provide patient care in a variety of settings including high schools, colleges, military, and industrial facilities. Unlike most healthcare professionals, athletic trainers are readily and easily accessible to their patients.

For example, athletic trainers are likely the only healthcare professional that provides care to a patient prior to (e.g., pre-participation examinations, injury prevention protocols, maintenance programs), at the moment of, and following an injury or illness. Furthermore, it is not uncommon for an athletic trainer to treat a patient on a daily basis from intake to discharge.

Athletic training practice based research network

The AT-PBRN is the first and only practice-based research network in athletic training that is recognized by the Agency for Healthcare Research and Quality. Practice-based research networks (PBRNs) are groups of clinicians and educators who work together to translate research findings into practice. In order to be eligible for federal grant money, a PBRN must have an established infrastructure that includes the following basic elements:

1. At least 15 ambulatory practices and/or 15 clinicians devoted to the primary care of patients,
2. A statement of the PBRN's purpose and mission, including an ongoing commitment to research,
3. A director who is responsible for administrative financial, and planning functions,
4. A support staff of at least 1 person reporting to the director,
5. A mechanism such as a community advisory board to solicit advice and feedback from the communities of patients served by the PBRN clinicians,
6. An organizational structure independent of any single study, and
7. Communication processes such as regular newsletters, e-mails or list serves, conference calls, or face-to-face meetings.

The EMR was designed to ensure that the collection of patient data does not require more time than what is commonly needed to complete appropriate healthcare documentation. Therefore, instead of burdening busy athletic trainers with separate data collection procedures for ongoing investigations, data collection occurs during the athletic trainer's routine patient documentation process. In short, the EMR is designed to enhance the documentation and clinical practice of athletic trainers, as well as to facilitate clinical research at the point-of-care. As a clinical tool, the EMR facilitates the thorough and complete documentation of patient records, including patient registration (e.g., sex, age, grade), injury demographic (e.g., sport, diagnosis), initial evaluation (e.g., mechanism of injury, clinical findings such as range of motion assessment and special test results, and patient goals), daily treatment (e.g., progress notes, exercise and treatment parameters), and discharge notes (e.g., clinical findings at discharge, progress related to patient goals) (Table 1). The EMR also includes ICD codes for injury diagnoses and American Medical Association Current Procedural Terminology (CPT®) codes for physical medicine and rehabilitation treatment codes.

Table 1: Electronic Medical Record Documentation Features

System Component	Example of Data Collected
Patient Registration	Sex, age, race, grade
Daily Patient Encounter Tracking	Sign-in form
Injury Demographics	Sport, season, position, previous history of injury
Patient Evaluation	Diagnosis, injured body part, side, mechanism of injury
Daily Treatment, Progress, Discharge Notes	Interventions, rehabilitation protocols, date return-to-play
The International Classification of Diseases, 10th Revision, Clinical Modification (ICD-10 CM) and Current Procedural Terminology (CPT) codes	Diagnosis, treatment codes for characterizing practice and calculating cost estimates
Single-Item Outcomes Instruments	Global Rating of Change; Satisfaction
Multi-Item Outcomes Instruments	Foot and Ankle Ability Measure, Pediatric Quality of Life Inventory
Injury Surveillance	Incidence, athlete-exposure, time loss/non time loss, sports participation

A unique aspect of the EMR is the incorporation of patient-reported outcome measures, or self-report questionnaires used to capture the patient's perspective. Traditionally, patient care has emphasized the measurement and evaluation of changes at the *impairment* level (e.g., range of motion, strength) as indicators of treatment progression and success (Binkley 1999) [1]. While these clinician-rated outcomes are meaningful and important to clinicians, they generally fail to capture changes that are meaningful and important to their patients. As a result, clinician-rated outcomes may not be the best indicators for driving treatment decisions or providing patient-centered health care. In contrast, patient-rated outcomes are surveys or questionnaires completed by patients and target areas related to *function* (e.g., patient cannot run or cut) and disability (e.g., patient cannot play soccer), which are typically more meaningful and important to the patient and often best represent the way an injury, illness, or disease directly impacts a patient's daily life. Thus, patient-rated outcome are more likely to effectively guide whole person, patient-centered care than clinician-rated outcomes. Also, and more importantly, since patient-rated outcomes are completed by the patient and offer an insight into the patient's perspective related to his/her health care, they offer a way to formally incorporate the patient into all clinical decisions, enhancing whole person and patient-centered care.

Sports injury and outcomes documentation to improve athlete health and well being

Since its launch, the EMR has demonstrated that patient care data can be reliably collected and that data can be aggregated across sites to begin answering questions that are clinically relevant to athletic training practice. To date, the AT-PBRN has generally focused on characterizing routine athletic training clinical practice. Practice characterization is a way to describe primary components of routine clinical practice (Downar *et al*. 2001) [5]. While practice characterization can encompass many variables and factors of routine patient care, previous investigations have generally classified practice characteristics into three major areas: patient, treatment, and value characteristics. Patient characteristics describe the primary demographics of the patient population, while treatment characteristics report on the method used by many health professionals to make improvements to a patient's condition. Lastly, value characteristics describe cost and

quality of care provided by the clinician.

Through retrospective analyses of EMR data, the AT-PBRN has previously described primary practice characteristics of athletic training including patient (e.g., age, sex, sport, type of injury) and treatment (e.g., type, duration and amount of treatment) characteristics of routine clinical practice. For example, based on 5,595 sport-related injuries recorded within the AT-PBRN, it was reported that most injuries in the ankle, head, and knee (Table 2). The most frequently reported service was athletic training evaluation/re-evaluation treatment, followed by hot/cold pack, therapeutic activities or exercise, strapping of lower extremity joints, and electrical stimulation.

Table 2: Injuries Documented within the AT-PBRN Grouped by Body Part and Sex [n, (%)].

Body Part	Male	Female	Total
Ankle	571 (17.3)	518 (22.6)	1089 (19.5)
Back	137 (4.1)	104 (4.5)	241 (4.3)
Calf	116 (3.5)	129 (5.6)	245 (4.4)
Chest	43 (1.3)	9 (0.4)	52 (0.9)
Elbow	79 (2.4)	42 (1.8)	121 (2.2)
Finger	69 (2.1)	47 (2.0)	116 (2.1)
Foot	84 (2.5)	97 (4.2)	181 (3.2)
Forearm	37 (1.1)	13 (0.6)	50 (0.9)
General Medical	128 (3.9)	73 (3.2)	201 (3.6)
Hand	74 (2.2)	26 (1.1)	100 (1.8)
Head	568 (17.2)	338 (14.7)	906 (16.2)
Hip	122 (3.7)	90 (3.9)	212 (3.8)
Knee	469 (14.2)	360 (15.7)	829 (14.8)
Neck	78 (2.4)	19 (0.8)	97 (1.7)
Should	302 (9.1)	111 (4.8)	413 (7.4)
Thigh	217 (6.6)	193 (8.4)	410 (7.3)
Thumb	53 (1.6)	37 (1.6)	90 (1.6)
Toe	29 (0.9)	25 (1.1)	54 (1.0)
Trunk	29 (0.9)	11 (0.5)	40 (0.7)
Upper Arm	13 (0.4)	8 (0.3)	21 (0.4)
Wrist	84 (2.5)	43 (1.9)	127 (2.3)
Total	3302 (100.0)	2293 (100.0)	5595 (100.0)

In addition to patient and treatment characteristics, the AT-PBRN has begun to describe changes in patient-reported outcomes over time for a wide-range of injuries including ankle sprains and knee sprains. For example, a recent study determined changes in self-report of function, as measured by the Foot and Ankle Ability Measure (FAAM), during the first two weeks after an ankle sprain injury. Thirty-nine patients (male=20, age=16.7±1.4 years, height=168.7±10.7 cm, mass=70.1±3.2 kg; female=19, age=16.5±2.3 years, height=143.3±23.4 cm, mass=67.5±3.0 kg) represented twelve different sports and were diagnosed with an ankle sprain injury by an athletic trainer within the AT-PBRN. Patients received usual care from an athletic trainer and completed the FAAM during treatment sessions at post-injury Time 1 [(T1); range=0-5 days post-injury] and Time 2 [(T2); range=10-15 days post-injury]. The FAAM is a patient-rated outcome measure consisting of two subscales: activities of daily living (FAAM-ADL; 21 items) and sport (FAAM-Sport; 8.

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