# Redefining Professional Knowledge in Athletic Training: Whose Knowledge Is It Anyway?

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**Context:** As athletic training continues to evolve as a profession, several epistemological considerations must be considered. These include how we generate professional knowledge and how we secure and legitimize it in both professional and public spheres.

**Objective:** The purpose of this commentary is to provide an overview of how athletic training has defined its body of knowledge. By contrasting our professional knowledge with recent advancements in medical cognition and epistemology, we aim to provide a more robust definition of professional knowledge for our profession.

**Background:** A profession is defined as an occupation that has a unique knowledge base and skill set that, when wielded, fulfills an ethically founded social contract with the public. One of the greatest challenges for the profession of athletic training as we move into the future is securing a knowledge base that is uniquely our own.

**Synthesis:** In this commentary, we synthesize the process by which we secure our body of knowledge through the Role Delineation Study with emerging trends on the nature of professional knowledge from the medical and health care literature.

**Results:** Based on the evidence presented, we propose a new definition for professional knowledge in the context of athletic training: *Information that is purposefully linked together to develop the ability to explain and predict the clinical phenomena associated with the profession's social contract.* 

**Recommendation(s):** As this new epistemological definition holds the potential to better structure and guide the athletic training's professional transformation, including its professional education processes, we recommend this model be considered for adoption and implementation.

**Conclusion(s):** It is apparent that a new construct for professional knowledge, one capable of supporting the profession's infrastructure and intentions, is needed for athletic training. In addition, and crucial to the formation of our professional body's construction of knowledge, is a need for collecting multivariable outcomes concerning our ability to legitimize it.

Key Words: Epistemology, evidence-based practice, outcomes, social contract

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"The beginning of wisdom is the definition of terms." —Attributed to Socrates

The most recent educational reform in athletic training has culminated in the decision for athletic training to adopt a graduate education model for entry into the profession. The main impetus of this change was ensuring that athletic training as a profession aligns with its peer health care professions' entry-level educational models. By doing so, athletic training has the opportunity to be recognized by these other professions as a viable health care profession in and of itself. An important consideration for the development of entry-level athletic training graduate programs is the incorporation of interprofessional education throughout the graduate curriculum.<sup>1,2</sup> On some level, these considerations, entry-level graduate preparation and interprofessional education, may be intended to help bring athletic training greater recognition as a health care profession in the eyes of the larger health care community, and perhaps even in the public eye.<sup>1</sup> As we engage in this endeavor, it is perhaps important to first ponder a few deeper or more philosophical aspects related to complex professions, such as "What is a profession?"; "How does a profession function in the context of the health care community?"; and "How does a profession gain recognition from the public it serves?" The purpose of this critical narrative is to present the most recent advances in health care education related to our profession's knowledge and the epistemological considerations for steering the profession of athletic training in the future as an equitable health care profession among a sea of worthy competitors.

### A PROFESSION DEFINED ....

The term *profession* is ubiquitous in health care and especially in the field of athletic training. It is used commonly in isolation as well as a root for many words and phrases we adopt in athletic training education: *professional, professionalism, interprofessional education and practice,* and the list continues. While this term has become readily and too passively accepted as part of athletic training's working identity, there has not been a clear definition of what it actually is, or what it fundamentally means. In 2004, recognizing the lack of a clearly defined term for profession in medicine, Cruess et al<sup>3</sup> put forth a framework for a working definition based on elements derived from sociology, and upon review this framework seems to be an extremely apt construct for athletic training to consider:

An occupation whose core element is work based on mastery of a complex body of knowledge and skills. It is a vocation in which knowledge of some department of science or learning or the practice of an art founded upon it is used in the service of others. Its members are governed by codes of ethics and profess a commitment to competence, integrity and morality, altruism, and the promotion of the public good within their domain. These commitments form the basis of a social contract between a profession and society, which in turn grants the profession a monopoly over the use of its knowledge base, the right to considerable autonomy in practice and the privilege of self-regulation. Professions and their members are accountable to those served and to society. (p75)

Based on this definition, it is apparent that in order for a particular occupation to be considered a profession, it should possess (1) a clearly established specific body of knowledge that is common to all members, (2) public sanction and recognition for the body of knowledge and the services/skills derived from it, (3) a code of ethics with regard to how the body of knowledge is wielded in fulfilling the social contract with the public, and (4) professional authority based on the public sanction of exclusivity in the use of the claimed body of knowledge.<sup>4</sup> The most important feature of a profession, then, is that its body of knowledge is wielded to serve a social purpose and that services derived from this body of knowledge form the basis of the social contract with the public.<sup>3–7</sup> From the public, the profession can expect a monopoly on the right to the use of its knowledge, autonomy in how it is used in the service of others, and the ability to selfregulate its members. The expectation from the public in terms of this social contract is the service benefit that is carried forth through ensuring guaranteed competence combined with altruism, integrity and morality, and transparency from the profession. Lastly, other related professions are bound to recognize and relate to the established body of knowledge and the professional body constructed by such knowledge, codes, and practices. Together, these 3 interrelationships and ethical bonds form the basis of any profession's accountability to the public and other professions in its fulfillment of the social contract.

Athletic training has made great strides in the last 40 years in securing its standing as a profession and in defining itself among the health care community.<sup>8,9</sup> There have been several developments that are of key importance to the profession's arrival, including:

- 1. The founding of the Professional Education Committee and Board of Certification;
- 2. The 1990 recognition from the American Medical Association that athletic training is an allied health profession;
- 3. The formation of the Joint Review Committee on Educational Programs in Athletic Training (JRC-AT) within the Committee on Allied Health Education and Accreditation (CAHEA) and the Commission on Accreditation of Allied Health Education Programs (CAA-HEP), which would eventually evolve into the Commission on the Accreditation of Athletic Training Education (CAATE);
- 4. The founding of the NATA Research and Education Foundation; and

5. The formation, legislation, and implementation of state practice acts across 49 states, which regulate the practice of athletic training.

Although the profession clearly has not reached its pinnacle as of yet, these key events in athletic training's history mark critical and necessary steps toward solidifying it as a legitimate profession in the eyes of the public as well as in those of other peer health care professions. Athletic training promised competence from its membership by wielding its recognized body of knowledge, which it self-regulated through external accreditation and certification. These historical milestones have been touted to culminate in the official founding and arrival of athletic training as a profession. However, there is an important question that has yet to be asked, and according to Cruess' definition of knowledge, this question is of critical import if the profession hopes to achieve the legitimization it so desires—"Does athletic training have a monopoly on its body of knowledge in the public's eye which can be used to fulfill its social contract?" The answer to this question more than likely resides in "how" athletic training specifically defines and secures its body of knowledge.

# HOW DOES A PROFESSION DEFINE AND SECURE A SPECIFIC BODY OF KNOWLEDGE?

As Cruess et al<sup>3</sup> articulated, it is clear that among the most important defining characteristics of any profession is a "specialized body of knowledge that is common among all members of the profession." Traditionally and chiefly, athletic training's body of knowledge has been secured through 2 sources: the Role Delineation and Practice Analysis Study (RD/PAS)<sup>10</sup> and the Athletic Training Education Competencies. From these 2 sources, the regulatory framework for the entry-level curriculum and the structure of Board of Certification (BOC) examination are constructed and dictated. As clearly stated in the 6th RDS:

For certification purposes, a role delineation/practice analysis study is used to establish a clearly delineated set of domains, tasks, and associated knowledge and/or skills necessary to carry out the responsibilities of the job to the standards required for certification.

Key to the construction of tasks and domains is the working definition for knowledge and skill, which the authors of the RD/PAS define as follows: "An organized body of factual or procedural information is called knowledge. The proficient physical, verbal, or mental manipulation of data, people, or objects is called skill."

During the RD/PAS, conducted approximately every 5 years, a panel of "Subject Matter Experts" reviews the previous version of the RD/PAS as well as the feedback from the BOC examination item writers to chart a new course for what should be the most current version of the body of knowledge that defines entry-level athletic training. An *Entry-Level Athletic Trainer* has been defined as

One who has met the eligibility requirements and demonstrated an acceptable level of competence in the provision of athletic training services within identified performance domains, all as defined by the Board of Certification. In the most current RD/PAS (6th edition),<sup>10</sup> the development panel consisted of 23 Subject Matter Experts in the athletic training profession. Within the RD/PAS, no definition for what constitutes a Subject Matter Expert was provided. To breakdown the key characteristics of this panel, 18 of the panel members held a master's degree (disciplines/domains not specified), 3 held a bachelor's degree (assumed to be Athletic Trainer), and 2 had a doctorate (the degree type and emphasis were not specified). As well, these "Subject Matter Experts" were *relatively experienced* in the field (15 reported over 15 years of experience as an athletic trainer, 1 reported 11–15 years, 5 reported 6–10 years, and 2 reported 3–5 years). Ten of the panel members (43%) were employed at educational institutions, 4 (17%) with state and federal governments, and 9 (40%) with corporations. These Subject Matter Experts carried out their charge of conducting a practice analysis of the tasks and domains previously identified, revising them, and developing a new set of tasks and domains that would constitute the most current and representative body of knowledge and skills required for entry-level athletic training. Within the 2004 Role Delineation Study (5th edition RDS), a practice analysis determined that there were 37 essential tasks that an athletic trainer needed to perform to be considered a "minimally competent entry-level athletic trainer." These tasks were then categorized into 6 domains of practice, and BOC exam writers then developed the national examination based on these domains. In 2008, a new Subject Matter Experts panel was assembled and after reviewing the feedback from the previous version of the BOC examination and the Role Delineation Study tasks and domains developed a new list of tasks. The Subject Matter Experts conducted a new practice analysis and reduced the essential tasks from 37 to 28 based on either eliminating or combining certain tasks. These 28 tasks were then categorized into 5 practice domains, which included the following:

- 1. Injury/Illness prevention and wellness protection;
- 2. Clinical evaluation and diagnosis;
- 3. Immediate emergency care;
- 4. Treatment and rehabilitation; and
- 5. Organizational and professional health and well-being.

From this newly formed list of practice analysis tasks and professional practice domains, the Subject Matter Expert panel developed knowledge and skills statements. These statements specifically highlight the knowledge and skills that a BOC candidate should possess to ensure safe and competent performance as a professional. Upon securing the new tasks, domains, and knowledge and skill statements, the BOC contracted Castle Worldwide Inc (Castle), a certification and licensure design, development, and administrative service company, to conduct the RDS validation survey. Within this survey, participants were asked to rate the tasks and domains identified by the Subject Matter Experts on their criticality and frequency. Criticality was defined as "The degree to which workers, clients, a member of the public, or other stakeholders would be physically, emotionally, or financially harmed if an athletic trainer failed to perform the task competently." *Frequency* was defined as "The time that a competent athletic trainer spends performing duties within each domain or task." Each task and domain item was ranked on a 4-point Likert scale for both criticality ("4" indicating most severe consequences) and frequency ("4" representing always performs this task). Each task/domain was weighed for its relative

importance for each by taking the sum of the frequency score and the squared criticality score. These scores would then serve as the blueprint for the BOC examination construction.

The participants who Castle contacted comprised 5000 BOC certified athletic trainers with 3 to 7 years of experience across the United States. A complete response rate of approximately 20% was received. The majority of these participants working at least 75% of their time as an athletic trainer (57%); 19% indicated that they worked less than 25% of their time as an athletic trainer, and the remainder reported their percent employment in this field as somewhere in between. Across the participants, the most common athletic training practice settings were the secondary school setting (28%), the university/college setting (23%), and the clinical setting (16%). The most common positions held by the participants were either "Athletic Trainer" (40%) or "Head Athletic Trainer" (31.3%). Lastly, 70% of the participants held "ATC" as their sole professional credential.

Upon completion of the RDS, the domains, tasks, and knowledge and skills statements were clearly articulated, weighted, and used as a blueprint for the next BOC examination. Based on the results of the RDS and Practice Analysis, the NATA Professional Education Council developed the 5th edition of the Athletic Training Education Competencies,<sup>11</sup> which specifically reflect the knowledge, skills, and clinical abilities of entry-level athletic trainers. These competencies, revised in 2011, now reflect what is considered to be the most important content for each task/ domain identified through the RDS. These standards are meant to secure athletic training's "unique body of knowledge." The CAATE is then charged with ensuring that each professional athletic training education program delivers this content in a consistent manner, as outlined by the standards for accreditation. Ideally, this safeguards that athletic training's unique body of knowledge is common among all those who are credentialed to educate future practitioners in the profession. The 8 newly revised content areas for the competencies represent the minimum requirements of knowledge and skill required for an entry-level athletic trainer in order to perform professional duties and now include

- 1. Evidence-based practice;
- 2. Prevention and health promotion;
- 3. Clinical examination and diagnosis;
- 4. Acute care of injury and illness;
- 5. Therapeutic interventions;
- 6. Psychosocial strategies and referral;
- 7. Health care administration; and
- 8. Professional development and responsibilities.

In addition to the competencies, the clinical integration proficiencies are meant to measure the real-life application and synthesis of athletic training knowledge and skills in the context of clinical experiences. These proficiencies represent "... the synthesis and integration of knowledge, skills, and clinical decision-making into actual client/patient care." The goal of the clinical integration proficiencies is for students to have the opportunity to see connections among the content of the competencies in the context of clinical experience, thus providing a platform for full integration of the tasks and domains outlined by the RDS. The 4 areas of clinical integration proficiencies now include

- 1. Prevention and health promotion;
- 2. Clinical assessment and diagnosis/acute care/therapeutic intervention;
- 3. Psychosocial strategies and referral; and
- 4. Health care administration.

When examining the second area of clinical integration proficiencies, the rationale behind combining multiple competency areas is that these competencies are never used in isolation in real-life settings and are instead highly dependent on one another. These real-life clinical experiences serve as the medium by which athletic training students are meant to synthesize information into working models of clinical practice for enhancing decision-making and outcomes. The emphasis on evidence-based practice and health care administration is to help the student grasp the use of best practices while also documenting the outcomes of their clinical decisions. This ideally translates to enhanced evidence that athletic training as a profession is not only worthwhile, but also essential to the health and well-being of the public.

Based on the RDS, the BOC examination, the Athletic Training Education Competencies, and the self-regulation of athletic training education through the CAATE, athletic training has certainly created the infrastructure for and roadmap to a viable profession, as described by Cruess. The problem is, however, that a deeper and more nuanced analysis of things reveals that much of athletic training's required knowledge, skills, and abilities are shared by many other health care professions; much of what athletic trainers "know" is not in fact owned by athletic trainers, constructed by athletic trainers, or exclusive to athletic training; it is rather a combination of some knowledge that is indeed owned by athletic training and some knowledge that is shared with other professions. It is a fair point to make that much of what athletic trainers do on a daily basis is not exclusive to athletic training, but rather has been gradually or directly co-opted from other, similar health care professions because it relates directly to the practice demands and patient-oriented needs and goals of athletic trainers "doing athletic training." For example, it certainly would be hard to argue that at least large parts of the knowledge related to or arising from pharmacology, emergency medicine, general medicine, sports nutrition, sports psychology, therapeutic modalities, and even certain aspects of orthopaedic assessment (Cyriax principles, for example) are unique to athletic training. It is clear that much of what athletic training has been teaching, doing, and claiming as professional knowledge is shared with medicine, physical therapy, psychology, and other related allied health care fields and professions under the sports medicine umbrella.

What then is considered to be athletic training's professional knowledge, to which the public grants exclusive right and authority and to which other competing professions recognize as legitimately "ours"? While we as a profession claim to have this professional knowledge, many other professions claim the exact same knowledge. Given these real and nuanced professional boundary and jurisdiction issues<sup>12–14</sup> in health care, "whose knowledge is it anyway, and who has the most legitimate claim and jurisdiction over it?" The answer may lie within the examination of what the public has granted athletic training in practices vary from state to state based on the

form of legislation (licensure, certification, registration, exemption), what the actual practice acts include, and the restricted use of our knowledge, skills, and abilities across clinical practice settings suggests that there may be a different social contract with the public than what is assumed to exist. For example, there is debate across several professions about the legitimate role of the athletic trainer in health care, who the athletic trainer can treat, and what kinds of conditions are allowable for athletic training care. In New York State currently, the professions of Medicine, Chiropractic, Physical Therapy, and Occupational Therapy are actively speaking out and levying concerns over the term *rehabilitation* being used in the State's athletic training practice act reformulation. These professions feel as though this is a direct infringement on the social contract that *they* have with the public and would limit their exclusive right and authority to the content. This is certainly not an isolated incident, and at athletic training state meetings, practice acts are often a point of discussion and contention. A contributing factor to this issue may potentially be athletic training's ever-expanding presence in "nontraditional" settings that fall outside what is considered to be our jurisdiction in the eyes of other health care professions<sup>14</sup> and our social contract with the public. In other words, our own desired and organic professional evolution and wandering across other professions' boundaries and jurisdiction<sup>14</sup> may in fact be the reason why other professionals are now questioning the legitimacy of our body of knowledge and our professional scope of practice.<sup>13</sup> In order to move forward as a profession, it is essential, then, that we take the opportunity to forge a uniform and deeper understanding of our social contract with the public and the perceived knowledge boundaries<sup>14</sup> with our sister health care professions. To do so, we must first entertain a greater understanding of what exactly constitutes a social contract with the public and various professional bodies.

# WHAT IS A PROFESSION'S SOCIAL CONTRACT WITH THE PUBLIC?

The social contract between those who participate in an occupation and the public is the defining feature of a profession.<sup>3,4</sup> The term *profession* connotes to the public a group of individuals who are capable of delivering complex services to fulfill a particular public need. Much of a social contract between a profession and the public is implicit, which makes it difficult for the development of a working definition; however, there are explicit expectations that afford the opportunity to provide that definition. In fulfilling the public need, the public expects that those who participate in the profession will provide those services altruistically with morality, integrity, and guaranteed competence. In doing so, there can be a strong and transparent promotion of the public good on the part of the professional, who is held accountable by the public for his/her actions in providing services. In return, the public grants autonomy and authority to the profession and a sense of trust to act in the best interest of the public when wielding the profession's body of knowledge. To do this, the public grants the profession the right to selfregulation and a monopoly on the body of knowledge that defines the services provided. This then constitutes public recognition and sanction. These are the terms most commonly used in our practice acts. What does the public recognize we can do? The legislation of the practice act ensures that no one else can claim the name of our profession other than those

who have been sanctioned by the public as able to fulfill the social contract. It is in this context that professional knowledge is then defined and operationalized. In other words, the boundaries<sup>12–14</sup> of the profession are clearly drawn for both the public and other professional bodies to recognize and respect.

### THE EPISTEMOLOGY OF ATHLETIC TRAINING: MOVING FROM MINIMUM COMPETENCE TO EXPERTISE: WHAT IS PROFESSIONAL KNOWLEDGE?

As stated earlier, the authors of the RDS define knowledge as "an organized body of factual or procedural information" that is secured from a panel of Subject Matter Experts. There are several issues that require careful scrutiny in order to examine how athletic training secures its body of knowledge through this process. First and foremost is the definition of Subject Matter Expert. In this context, knowledge is a "thing" that is thought to represent truth, based on the belief that it can in some manner be justified or verified. This is consistent with the classical definition of knowledge, but this definition does not align with the type of knowledge we use to make clinical decisions. By contrast, knowledge within the medical disciplines is recognized as being much more complex than a simple taxonomy of facts and figures. Rather, medical knowledge is much more complex, dynamic, and multifaceted, and, perhaps more importantly, it is very difficult to acquire and operationalize.15,16

### TYPES OF KNOWLEDGE IN CLINICAL PRACTICE

Within health care, there are 3 different types of knowledge that contribute to what is considered to be professional knowledge: *codified*, *personal*, and *cultural*.<sup>17</sup> Throughout the following sections, we discuss each type and articulate how it relates to the athletic training profession, serving in part to shape our social contract with the public and professional body. One of the main issues that readily emerges is our working definition of knowledge. What we'll find is that the current working definition of knowledge used in the RDS does not necessarily reflect the nature of athletic training knowledge, nor does it represent the totality and nuance of our full and real professional knowledge base. To secure our own body of knowledge, which the public grants us exclusivity and authority over and with, we first need a more robust working definition. In the following sections, we outline the component parts of what is known about knowledge, expertise, and health care and provide a constructive framework for a new, more optimal operational definition of knowledge for the athletic training profession.

# CODIFIED KNOWLEDGE: THE FOUNDATION OF OUR PROFESSIONAL KNOWLEDGE

The most prominent type of knowledge is *codified knowledge*, meaning it is written down and passed down from one generation of professionals to the next.<sup>17,18</sup> Codified knowledge (often also referred to as *explicit knowledge*) is contained in anything that is published, including journal articles, textbooks, class notes, PowerPoint presentations, even Web content. This type of knowledge is the most concrete type of knowledge in that it is in written form and is considered to be a "thing"—a real, credible, and authoritative thing that can be acquired and operationalized. Generally speaking, this is the

organized body of facts and procedural information proposed by the RDS each time that it is revisited. When examining the RDS' content areas, tasks, and their subsequent contribution to the educational competencies and proficiencies, codified knowledge serves to drive the engine of knowledge proliferation, dissemination, and utilization, starting with professional education mechanisms and procedures. By having a means of passing down what is considered to be the most relevant content to our practice, we logically and by extension believe that we are securing our own legitimate body of knowledge.

When examining the evolution of athletic training education curricula over the last 50 years, we see this prioritization of codified knowledge at work. Initially, early athletic training curricula centered on providing this codified knowledge to those who sought to be athletic trainers through the ability to master anatomy, physiology, and kinesiology, in addition to a set list of prerequisite courses associated with physical therapy education.<sup>8</sup> It was initially the belief that the extent of knowledge for athletic training was limited and that most practitioners would need to be exposed to the professional knowledge from physical therapy to be viable as health care professionals. As our curricula continued to evolve, we began to secure codified knowledge associated with our practices beyond physical therapy, such as taping and bracing, but we also realized that many professional members were finding employment in secondary schools.<sup>8</sup> The focus of the second evolution of athletic training curricula was to prepare professional members to also teach at the secondary school level. Therefore, much of the codified knowledge used was derived from teacher education. As we continued to evolve, we began to develop curricula that had "athletic trainingspecific" courses that were derived from codified knowledge gained or borrowed from medicine and physical therapy, such as prevention and care of athletic injuries, therapeutic interventions, injury assessment, etc.<sup>8,9</sup> A major issue related to this evolution, however, was that very little of what we were incorporating into our body of knowledge was actually "ours." Rather, much of the knowledge that we incorporated into athletic training education is technically "shared" with other professions-that constitutes boundary knowledge that we eventually claim jurisdiction over by bending and shaping a lot of that knowledge into the athletic context and scope of practice.<sup>14</sup> This speaks to the idea that the knowledge we often use as the foundation of what we practice is shared by many other professions,<sup>14</sup> what we have heretofore called *boundary* knowledge.<sup>12-14</sup> Therefore, large parts of the hybridized and co-opted knowledge we use in our professional preparation do not constitute professional knowledge alone, at least not as Cruess et  $al^{3-7,19,20}$  has described it in the medical literature.

More recently, as our professional education continues to evolve, we have incorporated evidence-based practice as a central theme of our education.<sup>11,21</sup> Within evidence-based practice we acknowledge that not all codified knowledge is equal. Rather, codified knowledge should be carefully scrutinized for its content, validity, and bias as we use it to help us make clinical decisions. The systematic process of evaluating codified knowledge for its usefulness is a critical step in validating our professional knowledge base. The milestone of the evidence-based movement in athletic training has been the work of the NATA Pronouncements Committee, which publishes numerous position statements regarding relevant topics that require codified knowledge for our

decisions. Within these position statements (eg, Management of Concussions,<sup>22</sup> Sudden Death in Athletes,<sup>23</sup> Heat Illness,<sup>24</sup> and Ankle Sprains<sup>25</sup>), writing teams comprising athletic trainers and other health care professions who have expertise in a particular content area perform an exhaustive search of the published literature (codified knowledge) on a particular subject matter associated with athletic training practice. Through this process, the writing team provides "best practice" recommendations for using the best available codified knowledge when making clinical decisions and provides a grade for the quality of the codified knowledge (ie, external evidence). The grading system is used to inform the reader about the quality of the codified knowledge used, including (1) how consistent the trend in codified knowledge was, (2) how unbiased the knowledge is, and (3) how the knowledge was generated. As is commonly known now in our profession, knowledge generation in this context can range from expert opinion to the interpretation of findings from large-scale systematic reviews of prospective studies. In this way, we are demonstrating to the larger health care community and the public that the codified knowledge we use to guide our decisions has been carefully scrutinized by the Content and Context Experts of the particular topic. As a component of each position statement, there are recommendations for future research, which speaks to the dynamic nature of codified knowledge. New information that emerges about a particular topic could substantially change the perception of the codified knowledge published previously. This is the critical importance of the evidence-based practice movement-the fluidity and organic nature of knowledge production. Codified knowledge is therefore not set in stone. It rather represents "probable knowledge," as what seems to represent the truth based on our current understanding of the problems we face.

As stated earlier, many other health care professions share at least parts of our codified knowledge base. Our professional knowledge base comes from the application of shared knowledge within the confines of the social contract we have with the public. In this way, as Eraut<sup>17</sup> articulates, "A profession is better understood as an applied field rather than a discipline, because its rationale derives from its social purpose and not from any distinctive form of knowledge." In this capacity, our professional knowledge is not the content, but rather the context in which it is applied. Therefore, knowing a great deal of codified knowledge, being the expert on terms of subject matter, does not necessarily translate to being an expert within the profession. The contextual framework of knowledge as it is applied to a patient is a much more personal level of knowledge.<sup>15,17,26</sup> Therefore, the next type of knowledge, as it relates to professional knowledge, has been termed personal knowledge.

### PERSONAL KNOWLEDGE—THE IMPLICIT KNOWLEDGE WE USE TO MAKE OUR CLINICAL DECISIONS

*Personal knowledge* is the knowledge that an individual professional brings to a particular patient interaction, which enables the ability to gather information, link that information into a usable framework, and perform the required actions within the confines of a particular clinical situation.<sup>16–18</sup> Personal knowledge is heavily reliant on experience and what one does with that experience, and in this capacity represents the "clinical expertise" component of evidence-

based practice.<sup>27,28</sup> This is the form of knowledge that is derived from practice at the level of the individual and how the individual comes to use and appreciate the value of his/ her training. While the acquisition and application of codified knowledge is thought to represent a more analytical process, personal knowledge is driven more so by a nonanalytical, unconscious, and nuanced approach that is for many hard to make objective or to quantify. Within the clinical reasoning literature it has been clearly articulated that experts and novices use different reasoning strategies based on how familiar they are with a particular clinical situation, how they have stored and have access to their knowledge (stores), and based on their use of metacognitive strategies that help to make sense of and enrich their experiential knowledge.<sup>27–29</sup> An expert who is very familiar with a particular condition applies a case pattern to solve clinical problems. These case patterns, also called schemata, are stored bits of codified and experiential knowledge that have been encapsulated (linked together) into a familiar pattern of presentation. When evaluating a patient, an expert looks for triggers for the use of a pattern rather than collecting a great deal of information. These triggers, also known as key features, together represent encapsulated or elaborated knowledge scripts that dramatically speed up the ability to diagnose and treat conditions that are familiar. Compared with a novice, the expert who is familiar with certain conditions and has supremely organized knowledge networks operates much faster, more efficiently and accurately, and targets information from the patient as the primary source of making decisions rather than collecting lots of objective information through the evaluation process and analyzing them, part and parcel.<sup>28</sup> In this way, the wellreasoned expert is able to explain and predict the pattern of the patient more accurately than is the novice with far less information.

It is well established that personal knowledge is very difficult to codify.<sup>16</sup> In fact, it is typically referred to as knowledge that works in the periphery of thinking and is often not even acknowledged. However, there is mounting evidence that this type of knowledge is the crucial knowledge for cultivating clinical expertise through deliberate practice.<sup>28,29</sup> Deliberate practice is the ability to act and carefully scrutinize the outcomes of your actions to better prepare for the future.<sup>30</sup> It has been estimated that it takes approximately 10 years of deliberate practice to become an "expert." To be clear, it is not enough to simply attain and accrue experience; the experience must be deliberate, made sense of, connected to existing knowledge structures, and reflected upon in order for it to add to the level of expertise. Noted medical expertise "expert" Vilma Patel is clear to discern between "experienced experts" and "experienced non-experts" in this context.<sup>28,31</sup> The ability to act, reflect upon actions, and prepare for future decisions based on what has been gained from the reflection of outcomes is by nature the vision of evidence-based practice as well.<sup>18,30</sup> Personal knowledge, then, is cultivated and refined through a symbiotic relationship between clinical education and experience, is fortified with reflection and superior organization skills, and cannot be gained simply through codified knowledge alone. As such, personal knowledge is very difficult to pass down from one person to another; sure, various facts, figures, trends, and findings are transferable on some level, but the nuanced and richer contextual glue that holds those data bits together is often more difficult to

express and transfer from one clinician to the next. Internally we know more than we can tell, and we can tell more than we can write down.<sup>16</sup> This indicates that much of what the expert clinician uses to make decisions comes directly from the context of "meaning-making" of experience rather than from formal exposure to codified knowledge.

When considering the types and applications of knowledge used by experts and novices, personal knowledge is driven to a greater extent by context rather than by content.<sup>15,26</sup> In medical cognition, there is good evidence to suggest that basic science knowledge can help foster a greater understanding of clinical case presentations, but only after the student has learned to clinically evaluate the patient.<sup>27,28</sup> In a series of studies, Patel and colleagues<sup>31</sup> found that when presented with a clinical case, final-year medical students had a greater appreciation for and utilization of biomedical knowledge after they completed the case compared with first-year and secondyear medical students who had first studied biomedical knowledge and then were asked to apply it to a case. These findings build the case that context can drive a greater appreciation for content compared with content driving context.<sup>15</sup> When considering this point, it is apparent that personal knowledge can help foster the ability to encapsulate codified knowledge. This also supports the philosophy of William Olser,<sup>32</sup> one of the founding physicians of the Johns Hopkins Medical School, who believed that medical education must be driven by patient interactions rather than by awareness of biomedical facts. It is then the integration of personal and codified knowledge that appears to give rise to professional knowledge. In this case, the combination appears essential for allowing one to explain clinical phenomena as well as predict their course. Perhaps a new working definition of knowledge is needed for our profession, one that takes into account both personal and codified knowledge.

# CULTURAL KNOWLEDGE—THE UNSPOKEN DRIVING FORCE IN INTERACTIONS WITH PATIENTS

Cultural knowledge is the plural form of personal knowledge: the socialized version of internal evidence. It is the knowledge that is implicit in interactions within a particular group or culture.<sup>17</sup> In the language of evidence-based practice, cultural knowledge is very similar to patient values and preferences. The interactions with a particular group of people and exposure to their beliefs and behaviors shape how we choose to relate to them. While cultural knowledge is often characterized by a knowledge factor such as gender, age, socioeconomic status, level of education, work environment, etc, athletic trainers develop a very unique and specific type of cultural knowledge in the athletic training clinical environment. It is inherent that an athletic trainer would not necessarily interact in the same way with a football player and a cross-country runner, nor would he or she interact the same way with a high school athlete versus a professional athlete. There are certain strategies the athletic trainer learns to enhance the fidelity, compliance, and adherence to clinical decisions for these patients and other stakeholders (coaches, parents, etc) through interactions with them. As is well known, but very difficult to codify, there are different cultural expectations even among athletes who participate in different sports. As Eraut<sup>17</sup> articulated, "In addition to the cultural practices and discourses of different medical specialties and a wide range of other health professions, one has to consider the

cultural knowledge of health and illness that permeate the beliefs and behaviours of patients from different cultural backgrounds." Our recognition of the shared beliefs and values in a particular sport cannot necessarily be codified (captured systematically and documented) because it predominantly exists in the background of our interactions. In this way, the main way to cultivate an appreciation of the cultural knowledge of those we serve is through experiential exposure of the culture. It is apparent that an enhanced appreciation of cultural knowledge provides a strong foundation for the social contract between the public and the profession, which in turn instills a sense of trust in the profession on the part of the public. In this way, we gain greater insight into the factors that drive compliance, fidelity, and adherence to our clinical decisions as we serve them.

# A NEW DEFINITION FOR PROFESSIONAL KNOWLEDGE IN ATHLETIC TRAINING

As stated earlier, the authors of the RDS defined knowledge as an organized body of factual and/or procedural information. While this definition takes into account the role of codified knowledge, it fails to highlight not only the essential role that personal knowledge plays in the development expertise and clinical decision-making but also the other characteristics known to represent medical expertise. It appears that the exposure to facts and biomedical information is very important for any health care profession, but what is also important is the development of personal knowledge upon which clinicians rely more heavily when making clinical decisions. It is apparent that novices do not have a substantial amount of personal knowledge as a result of a lack of deliberate practice and enriched clinical exposure and therefore must then rely more heavily on codified knowledge to guide their decisions. As experience from deliberate practice is gained and personal knowledge becomes more abundant, there is an expected shift toward reliance on personal knowledge in familiar clinical situations, which coordinates with a more expert approach to clinical reasoning. This, however, does not address the issue of what happens when an experienced clinician encounters something new. There is evidence to support that novice and experienced clinicians use similar reasoning strategies when they encounter something new; in short, experts confronting a novel case revert back to novice thinking in order to problem-solve the inexperienced case.<sup>33</sup> As a result of a lack of personal and/or cultural knowledge about a new case, both must rely more heavily on codified knowledge to make decisions, increasing error and time and decreasing efficiency. The act of working through the novel case combined with deliberate practice provides the opportunity to increase personal and cultural knowledge.

While codified, cultural, and personal knowledge are used in the discussions of what constitutes professional knowledge in the literature,<sup>17</sup> there are other terms that may be more applicable to athletic training. By translating the terms *codified knowledge, cultural knowledge,* and *personal knowledge* into evidence-based practice nomenclature, we can substitute the term *external evidence* for codified knowledge and the term *internal evidence* for personal knowledge. Cultural knowledge would then represent patient values and preferences in the evidence-based practice context.<sup>17,21</sup> Novice clinicians must rely more heavily on external evidence when making decisions in novel clinical situations because of a lack of internal evidence. Experienced clinicians have a tendency to rely more heavily on internal evidence when conditions are familiar. The transition between novice and experienced appears, then, to be governed by the context and use of these 2 types of evidence in conjunction with an appreciation of the cultural knowledge from the patient. The goal of making clinical decisions is to explain the clinical phenomena we encounter in our patients and to predict the outcomes of our decisions (Figure). This then allows us to redefine the term *knowledge*.

We propose a new definition of knowledge: Information that is purposefully linked together to develop meaning. In the context of clinical practice, meaning can then be operationally defined as the ability to explain and predict clinical phenomena. In this way, the new definition of professional knowledge for athletic training would then be Information that is purposefully linked together in order to develop the ability to explain and predict clinical phenomena. This new definition captures the dynamic nature of codified knowledge, personal knowledge, and cultural knowledge and adds the context of how we use internal and external evidence in fulfilling the social contract with the public we serve and to legitimize our professional jurisdiction in the eyes of other health care and medical professions.<sup>3,15</sup> Cultural knowledge in this definition emphasizes the public's expectations of athletic trainers, representative of their values, beliefs, and preferences. In this new definition, knowledge is not viewed simply as an organized body of facts and procedural information but rather as an enriched body of the most essential bits of information that, when combined with deliberate clinical practice, produce the ability to explain and predict the issues we are most likely going to see when fulfilling our fiduciary obligations to the public we serve. This new definition affords us the ability to use much of the same codified knowledge that is shared among many other health care professions, but it is our deliberate clinical practice of fulfilling our social contract that generates our professional knowledge. All shared codified knowledge among the health care professions should really then be considered preprofessional knowledge or "uncontextualized" knowledge. Professional knowledge is gained through the application of shared external evidence in the context of fulfilling our social contract with the public.

### OUTCOMES—THE NECESSARY INGREDIENT FOR SECURING PROFESSIONAL KNOWLEDGE

In fulfilling our social contract with the public, it is essential that we demonstrate the fruits of our professional knowledge application in order to legitimize our professional jurisdiction and practice. When considering our proposed new definition of knowledge, we have the opportunity to generate outcomes based on our ability to explain and predict clinical phenomena in the context of our social contract. The tenets of evidencebased practice provide the framework for our professional outcomes. As previously stated, as a profession we expect the public to grant us autonomy and authority within our social contract to act in the best interest of the public we serve. We are given exclusivity in most states to work in certain clinical environments, including the secondary school and university settings, with interscholastic and intercollegiate athletics under the supervision of a physician. Within these environmental constraints we can use the external evidence available to us to guide our clinical decisions. In short, we must make

Figure. In this figure, we depict the interaction between the types of knowledge that govern professional knowledge (Codified, Personal, and Cultural) and the sources of evidence we use in evidence-based practice (External Evidence, Internal Evidence, Patient Values and Preferences). By seeing the interaction between these 2 paradigms, we see that we use our professional knowledge for making our clinical decisions. By tracking the outcomes of our clinical decisions, we therefore secure our professional body of knowledge and jurisdiction (authority and legitimacy).



all knowledge that we use, that we share from across the boundaries, from other professions, and that which we produce ourselves "ours" by developing the evidence to support the idea that it is "our professional knowledge." By reflecting on the outcomes of our clinical decisions, we have the opportunity to refine our internal evidence, develop meaningful case patterns, and enhance our ability to fulfill our social contract, thus establishing our professional legitimacy and jurisdiction. In this lens, our outcomes tell the public that we indeed fulfill our social contract with them in very meaningful and authentic ways.

# OUTCOMES AND EXTERNAL EVIDENCE—OUR PROFESSIONAL KNOWLEDGE CODIFIED

As we have discussed, the application of both external and internal evidence in our clinical decisions represents our professional body of knowledge. In the RDS, the Subject Matter Experts developed the 28 tasks that an athletic trainer should perform, and the participants in the survey rated these for their criticality and frequency. However, while these are tasks that we assume are performed by an athletic trainer, how many of these do we actually have outcomes for? Is there any external evidence to suggest that these tasks allow an athletic trainer to fulfill the social contract with the public? These are not trivial questions. They are indeed very critical questions to ponder and address as they reflect fundamental ontological (who we are as a profession) and axiological (how we ethically fulfill our social contract) tenets. The outcomes of our decisions represent how well we are able to explain and predict the phenomena we encounter in fulfilling our social contract.<sup>34</sup> These outcomes therefore provide the mechanism by which we shape our professional jurisdiction, cultivate legitimacy in the eyes of other health care professions, and secure professional authority from the public.<sup>12–14</sup>

Within evidence-based practice, we consider the use of epidemiological evidence when explaining the clinical phenomena that we are most likely going to encounter in a particular clinical environment. The most common clinical settings for athletic trainers currently are the secondary school and collegiate settings. The National Collegiate Athletic Association Injury Surveillance Program (ISP)<sup>35</sup> (Datalys, Center for Sports Injury Research and Prevention, Inc, Indianapolis, IN) and the Reporting Information Online  $(RIO)^{36}$  system for high school injuries are 2 major mechanisms by which athletic training has tracked the types of injuries encountered in specific sports, the diagnoses, and return to play, and many other factors that we can use to observe and describe the clinical phenomena of our profession. Numerous publications have been generated from the results of these databases and provide great evidence for athletic trainers' ability to systematically collect information about their outcomes in fulfilling our social contract with the public. While these 2 systems offer tremendous benefit to us as a profession, not all athletic trainers participate in these systems. Based on the epidemiological trends captured from these databases, we have the opportunity to make better

predictions related to the types of outcomes we anticipate in these settings. The more our profession moves toward documenting outcomes, the more we gain the ability to show the public what our professional knowledge base is. It is in these outcomes that we document our clinical decisions based on our codified knowledge, personal knowledge, and cultural knowledge. In this way, we generate external evidence that our profession gains positive outcomes in fulfilling our social contract. Another way these outcomes are being captured is through practice-based research networks, such as the Athletic Training Practice-Based Research Network (AT-PBRN) housed in AT Still University.<sup>37,38</sup> The AT-PBRN provides the framework through which to systematically explore the decisions and outcomes that athletic trainers make in the diagnosis, prognosis, and therapy for athletic-related injuries, and it offers the opportunity to incorporate the most relevant emerging trends from research into practice. In doing so, the documented outcomes afford us the opportunity to secure our professional body of knowledge. As with the ISP and the RIO systems, the AT-PBRN currently has limited participation. If we move as a profession toward documenting the outcomes of our clinical decisions, we can provide greater justification for our profession in the public's eye as well as evidence for the expansion of our profession into other settings, perhaps appeasing our adversaries in other professions who are concerned about epistemological border wars.

When examining the RDS as well as the competencies and proficiencies of our professional education, perhaps the question we need to ask ourselves is "What evidence do we have to support that these tasks, competencies, and proficiencies are actually our professional knowledge base?" In other words, how do these tasks, competencies, and proficiencies afford us the ability to explain and predict the clinical phenomena associated with our social contract? Currently we do not have a great deal of evidence to support that the tasks, competencies, and/or proficiencies truly benefit the public. This may be a contributing factor for our questionable professional authority in the public's eye as well as our jurisdiction and legitimacy in the eyes of other health care professions. The outcomes generated from the ISP, the RIO, and the AT-PBRN are indeed a great and critical start, but we need more consistent implementation of this process across our profession-including in the educational policy arenas. Without this evidence, we cannot claim our authority in fulfilling our professional social contract with the public, or legitimacy from other health care and medical fields.

# FUTURE DIRECTIONS FOR THE EPISTEMOLOGY OF ATHLETIC TRAINING

As a profession, we are currently at a crossroads in our development. We are changing the educational requirements as well as the standards of practice for our profession, and we are kicking the issues surrounding advanced clinical residences, advanced athletic training education, and the clinical doctorate degree down the road in the meantime. With the decisions to move to the entry-level master's model of professional education and to adopt the World Health Organization's core competencies as our practice standards, now is the most important time to codify our clinical outcomes. Our documented outcomes serve as our road map to securing our own professional knowledge base, and thus as the mechanism by which to legitimize our profession as unique and critical health care providers. Now that educational reform is upon us, it is critical that we teach the necessity of appropriate and consistent methods of documenting our clinical decisions based on the information we purposefully link together to develop meaning. Our future as a profession within the larger health care community depends on it.

### CONCLUSIONS

As we continue to advance as a profession, it is essential that we no longer look at our definition of knowledge as a body of organized facts and procedures. Rather, we need to use a term that better captures our ability to act as a profession that has a clearly articulated social contract with the public we serve and claims to have a unique and necessary role in the spectrum of health care. To do so, it is essential that we adopt a definition that is influenced more heavily by the emerging trends in medical cognition and knowledge management. Professional knowledge is information that is purposefully linked together to develop the ability to explain and predict the clinical phenomena we encounter. Before we seek to expand our practices into other health care arenas (crossing borders), we need to generate outcomes based on our professional knowledge to prove that we indeed fulfill our social contract with the public. By doing so, we create opportunity to expand based on evidence rather than conjecture and axiomatic principles of yesteryear.

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