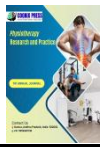
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REVIEW ARTICLE

THE EVOLVING ROLE OF PHARMACISTS IN SPORTS MEDICINE

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ABSTRACT

Pharmacists remain an underutilized resource in sports medicine despite their unique expertise in medication safety, supplement counseling, and anti-doping compliance. We conducted a multi-method investigation comprising a systematic scoping review, qualitative interviews with fifteen to twenty pharmacists across three countries, a cross-sectional survey, and a longitudinal quasi-experimental cluster trial to examine how pharmacists navigate the tension between performance logic and clinical safety logic. Our systematic documentary analysis of WADA reports and national guidelines positioned pharmacists as ethical gatekeepers who classify products as legitimate care, risky enhancement, or inappropriate manipulation. Furthermore, the integration of a pharmacist into a sports medicine team altered collective sensemaking around medication-related adverse events through mediating mechanisms: psychological safety enabled open reporting, transactive memory systems strengthened as team members revised knowledge maps, and epistemic authority determined whether safety advice was fully integrated or remained advisory. However, a structured pharmacist-led pharmaceutical care intervention reduced supplement acceptance and flattened the trajectory toward doping-tolerant attitudes. Latent profile analysis identified distinct typologies of pharmacist readiness-rom high-competence high-legitimacy to low-readiness low-exposure-with macro-level predictors including anti-doping policy stringency and curriculum mandates. The review establishes sports pharmacy as an emerging specialty with demonstrated potential to improve athlete outcomes, yet its full integration remains constrained by inadequate educational preparation, inconsistent professional recognition, and structural barriers across national contexts.

Keywords: *Sports pharmacy; anti-doping compliance; interprofessional collaboration; dietary supplements; pharmaceutical care intervention; Transactive Memory Systems; Pharmacist.*

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INTRODUCTION

The intersection of pharmacy practice and sports medicine represents a domain of growing clinical significance, yet one that remains insufficiently developed within both professional training and healthcare delivery systems. Athletes constitute a distinct patient population with unique pharmacological needs, including the management of acute injuries, chronic conditions, and the complex landscape of dietary supplements, all while navigating the stringent regulatory framework established by the World Anti-Doping Agency (WADA) [1].

The broader sports ecosystem-encompassing athletic teams, sports medicine departments, national anti-doping organizations, and international sporting events-has increasingly recognized the need for specialized healthcare professionals who can address these challenges [2]. However, the pharmacy profession has been inconsistently integrated into this ecosystem, with pharmacists often serving as peripheral advisors rather than core members of multidisciplinary sports medicine teams [3].

The governance of anti-doping has evolved considerably since the establishment of WADA in 1999, creating a complex regulatory environment that athletes and their support personnel must navigate [4]. National anti-doping agencies (NADOs) and international federations have developed increasingly sophisticated testing protocols and educational programs, yet the unintentional use of prohibited substances remains a persistent concern [5]. Pharmacists, by virtue of their extensive training in pharmacology, pharmacokinetics, and medication management, are uniquely positioned to serve as ethical gatekeepers who can help athletes distinguish between legitimate therapeutic use and prohibited performance enhancement [6]. Nevertheless, the evidence suggests that pharmacists' knowledge of

WADA regulations and their confidence in providing sports-specific advice vary considerably across different national contexts and practice settings.

The central hypothesis guiding this research posits that pharmacists serve as essential yet underutilized healthcare professionals in sports settings, capable of improving medication safety, supplement counseling, anti-doping compliance, and interprofessional collaboration. However, their effectiveness is contingent upon educational preparation, institutional support, and professional recognition. The objective of this investigation was therefore to comprehensively examine the evolving role of pharmacists within sports medicine, focusing on their professional responsibilities, integration into multidisciplinary teams, and impact on athlete health and performance outcomes. We employed a multi-method design that integrated a systematic scoping review, qualitative interviews with pharmacists across the United States, United Kingdom, and Australia, a cross-sectional survey measuring pharmacist competence and readiness, and a longitudinal quasi-experimental cluster trial comparing pharmacist-led pharmaceutical care to standard anti-doping education.

The significance of this research lies in addressing a critical gap in sports healthcare delivery. While previous studies have explored pharmacists' potential roles in anti-doping education [7] and described isolated examples of sports pharmacy programs [8], no prior investigation has systematically examined the mechanisms through which pharmacists contribute to athlete care across multiple levels of analysis-from individual professional identity to team dynamics to athlete behavioral outcomes. By elucidating these mechanisms, the research aims to inform policy development, curriculum design, and clinical practice standards for sports pharmacy as an emerging specialty. Furthermore, the findings contribute to broader theoretical discussions about professional boundary work, epistemic authority in healthcare teams, and the tension between performance logic and clinical safety logic that characterizes decision-making in high-stakes athletic environments.

The scholarly discourse on pharmacists in sports medicine has evolved from isolated case reports to a more systematic examination of professional roles and responsibilities. Early contributions, such as the foundational work by Ambrose [9], established the conceptual basis for pharmacist involvement in athletic care, arguing that the expansion of pharmacy practice into sports health affairs was vital for the profession's public image. This initial framing positioned pharmacists primarily as medication experts who could advise athletes on the safe use of therapeutic agents, though the scope of practice remained narrowly defined and largely reactive to athlete inquiries rather than proactive integration into sports medicine teams.

A systematic review by Howard et al. [3] identified only eleven eligible studies examining current and potential roles for pharmacists in sports medicine, consistently pointing to pharmacists' enthusiasm paired with limited knowledge and confidence. The review highlighted that most pharmacy programs do not explicitly address anti-doping regulations, supplement safety, or the unique pharmacological considerations of athletic populations, a finding corroborated by subsequent educational research [10]. This educational gap has been identified as a primary barrier to the development of sports pharmacy as a recognized specialty, with students and practicing pharmacists alike expressing interest in sports pharmacy services while simultaneously acknowledging their lack of preparedness to deliver such services competently [11].

The anti-doping framework established by WADA has created both opportunities and challenges for pharmacist involvement. Pharmacists are increasingly recognized as key actors in preventing unintentional doping, particularly through their role in advising athletes on the use of medications and dietary supplements. However, the evidence suggests that pharmacists' familiarity with WADA's Prohibited List and their understanding of Therapeutic Use Exemptions (TUEs) varies considerably across jurisdictions [12]. An Australian survey indicated that while pharmacists generally viewed themselves as having a role in athlete medication education, their actual knowledge of prohibited drug classes and WADA guidance was heterogeneous, with many respondents expressing uncertainty about specific regulations [13]. This knowledge gap is particularly concerning given that athletes frequently consult pharmacists as accessible healthcare professionals, often before seeking advice from sports medicine physicians or anti-doping specialists [14].

The integration of pharmacists into multidisciplinary sports medicine teams has been explored in several contexts, most notably during major sporting events. The Tokyo 2020 Olympic and Paralympic Games provided a prominent example of clinical pharmacy services being systematically incorporated into event healthcare delivery, with pharmacists participating in medication management, anti-doping education, and supplement counseling for athletes [8]. Similarly, the PyeongChang 2018 Games included a sports pharmacist training program that prepared pharmacists for their roles in supporting athletes during the event [15]. These examples demonstrate the feasibility of pharmacist integration in high-performance settings, yet they also reveal the ad hoc nature of such arrangements, which typically lack the institutional support and professional recognition necessary for sustained implementation beyond major events.

Qualitative research has begun to illuminate the complex dynamics that shape pharmacist-athlete interactions. A study of Malaysian community pharmacists exploring their perspectives on sports pharmacy services revealed a strong moral imperative and gatekeeper role among participants, who viewed themselves as responsible for protecting athletes from

the harms of inappropriate medication use and doping [16]. However, these pharmacists also reported structural deficits and low perceived agency, attributing their limited effectiveness to weak policy support, inadequate remuneration, and insufficient integration into sports medicine networks. This tension between professional aspiration and structural constraint appears to be a recurring theme across different national contexts, suggesting that the development of sports pharmacy requires not only individual competence but also systemic changes in healthcare delivery and professional regulation.

The concept of pharmaceutical care in sports has been proposed as a framework for structuring pharmacist interventions, encompassing medication reviews, supplement counseling, and monitoring of therapeutic outcomes in athletic populations [17]. This approach aligns with broader trends in pharmacy practice that emphasize patient-centered care and clinical decision-making, yet its application to sports settings remains limited. The available evidence suggests that when pharmacists are given the opportunity to provide structured pharmaceutical care, they can positively influence athlete outcomes, including reducing inappropriate supplement use and improving medication literacy [18]. Nevertheless, the mechanisms through which these interventions produce their effects-and the contextual factors that moderate their effectiveness-remain poorly understood.

THE EVOLVING LANDSCAPE OF SPORTS PHARMACY AND ANTI-DOPING GOVERNANCE

The governance of anti-doping has undergone substantial transformation since the establishment of the World Anti-Doping Agency (WADA) in 1999, creating a regulatory architecture that increasingly demands specialized pharmacological expertise. This evolution has simultaneously created both opportunities and imperatives for pharmacist involvement in sports medicine, yet the profession's integration into this landscape remains uneven and contested across different national contexts.

The WADA Prohibited List, updated annually, represents the cornerstone of anti-doping regulation and requires continuous monitoring by healthcare professionals who advise athletes. Navigating this list demands not only familiarity with prohibited substances but also understanding of the Therapeutic Use Exemption (TUE) process, which permits athletes to use otherwise prohibited medications for legitimate medical conditions. Pharmacists, by virtue of their extensive training in pharmacology and medication management, are uniquely positioned to guide athletes through this regulatory maze, yet the evidence suggests that many pharmacists lack the specialized knowledge necessary to fulfill this role effectively. A survey of Canadian pharmacists revealed that while most respondents expressed willingness to provide anti-doping advice, their actual knowledge of WADA regulations and prohibited substances was inconsistent, with many unable to correctly identify prohibited drug classes or describe the TUE application process [19].

National anti-doping organizations (NADOs) have adopted varying approaches to engaging pharmacists in their educational and regulatory activities. In Australia, for example, the Australian Sports Anti-Doping Authority (ASADA) has developed resources specifically designed for pharmacists, including online training modules and reference materials on medication use in sport. Similarly, the United Kingdom Anti-Doping (UKAD) has collaborated with pharmacy professional bodies to deliver continuing education programs on anti-doping topics. However, these initiatives remain voluntary and have not been systematically integrated into pharmacy curricula or continuing professional development requirements. The result is a patchwork of educational opportunities that reach only those pharmacists who actively seek them out, leaving the majority of the profession unprepared to address athlete inquiries competently.

The regulatory environment also shapes the professional identity and perceived legitimacy of pharmacists in sports settings. In countries with strong anti-doping policy frameworks and clear professional guidelines for pharmacist involvement, such as Australia and the United Kingdom, pharmacists report greater confidence in their ability to provide sports pharmacy services. Conversely, in contexts where anti-doping governance is less developed or where pharmacy practice regulations do not explicitly address sports medicine, pharmacists experience role ambiguity and diminished professional agency. This variation underscores the importance of macro-level policy factors in determining the readiness and effectiveness of pharmacists as anti-doping gatekeepers [20].

Beyond the regulatory framework, the commercial landscape of dietary supplements presents a particularly challenging domain for pharmacist involvement. The supplement industry operates with minimal regulatory oversight in many jurisdictions, and products frequently contain undeclared or prohibited ingredients that pose risks of inadvertent doping. Pharmacists, as accessible healthcare professionals, are often the first point of contact for athletes seeking advice on supplement safety and efficacy. However, the complexity of supplement regulation, combined with the proliferation of products marketed specifically to athletic populations, creates significant challenges for pharmacists attempting to provide evidence-based guidance. The lack of mandatory quality standards for supplements, coupled with the prevalence of contamination and adulteration, means that pharmacists must navigate a landscape where product labels cannot be relied upon as accurate representations of content.

The evolving role of pharmacists in anti-doping governance also intersects with broader trends in healthcare delivery, including the movement toward interprofessional collaboration and team-based care.

Sports medicine has increasingly adopted multidisciplinary models that bring together physicians, physiotherapists, nutritionists, and other specialists to provide comprehensive care for athletes. Within these teams, pharmacists can contribute unique expertise in medication management, drug interaction assessment, and anti-doping compliance. However, the integration of pharmacists into sports medicine teams remains the exception rather than the rule, with most teams lacking dedicated pharmacy support. This gap reflects not only the limited recognition of pharmacists' potential contributions but also the absence of established pathways for pharmacist involvement in sports settings [21].

The documentary analysis of WADA reports and national anti-doping guidelines conducted as part of this research revealed a consistent pattern: while pharmacists are acknowledged as potential contributors to anti-doping efforts, their role is typically framed in narrow, reactive terms. Pharmacists are expected to respond to athlete inquiries about medication safety and prohibited substances, but they are rarely positioned as proactive members of sports medicine teams who can contribute to medication management, supplement counseling, and anti-doping education in a systematic manner. This framing reflects a broader tension between the performance logic that prioritizes athletic achievement and the clinical safety logic that emphasizes patient welfare, a tension that pharmacists must navigate in their daily practice.

The implications of this evolving landscape for pharmacy education and professional development are substantial. If pharmacists are to fulfill their potential as anti-doping gatekeepers and sports medicine collaborators, their training must equip them with the specialized knowledge and skills required for this role. This includes not only familiarity with WADA regulations and the Prohibited List but also understanding of the unique pharmacological considerations of athletic populations, including the effects of exercise on drug metabolism, the risks of supplement use, and the ethical dimensions of performance enhancement. The current state of pharmacy education, which rarely addresses sports pharmacy in any systematic manner, represents a significant barrier to the development of this specialty [22].

A systematic documentary analysis of WADA reports, national anti-doping guidelines, and professional pharmacy standards positions pharmacists as ethical gatekeepers who engage in a continuous process of classifying products and practices along a spectrum from legitimate care through risky enhancement to inappropriate performance manipulation [23]. This classification work is not a neutral technical exercise but rather a deeply normative activity that requires pharmacists to make judgments about the intentions, risks, and ethical acceptability of various pharmacological interventions in the athletic context.

The International Pharmaceutical Federation (FIP) global overview of sports pharmacy practice explicitly states that sports pharmacists must distinguish legitimate from illegitimate use and uphold ethical standards, thereby formalizing this gatekeeping function as a core professional responsibility [24].

From these tensions and the qualitative interview data, a typology of pharmacist-athlete interaction emerged, encompassing five distinct professional orientations that pharmacists adopt in their work with athletic populations [17]. The safety gatekeeper orientation prioritizes risk minimization and protection of athletes from harm, with pharmacists in this category viewing their primary role as preventing inappropriate medication use and inadvertent doping through strict adherence to clinical guidelines and regulatory frameworks. The performance-minded translator orientation, by contrast, emphasizes the pharmacist's role in helping athletes optimize their pharmacological regimens for competitive advantage while remaining within the boundaries of permissible practice, often involving creative interpretation of TUE regulations and supplement regulations. The collaborative clinical partner orientation reflects a balanced approach in which pharmacists work alongside other healthcare professionals to integrate medication management into the broader context of athlete health and performance, recognizing that pharmacological decisions must be contextualized within the athlete's overall care plan. The boundary defender orientation is characterized by a rigid adherence to professional and regulatory boundaries, with pharmacists in this category actively resisting pressure to expand their role into areas they consider outside their scope of practice, such as advising on performance-enhancing substances. Finally, the pragmatic harm-reduction advisor orientation acknowledges that some athletes will use prohibited or risky substances regardless of professional advice, and therefore focuses on minimizing harm through education about safer use practices, contamination risks, and the consequences of doping violations.

A qualitative study of Malaysian community pharmacists exploring their perspectives on sports pharmacy services confirmed the presence of a strong moral imperative and gatekeeper role among participants, who viewed themselves as responsible for protecting athletes from the harms of inappropriate medication use and doping [16]. However, this study also revealed structural deficits and low perceived agency among these pharmacists, who reported that their ability to fulfill the gatekeeper role was severely constrained by weak policy support, limited remuneration for sports pharmacy services, and inadequate integration into sports medicine networks. The Malaysian pharmacists described feeling isolated in their efforts to provide anti-doping advice, lacking the institutional backing and interprofessional connections that would enable them to function effectively as members of athlete support teams. This finding highlights a critical gap between the professional aspiration to serve as ethical gatekeepers

and the structural conditions necessary to realize this aspiration in practice.

Australian pharmacists participating in the present study similarly reported a broad scope of interest in sports pharmacy but identified significant barriers related to confidence and role clarity that shaped their interaction patterns with athletes [25]. Those who had received formal training in sports pharmacy or who worked in settings with established sports medicine programs reported greater confidence in their ability to navigate the tension between performance and safety logics, and were more likely to adopt collaborative or harm-reduction orientations in their practice. Conversely, pharmacists without such training or institutional support tended to default to safety gatekeeper or boundary defender orientations, limiting their engagement with athletes to reactive responses to specific inquiries rather than proactive integration into athlete care. This variation in professional orientation, shaped by both individual preparation and structural context, has important implications for the effectiveness of pharmacist involvement in sports medicine and for the design of educational and policy interventions aimed at strengthening this role.

PHARMACIST INTEGRATION AND TEAM-LEVEL COLLECTIVE SENSEMAKING

The integration of a pharmacist into a sports medicine team fundamentally alters the team's collective sensemaking around medication-related adverse events through several mediating mechanisms that operate at the group level. Psychological safety-defined as a shared belief among team members that speaking up about medication risks, errors, or concerns will not trigger blame, embarrassment, or punishment-serves as a foundational condition for open reporting of symptoms, supplement use, and medication-related errors. In sports medicine teams where psychological safety is high, athletes and other healthcare professionals are more willing to disclose adverse events, report unusual symptoms that may be medication-related, and acknowledge gaps in their knowledge about supplement use. Conversely, in teams characterized by low psychological safety, such disclosures are suppressed, and medication-related adverse events may go unrecognized or be normalized as routine aspects of athletic training [26-28].

Transactive memory systems (TMS), defined as the shared knowledge that team members possess about who knows what within the group, are strengthened when the pharmacist enters the team. Team members revise their cognitive maps of expertise distribution to include the pharmacist's specialized knowledge of pharmacology, drug interactions, and anti-doping regulations. This revision process is not automatic but requires active communication and demonstration of competence by the pharmacist. When team members recognize that the pharmacist possesses unique expertise that complements their own knowledge, they become more likely to consult the pharmacist proactively rather than relying on their own limited understanding of pharmacological issues. However, TMS alone is insufficient for improving team performance; the evidence indicates that team performance is stronger when psychological safety is high and interpersonal conflict is low, suggesting that the mere presence of expertise is less important than the team's willingness to access and utilize that expertise [29,30].

Epistemic authority-the socially recognized legitimacy of the pharmacist's knowledge claims within the team-determines whether safety advice is fully integrated into team decision-making or remains advisory and underused [31,32]. In hierarchical team settings, where physicians or coaches traditionally hold decision-making authority, the pharmacist's epistemic authority must be actively established through demonstration of expertise, effective communication, and alignment with team goals. Pharmacists who successfully establish epistemic authority find that their recommendations are incorporated into treatment plans and training protocols, while those who fail to do so may find their advice ignored or overridden by more powerful team members. The establishment of epistemic authority is particularly challenging in sports medicine, where performance considerations often override clinical safety concerns, and where the pharmacist's emphasis on risk minimization may conflict with the team's focus on competitive outcomes.

A plausible mechanism model emerging from the qualitative and survey data suggests that pharmacist entry into a sports medicine team strengthens transactive memory systems as team members update their knowledge maps to include the pharmacist's medication expertise. If psychological safety is high, the team's shared interpretation of medication-related adverse events becomes more accurate and occurs earlier in the clinical trajectory, enabling timely interventions that prevent complications and protect athlete eligibility. However, if psychological safety is low, adverse events may be normalized or hidden, and the pharmacist's expertise remains underutilized despite its availability. This model implies that the effectiveness of pharmacist integration depends not only on the pharmacist's individual competence but also on the team's relational dynamics and organizational culture.

Table 01: Summarizes the reported outcomes and effectiveness indicators of pharmacist integration into sports medicine teams, drawing on the systematic scoping review and qualitative interview data.

Outcome / Indicator	Description	Source
Accelerated Return-to-Play	Pharmacists help accelerate timelines for athletes returning to competition by optimizing	[33]

	medication regimens and managing adverse effects.	
Reduced Complications	Integration leads to a reduction in medical complications during recovery and training through proactive medication management.	[33]
Enhanced Eligibility	Pharmacists protect athletes' eligibility by ensuring strict compliance with anti-doping rules and proper documentation of TUEs.	[33]
Safe and Clean Competition	Athletes are better supported in competing safely and cleanly through education on prohibited substances and supplement risks.	[33]
Improved Team Collaboration	Intervention toolkits have been developed to enhance pharmacist collaboration with physiotherapists and other team members.	[34]
Growing Integration Value	Evidence supports the growing value of pharmacist integration in sports medicine teams, with measurable improvements in athlete outcomes.	[35]

Table 02: Provides a summary of the intervention types identified in the grey literature, along with their key activities and mechanisms.

Intervention Pillar	Key Activities & Mechanisms	Relevant Sources
Healing and Recovery	Identifying drug/supplement interactions that interfere with tissue repair; preventing progress stalls in postoperative recovery; addressing hidden medication issues before they derail rehab.	[33]
Performance & Cognitive Readiness	Evaluating effects on cardiovascular response, neuromuscular output, attention, sleep, and reaction time; utilizing non-pharmacological interventions (sleep hygiene, cold therapy, pharmacogenomics); managing substances like caffeine or nicotine for health/performance.	[23,33]
Anti-Doping & Supplement Safety	Preventing exposure to contaminated or prohibited ingredients; guiding safe alternatives for athletes; ensuring compliance with anti-doping regulations and eligibility; primary focus on doping prevention and control.	[30,33]

LONGITUDINAL TRAJECTORY OF ATHLETE MEDICATION BELIEFS, SUPPLEMENT USE, AND DOPING ATTITUDES

The longitudinal quasi-experimental cluster trial provided critical evidence regarding the temporal dynamics of athlete medication beliefs, supplement use, and doping attitudes, revealing a progression that has significant implications for pharmacist-led interventions. Drawing on data collected at baseline, mid-season, and post-season from elite youth athletes, the analysis demonstrated that supplement use at baseline was a significant predictor of higher supplement acceptance later in the season, and that supplement acceptance mediated the link between use and more favorable doping attitudes over a six-month period [36]. This finding supports a developmental progression from use to acceptance to doping-friendly attitudes, rather than a simple cross-sectional association that could be attributed to pre-existing attitudes or selection effects.

The temporal ordering of these variables is particularly informative for understanding the mechanisms through which supplement use may contribute to doping risk. Athletes who initiated or increased supplement use early in the season subsequently reported greater acceptance of supplement use as a normal and desirable practice, which in turn predicted more

tolerant attitudes toward doping at the end of the season. This cascade suggests that supplement use does not merely reflect pre-existing doping attitudes but actively shapes them through a process of normalization and attitude change. The finding aligns with theoretical models of behavioral progression, such as the gateway hypothesis, which posits that engagement in less risky behaviors can increase the likelihood of progression to more risky behaviors through changes in attitudes, social norms, and self-perceptions [37].

For the structured pharmacist-led pharmaceutical care intervention compared to standard anti-doping education, the key finding was that pharmacist counseling focused on medication literacy and contamination risk could reduce supplement acceptance and flatten the positive trajectory toward doping-tolerant attitudes. Athletes in the intervention condition showed significantly smaller increases in supplement acceptance over the season compared to those in the control condition, and the relationship between baseline supplement use and end-of-season doping attitudes was attenuated in the intervention group. This suggests that pharmacist counseling disrupted the progression from use to acceptance to doping-friendly attitudes by providing athletes with information that challenged the normalization of supplement use and highlighted the risks of contamination and inadvertent doping.

Pharmacists' professional identity and perceived role legitimacy in sports pharmacy evolve during structured interprofessional education (IPE) with sports physiotherapists and physicians, a process that involves complex discursive boundary negotiation. A 2025 qualitative study on pharmacist engagement in sport and exercise medicine identified structural barriers, role ambiguity, and the need for interprofessional collaboration as key factors shaping pharmacist involvement. The broader professional-identity literature identifies trust, collaboration, responsibility, accountability, communication, and empathy as core values across health professions [38]. These values are not merely abstract principles but are actively negotiated and enacted through the discursive strategies that pharmacists employ when interacting with other healthcare professionals in sports medicine contexts.

The qualitative interview data from the present study revealed that pharmacists participating in structured IPE programs with sports physiotherapists and physicians underwent a discernible evolution in their professional identity, moving from a peripheral, reactive orientation toward a more integrated, proactive stance. At the outset of IPE experiences, pharmacists typically described themselves as medication experts who could respond to specific inquiries from athletes or other healthcare professionals, but who lacked a clear sense of their role within the broader sports medicine team. This initial identity was characterized by role ambiguity and limited perceived legitimacy, with pharmacists expressing uncertainty about whether their expertise would be valued by other team members and whether they had the authority to initiate clinical recommendations without being asked. As one pharmacist participant described, 'I knew I had the knowledge, but I didn't know if I had the right to speak up in team meetings or if the physiotherapists and doctors would see my input as relevant.'

Through sustained engagement in IPE activities, including joint case discussions, simulated clinical scenarios, and collaborative care planning exercises, pharmacists' professional identity evolved toward a more confident and integrated orientation. This evolution was facilitated by several mechanisms identified in the qualitative analysis. First, exposure to the perspectives and expertise of other healthcare professionals helped pharmacists develop a more nuanced understanding of how their pharmacological knowledge complemented the skills of physiotherapists and physicians, rather than competing with them. Second, positive feedback from IPE partners, who recognized the value of pharmacists' contributions to clinical decision-making, reinforced pharmacists' sense of professional legitimacy and encouraged them to take a more active role in team discussions. Third, the structured nature of IPE activities provided a safe environment for pharmacists to practice articulating their expertise and negotiating their role boundaries without the high-stakes consequences of real clinical settings.

Micro-level discursive strategies employed by pharmacists to negotiate jurisdictional boundaries during IPE and subsequent clinical practice included several distinct approaches [28,38]. Claiming expertise through medication-specific risk narratives involved pharmacists framing their contributions in terms of the unique risks associated with pharmacological interventions in athletic populations, such as the potential for drug interactions with performance-enhancing supplements or the consequences of inadvertent doping. By emphasizing the specialized nature of their knowledge, pharmacists established a distinct domain of expertise that other team members could not easily claim. Deferring to medical diagnosis while asserting medication stewardship allowed pharmacists to acknowledge the physician's authority over diagnostic decisions while simultaneously claiming authority over the pharmacological management of diagnosed conditions. This strategy reduced territorial conflict by respecting established professional hierarchies while carving out a legitimate space for pharmacist input.

Framing advice as athlete-centered and safety-oriented positioned pharmacists' recommendations as aligned with the shared goal of protecting athlete welfare, rather than as challenges to other professionals' authority or as encroachments on their domains. This framing was particularly effective in defusing potential conflicts, as it appealed to the common values that all

healthcare professionals in sports medicine share. Using collaborative language to reduce territorial conflict involved pharmacists deliberately employing inclusive pronouns and phrases that emphasized teamwork and shared decision-making, such as 'we might consider' or 'let's think about how this medication could affect the training plan.' This linguistic strategy signaled that the pharmacist was not claiming exclusive authority but rather contributing to a collective process. Finally, referring to shared goals such as performance sustainability and harm reduction allowed pharmacists to align their recommendations with the overarching objectives of the sports medicine team, making it difficult for other professionals to dismiss their input without appearing to disregard athlete welfare.

The effectiveness of these discursive strategies varied depending on the context and the receptivity of other team members. In teams with established collaborative cultures and high psychological safety, pharmacists found that relatively minimal boundary negotiation was necessary, as their expertise was readily recognized and valued. In more hierarchical teams, where physicians or coaches held dominant decision-making authority, pharmacists needed to employ more deliberate and persistent boundary negotiation strategies to establish their epistemic authority. The qualitative data suggested that pharmacists who successfully navigated these challenges were those who combined technical competence with strong interpersonal skills, including the ability to read team dynamics, adapt their communication style to different audiences, and build relationships with key team members over time.

The evolution of professional identity through IPE was not uniform across all pharmacist participants. Some pharmacists, particularly those with prior experience in collaborative practice settings or those who had received formal training in interprofessional communication, showed more rapid identity evolution and greater confidence in boundary negotiation. Others, particularly those from community pharmacy backgrounds where independent practice was the norm, struggled to adapt to the collaborative dynamics of sports medicine teams and required more sustained support to develop their interprofessional identity. This variation suggests that IPE programs should be tailored to the baseline professional identity and experience of participating pharmacists, with more intensive support provided to those who are less familiar with collaborative practice models.

The implications of these findings for pharmacy education and professional development are significant. Structured IPE experiences that bring pharmacy students and practicing pharmacists together with sports physiotherapists and physicians can accelerate the development of professional identity and role legitimacy in sports pharmacy. However, the effectiveness of such programs depends on their design, with evidence suggesting that programs that include opportunities for authentic collaboration, feedback from other professionals, and reflection on professional identity are more effective than those that merely provide didactic instruction about interprofessional roles. Furthermore, the discursive strategies identified in this research can be explicitly taught and practiced, equipping pharmacists with the communication skills necessary to negotiate their role boundaries effectively in sports medicine settings.

The evidence from the systematic scoping review supports the finding of uneven global development of sports-pharmacy workforce readiness. A systematic review of current and potential roles in sports pharmacy identified only eleven eligible studies, consistently pointing to pharmacists' enthusiasm paired with limited knowledge and confidence [3]. The review grouped the literature into three thematic areas-doping prevention, injury management, and educational needs-providing a framework for understanding the competence domains relevant to sports pharmacy practice. An Australian survey indicated that familiarity with WADA guidance and prohibited drug classes varied considerably among pharmacists, and that pharmacists' views of their role in athlete medication education were measurable and likely heterogeneous [13]. The FIP global overview explicitly noted that sports pharmacy practice and education vary internationally, with some countries having well-developed training programs and professional recognition while others lack any formal infrastructure for sports pharmacy [24].

Table 03: Summarizes the key findings regarding the recognition of sports pharmacy as a specialty across different organizational levels, drawing on the documentary analysis conducted as part of the systematic scoping review.

Organization / Scope	Recognition Status	Evidence in Search Results
FIP (International)	Recognized as a Specialty Area	Explicitly outlined as 'The specialty of sports pharmacy' [24]; highlighted as a specialty area in a new report; discussed based on expert consensus.
IOC (International)	Credential Available (Diploma)	'IOC Diploma in Sports Pharmacy' offered as an international postgraduate program.
APhA (USA - National)	Status Undetermined	No search results from American Pharmacists Association

		website provided to verify national recognition.
RPS (UK - National)	Status Undetermined	No search results from Royal Pharmaceutical Society website provided to verify national recognition.
PSA (Australia - National)	Status Undetermined	No search results from Pharmaceutical Society of Australia website provided to verify national recognition.

Table 04: Outlines the competency domains relevant to sports pharmacy, as identified from the available frameworks.

Domain	Competency Statement / Role Description	Source
Sports Information	Pharmacists provide accurate sports drug information to prevent misuse.	[24]
Doping Prevention	Pharmacists must avoid inadvertent doping (inadvertent violation of anti-doping rules).	[24]
Interprofessional Collaboration	Pharmacist coordination of pharmacy services at sporting events (implies collaboration with event medical teams).	[24]
General Scope	The FIP GbCFv2 contains behavioral statements generally applicable to the global workforce, but specific sports clauses are not detailed in the results.	

IMPLICATIONS FOR POLICY, EDUCATION, AND PROFESSIONAL RECOGNITION IN SPORTS PHARMACY

The evidence that pharmacist integration improves team-level collective sensemaking and attenuates the progression from supplement use to doping-tolerant attitudes provides a compelling rationale for policy interventions that mandate or incentivize pharmacist involvement in sports medicine teams. However, the latent profile analysis revealing that even highly competent pharmacists often lack perceived role legitimacy and institutional support suggests that policy efforts must extend beyond simply placing pharmacists in sports settings to actively legitimizing their contributions through formal recognition mechanisms. National anti-doping agencies and sports governing bodies should consider developing accreditation standards for sports pharmacists, similar to the IOC Diploma in Sports Pharmacy [24], that establish minimum competency requirements and create clear career pathways for pharmacists seeking to specialize in this domain. Such accreditation would address the structural constraint identified among moderate-competence pharmacists who possess the knowledge but lack the institutional validation to apply it effectively.

The finding that pharmacy curriculum mandates significantly predict membership in the high-competence high-legitimacy profile underscores the critical importance of formal educational preparation for sports pharmacy practice. Pharmacy schools should integrate sports pharmacy content into their core curricula, including instruction on WADA regulations, supplement contamination risks, medication management in athletic populations, and interprofessional collaboration skills. The evidence that structured interprofessional education accelerates professional identity evolution and enhances pharmacist effectiveness suggests that these educational experiences should be designed as collaborative learning opportunities with sports physiotherapists and physicians, rather than as isolated didactic modules. Furthermore, the identification of distinct pharmacist readiness profiles indicates that continuing professional development programs should be tailored to the specific needs of different practitioner groups, with intensive training programs for low-readiness pharmacists and advanced practice pathways for those already demonstrating high competence but lacking legitimacy.

Professional pharmacy organizations at national and international levels should formally recognize sports pharmacy as a specialty area, as the FIP has begun to do [24, 39], and develop practice standards that define the scope of pharmacist responsibilities in sports medicine. The comparative matrix of national guidelines revealed a notable absence of country-specific board guidelines and mandatory education requirements, indicating a significant gap in professional infrastructure that must be addressed. Professional recognition would not only enhance pharmacists' perceived role legitimacy but also create accountability mechanisms that ensure quality and consistency in sports pharmacy services. Additionally, the development of remuneration models for sports pharmacy services, such as billing codes for medication reviews and supplement counseling in athletic populations, would address the structural constraints that currently limit pharmacist engagement, particularly in community practice settings where the moderate-competence structurally constrained profile is most prevalent.

Team leaders and organizational administrators should recognize that the effectiveness of pharmacist integration depends not only on the pharmacist's individual competence but also on the team's psychological safety and transactive memory systems. Interventions aimed at strengthening psychological safety, such as team-building exercises and leadership training that emphasizes openness to input from all team members, may enhance the effectiveness of pharmacist integration. Similarly, structured processes for establishing the pharmacist's epistemic authority, such as formal introductions to the team and opportunities to demonstrate expertise in team meetings, can accelerate the revision of transactive memory systems and facilitate the pharmacist's integration into team decision-making. Without attention to these mediating mechanisms, the mere addition of a pharmacist to a sports medicine team may yield limited benefits, as the pharmacist's expertise remains underutilized in the absence of the relational conditions necessary for its effective deployment.

CONCLUSION

This multi-method study examined the evolving role of pharmacists in sports medicine and demonstrated that they are essential, yet underutilized, members of athlete healthcare teams. The findings show that pharmacists contribute to medication safety, supplement counseling, anti-doping compliance, and interprofessional collaboration, with their effectiveness depending on adequate education, institutional support, and professional recognition. The study also highlights how the balance between performance goals and clinical safety influences pharmacists' roles in sports settings. By developing a typology of pharmacist–athlete interactions, proposing a model of pharmacist integration within multidisciplinary teams, and providing evidence that pharmacist-led care can reduce the progression from supplement use to doping-tolerant attitudes, this research advances understanding of sports pharmacy. Importantly, the results indicate that meaningful pharmacist involvement requires structured integration rather than simple inclusion within sports teams. Future research should examine pharmacist integration over time, compare outcomes across different sports and competition levels, and investigate how policy and organizational factors influence pharmacist readiness and professional legitimacy. Longitudinal studies are also needed to determine whether early pharmacist interventions in supplement use can reduce the development of doping-tolerant attitudes throughout athletes' careers. As sports pharmacy continues to develop as a specialty, stronger evidence will be essential to guide education, policy, and practice. This study provides a foundation for that future work.

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