

# Sports pharmacy practice and education

A global overview

2022



# Colophon

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## Executive summary

Inspired by the athletes themselves, their athleticism, and the spirit of competitive sport, pharmacists have become key players as athlete support personnel (ASP). As ASP, pharmacists support appropriate medication selection and provision of medicines management in the healthcare of athletes and pharmacy operations of sporting events. Increasingly recognised within the world of sports as a valuable expertise, the practice is known as “sports pharmacy”. The specialty of sports pharmacy is no longer a niche area but is one gaining traction as a recognised specialty on a global scale. Sports pharmacists advocate the health of recreational or competitive athletes in many settings and have been integral to the anti-doping movement. Pharmacists, as the most accessible healthcare provider, and often a first point of contact in the self-care continuum, have a unique and important role in providing accurate medicines-related information to athletes and the athlete support team to avoid inadvertent doping and adverse drug events, and support and review appropriate prescribing where applicable. This requires awareness of sports science, anti-doping rules and regulations, and physiopharmacology. Initial training through undergraduate studies and advanced training through continuing professional development in these areas facilitate pharmacist competency to function as ASP.

In 1999, the World Anti-Doping Agency (WADA) was formally established to protect athletes by promoting clean sport and embedding the “spirit of sport” on an international level. To achieve this, stakeholders harmonised anti-doping rules and established policies for all sports globally, which primarily focus on medicines and methods of blood or gene manipulation. This focus provides a unique opportunity for pharmacists, the experts in therapeutics, to accurately interpret pharmaceutical and pharmacological information and evidence for athletes and the ASP. Through their accessibility and expertise, pharmacists help athletes to avoid inadvertent doping while preserving their health and athleticism.

As therapeutics have evolved and advanced, so too has the expert role of the pharmacist in sports evolved and advanced with growing significance; this report aims to define this emerging specialist pharmacy area. Accessibility to accredited continuing professional development in sports pharmacy will improve athletes’ safety and therapeutic outcomes and pharmacists’ value to their communities.

In 2014, the International Pharmaceutical Federation (FIP) published guidelines titled “[The role of the pharmacist in the fight against doping in sport](#)”, which presented what individual pharmacists need to consider in providing information to athletes or working in sports. This document lists that pharmacists should:

- Keep up to date on the contents of the [World Anti-Doping Code](#);
- Promote the benefits to health of exercise, including participation in sporting activities, not least for those living with specific medical conditions;
- Remain vigilant to differentiate between the justified use of medicines and illegitimate practice;
- When circumstances permit, refuse to supply a medicine when it is clearly intended to be used to improve performance illegitimately;
- When informed that a person participates in competitive sport, enter that information in the individual’s medication record;
- Provide information to those identified as being involved in a competitive sport to help them recognise which medicines contain a substance included in the lists in the WADA Prohibited List;
- Provide information to those involved in sports on the benefits of nutritional supplements and the risks associated with using them;
- As part of pharmaceutical manufacturers, cooperate with WADA by informing the agency of the marketing of any new medicinal product that has the potential to be used for improving performance in sport; and
- Assist WADA to develop methods of testing to detect the use of substances, such as those on the WADA lists and new substances that have the potential to improve performance.

To further the aims and objectives of these FIP guidelines, this publication on sports pharmacists’ contributions to this area of practice delineates opportunities and proposes qualifications necessary to work within sports to support the health of athletes. This report defines the specialty area of sports pharmacy and demonstrates pharmacists’ involvement in the healthcare of athletes, pharmacy services in sports, and the

unique position of pharmacists in supporting athlete health and the anti-doping movement. This global overview of sports pharmacy provides the evidence base for the expert guidance on how all pharmacists can develop their practice to deliver quality services at a range of sporting events as well as directly to athletes, who may be competitive or non-competitive recreational athletes.<sup>1</sup>

The report also calls for adoption of formalised and quality education on sports pharmacy across international undergraduate curricula. Undergraduate and postgraduate education programmes in sports pharmacy could and should train and equip pharmacists with baseline knowledge and skills to advise and support athletes in making rational choices regarding effective clinical drug use or nutritional supplement options while ensuring compliance with the rules of the World Anti-Doping Code (WADC) and sports federations. Guidance on a framework for sports pharmacy education is presented in this report, along with examples of successful implementation at several pharmacy schools across the globe.

This report further seeks to demonstrate the wider impact that pharmacists have within sports and the health care of athletes based on experts' experiences and FIP members' case examples. To fully embed this into pharmacy practice, it is necessary to have a robust strategy that underpins the delivery of quality continuing education and training to upskill the workforce.

This report aims to inform the knowledge and skills framework that can support a pharmacist to identify continuing professional development to add value to their practice and ultimately attain an accredited qualification for this expertise ([FIP Development Goal 14 \[Medicines expertise\]](#)). Current education and training pathways for pharmacists to continuously develop knowledge and skills were reviewed, along with examples of opportunities for continuing professional development in sports pharmacy. This provides a platform from which stakeholders can embed clear and accessible developmental frameworks to support professional career development within sports pharmacy ([FIP DG 5 \[Competency development\]](#)).

In summary, pharmacists with an interest in sports pharmacy can use this document to self-assess their own learning needs and identify areas where they may require additional education and learning. Pharmacists involved in delivering education can use the knowledge and skills described within the document as a guide for educational course development. The overall aims of this report are to:

- Highlight potential career paths for pharmacists with a mission to support athletes with safe and effective pharmacy care, while avoiding possible inadvertent doping; and
- Increase awareness of opportunities where pharmacists can gain knowledge and increase their skills within sports pharmacy through reputable quality training, experience and education programmes.

# 1 Introduction

## 1.1 Background

The International Pharmaceutical Federation (FIP) Council adopted a [Statement of Professional Standards for pharmacists in doping in sport in 2005](#). These were transformed into [FIP guidelines “The role of the pharmacist in the fight against doping in sport”](#) in 2014, which put forth recommendations on pharmacy involvement in sport through governance, pharmaceutical associations, pharmaceutical manufacturers, and as healthcare professionals who support the anti-doping movement and the benefits of exercise. At that time, FIP established a clear commitment to the significant role pharmacists have in sports.

Since the publication of these guidelines, the work of many individual pharmacists has nurtured sports pharmacy from a niche interest into an expanding specialty. This growth occurred parallel to and often intertwined with growth of the anti-doping movement. Internationally, major stakeholders acknowledge sports pharmacists as key contributors to anti-doping and clean sport initiatives.<sup>2-8</sup> Facets of pharmaceutical care for athletes led by experienced sports pharmacists have become embedded in sports medicine around the world. Publications continue to reveal that the role for pharmacists in sports is broad and the definition of sports pharmacy is inconsistent.<sup>9-11</sup> With the variation in practice and limited opportunities for formalised education through schools of pharmacy, the profession has yet to officially classify the practice of sports pharmacy as a specialty.<sup>12</sup> As the next step of global recognition, this report aims to define and characterise sports pharmacy and firmly establish the specialty within the wider professional pharmacy landscape.

To further define this new specialty, this report addresses three questions:

1. What knowledge and skills in sports pharmacy provide a foundation that promotes safe and effective use of medicines in sport and reinforces anti-doping efforts within the profession?
2. What defines and distinguishes qualified sports pharmacists?
3. Which sports pharmacy professional practice models have demonstrated success?

## 1.2 Purpose

This overview builds on the FIP guidelines in the light of developments in the field of sports pharmacy. The opinions of experts come into accord for this report to classify sports pharmacy as a specialty. Defining sports pharmacy began with exploration of the progress made as a niche practice develops into a worldwide specialty. Qualified and experienced pharmacists, pharmacy operations managers and pharmacy academics have contributed to this report through interviews and submission of content and expertise.

The experts suggest that, in pharmacy undergraduate education and training, students should acquire knowledge about anti-doping and mitigation measures to establish a pharmaceutical workforce that is able to professionally contribute to the science of sport. Teaching pharmacology of human performance within the context of the anti-doping movement may fill a gap in awareness within the profession. This report offers a roadmap for teaching this specialty area, which would bolster pharmacy workforce competencies. Furthermore, before pharmacists become professionally involved in sport or working with athletes, advanced specialisation through education and training is crucial. Advanced training helps affirm pharmacists' knowledge and skills that safeguard beneficial, ethical pharmaceutical care and service for the athletics community. This sense of purpose in pharmacy service strengthens resilience in the anti-doping movement and advocacy for athletes' well-being.

By consulting practising pharmacists who consistently work in sports or with patient-athletes, this report presents a consensus for the training requirements followed by examples of advanced practice opportunities for qualified sports pharmacists. Sports pharmacy course topics listed in this report may be used to design curricula to harmonise credentialing between academic centres. Case submissions from FIP members highlight ways in which pharmacists with additional sports-specific training could pursue opportunities in sports pharmacy. As demonstrated with these case examples, the value of involvement of pharmacists in sport becomes evident.



## 1.3 Overview of sports pharmacy ethics and professional standards

In addition to promoting health and the benefits of active lifestyles, the FIP guidelines state that pharmacists should be able to differentiate between legitimate and unapproved use of medicines. Additionally, pharmacists should be aware of the implications of supplying a medicine known to be used to improve performance illegitimately or how to advise on the application for the necessary Therapeutic Use Exemptions (TUEs) in cases with clinical justification for use. Pharmacists should provide information to athletes involved in a competitive sport to help them recognise the regulations of medicines they may take in relation to the WADA List of Prohibited Substances and Methods by which they must abide. Pharmacists should also provide information on the benefits of nutritional supplements versus the risks associated with using them to support athletes to make informed choices for better health and to avoid inadvertent doping. Sports pharmacy experts also suggest that recognising and discouraging the clear intent to improve performance illegitimately by using dietary supplements, herbal medicines or research chemicals (including investigational molecules of any origin, natural or designer substances) should be an extension of pharmacists' functions.

In the realm of competitive sports, to meet these suggested duties, pharmacists require awareness of prohibited substances and the training to distinguish legitimate use. Pharmacists possess the expert knowledge to optimise medicines use, while sports pharmacists interpret this knowledge for performance within the context of medication safety, governance and, ultimately, supporting athlete ownership of their body. Shared decision making is vital when dealing with athletes due to the principle of strict liability of [Article 2 of the World Anti-Doping Code \(WADC\)](#). The onus is entirely on the athlete to be responsible for any substance they take. Likewise, sports pharmacy does not involve assisting athletes in avoiding drug control or pushing the boundary beyond fairness in sport. Sports pharmacists maintain both ethical and professional pharmacy standards and must make recommendations based on best evidence. Complacency around doping compromises ethical and professional standards.

Sports pharmacy integrity is fundamentally characterised by appropriate use of pharmaceuticals for health maintenance and health restoration or recovery. Pharmacists should seek to protect athletes' health and in resisting doping complacency. While pharmacists complicit in doping are rarely found, particularly when compared with the total pharmacy workforce, sports pharmacy healthcare includes the incorporation of advice on physical and mental health, where identified as appropriate, alongside pharmacological advice and support for the athletes being cared for. Pharmacists already serve a greater audience with similar needs, as many people take medicines (including prescription and over-the-counter medicines, supplements, and herbal remedies) and participate in sporting activities. The general population may not necessarily be competitive athletes but do require pharmaceutical support on safe medicines use to optimise health during sport and exercise or return to health after injury or illness.

Recreational athletes have drawn the attention of pharmacists as another portion of the population that may benefit from pharmacy services. However, a publication of Finnish pharmacists reveals that 94.3% of pharmacists in the survey had "no further education or courses" in anti-doping, even though 67.9% of those pharmacists believed they had "encountered doping user groups as pharmacy customers".<sup>13</sup> The survey also asked participants to rate their knowledge on prohibited substances and methods in sport, to which 55% rated themselves as having "poor or rather poor" knowledge. Likewise, 76% rated themselves as having "poor or rather poor" knowledge related to "doping in recreational sports". To provide a professional level of pharmaceutical counselling and to take necessary precautions when recommending or dispensing medicines to athletes, pharmacists should ensure they have completed appropriate recognised training.

Sports pharmacists serving as athlete support personnel (ASP) recognise and comply with the WADC as they are aware of the significance of the prohibited association list. A comment in the WADC, Article 2.10 reads:

*"Athletes and other persons must not work with coaches, trainers, physicians, or other athlete support personnel who are ineligible on account of an anti-doping rule violation or who have been criminally convicted or professionally disciplined in relation to doping. This also prohibits association with any other Athlete who is acting as a coach or Athlete Support Person while serving a period of ineligibility. Some examples of the types of association which are prohibited*

*include: obtaining training, strategy, technique, nutrition, or medical advice; obtaining therapy, treatment, or prescriptions; providing any bodily products for analysis; or allowing the Athlete Support Person to serve as an agent or representative.”<sup>7</sup>*

A far-reaching goal of this report is to eliminate the potential for pharmacist complacency due to lack of awareness by advocating formalised and quality education of anti-doping and issues in therapeutic drug use in sport for student pharmacists and practitioners.

## 1.4 Competence of sports pharmacists

In developing this report, questions arose as to what qualifies pharmacists to work with athletes and how experts would ascribe the title of “sports pharmacist”. This report places equal weight on the call for schools of pharmacy and continuing education providers to incorporate training to establish competencies and encourage awareness among all pharmacists and finds further benefit with establishing international quality standards for sports pharmacists to earn that title. It is also equally important to establish academic capacity for providing sports pharmacy education. Credentialing in sports pharmacy currently awaits global standardisation. Pharmacists who consistently work with athletes and in the realm of sports, dedicating themselves to continuing education to advocate athlete well-being and pledging to the anti-doping movement, are sports pharmacists. Pharmacists with a strong interest in sports pharmacy who aspire to provide pharmacy services or drug advice for athletes are obliged to complete appropriate training prior to identifying themselves as qualified sports pharmacists.

The Japan Anti-Doping Agency (JADA) notably created a unique Sports Pharmacist System to train pharmacists throughout Japan. This programme was used to prepare pharmacists for the Tokyo 2020 Olympic and Paralympic Games.<sup>24</sup> Pharmacists that completed the programme through JADA are registered to display a sports pharmacist certificate and enter a national registry that can be searched by athletes around the country. Japan is the first country to incorporate this unique and formalised approach to sports pharmacist credentialing and registration.

As ASP, pharmacists have the opportunity to act as drug experts. Pharmacists can support athletes and medical teams by focusing on every aspect of medicines: clinical (direct patient care), drug research and development, compounding or manufacturing, safe handling, storage, distribution, governance, pharmacy business management and administration, rational use of medicines, health literacy and drug detection. An important feature of sports pharmacy is the ability to detect drug levels in accordance with accredited standards and quality systems to contribute to quality assurance and quality control of testing strategies of anti-doping. Pharmacists also meticulously document their work, appreciating the pharmaceutical nuances mandated by local laws, rules and regulations for proper drug oversight. These work skills benefit medication management for teams or patient-athletes, and translate very well for coordinating and organising clinical drug management at sporting events. Trained sports pharmacists and pharmaceutical services on sports are essential for athletes, at major sporting events and as front-line professionals supporting the anti-doping movement. This publication describes the expanding role of sports pharmacists as a professional specialty, along with education recommended for the general pharmacy workforce.

## 1.5 Research and publications in sports pharmacy

The volume of publications on the topic of pharmacy or pharmacists associated with sports or exercise medicine has significantly increased over the past decade. While many discuss contributions and opportunities, most conclude the lack of formalised training for the pharmacy professional leaves many in the profession seeking direction. This report builds consensus from experts to provide that guidance based on experience, landmark publications and established programmes.

In 2000, retail pharmacists in France took part in a national survey that randomly selected pharmacists for a scripted telephone interview.<sup>25</sup> Results found 88% agreed that doping is a public health concern and 6% reported being offered a financial incentive to supply doping agents to a group of athletes. The majority (91%)

agreed pharmacist play a key role in preventing doping, although 74% felt “badly or very badly prepared” to address this issue. In the two decades since this survey, pharmacists are still accessible and willing to become key players, however, anti-doping training should be core training for all pharmacists as it represents a significant portion of the service that is provided.

These publications expose an inadequate level of knowledge or awareness among local or regional pharmacists, but this reflects the global experience. Mekacher *et al* surveyed retail pharmacists in Algiers in 2019 about doping in sport. Pharmacists self-reported experience in addressing questions related to doping. Since doping is rarely discussed during pharmacy courses, the public interest in seeking pharmacist knowledge was considered to evaluate a level of public perception to seek pharmacist advice. The report found that retail pharmacists frequently hear questions related to doping.<sup>16</sup> At the same time, pharmacists reported feeling uneducated on the topic, a sentiment echoed in most surveys of pharmacists about drugs in sport.

A recent publication by Greenbaum *et al* confirmed underdeveloped knowledge within the profession, while reinforcing the opportunities and roles for pharmacists.<sup>10</sup> Her team carried out a scoping review of research published in English on the role for or knowledge held by pharmacists or student pharmacists related to the use of prohibited substances by athletes. Research publications reviewed spanned 22 years from 1999 when the WADA anti-doping code was developed to March 2021. The review found literature consistently showing that pharmacists reported having limited knowledge of antidoping regulations and that pharmacists were concerned about their limited ability or inability to counsel athletes about the status of drugs in sport. An average of 36% of pharmacists in surveys reported having engaged in counselling athletes or their support personnel about prohibited substances. General roles identified for pharmacists included counselling, education, advice about prohibited substances and dispensing to athletes. Additional responsibilities are medication review and assisting athletes avoid unintentional ingestion of prohibited substances. According to the surveys, many pharmacists had limited knowledge of whether a substance was prohibited or permitted for use by athletes, diminishing the quality of medication counselling pharmacists could provide athletes.

On a global scale, however, sports pharmacy initiatives show positive developments in the field, as described in the research and publications listed by country in Table 1. While some parts of the world embrace pharmacists and pharmaceutical scientists within the sports world and anti-doping movement, other countries have had less leadership from pharmacists and have limited formal recognition of pharmacists working in sport. Several pharmacy publications call for schools of pharmacy to incorporate education and clinical training in sports related topics into their curricula.

Table 1 — Global development of sports pharmacy since 2000

Country	Research publication
Algeria	Mekacher LM, Lahmek K, Toudeft F, Azzouz M (2022). Retail pharmacists and doping in sport: Survey on knowledge and attitudes in Algiers. <i>Algerian J of Pharm.</i> <a href="https://www.asjp.cerist.dz/en/PresentationRevue/436">https://www.asjp.cerist.dz/en/PresentationRevue/436</a>
Australia	Page D (2000) pharmacists play role in making sure athletes are running clean. <i>Drug Topics</i> 144(18):33
	Hooper AD <i>et al</i> (2019) Current and potential roles in sports pharmacy: a systematic review. <i>Pharmacy</i> Mar 14;7(1):29. doi: 10.3390/pharmacy7010029. PMID: 30875783; PMCID: PMC6473300.
	Yee KC, <i>et al.</i> (2020) pharmacists as a source of advice on medication use for athletes. <i>Pharmac</i> 8: 18–23. <a href="https://doi.org/10.3390/pharmacy8010010">https://doi.org/10.3390/pharmacy8010010</a>
	Greenbaum DH <i>et al</i> (2022) pharmacists supporting athletes: a scoping review exploring the knowledge, role and responsibilities of pharmacists in preventing the unintentional use of prohibited substances by athletes. <i>Int J Pharm Prac</i> 30:108-115
Brazil	Bomfim JHGG. (2020) Pharmaceutical care in sports. <i>Pharmacy</i> 8: 1–9. <a href="https://doi.org/10.3390/pharmacy8040218">https://doi.org/10.3390/pharmacy8040218</a>
Cameroon	Ama PFM <i>et al</i> (2002) Dopage and sport: knowledges and attitudes of pharmacists in Yaounde. <i>Science &amp; Sports</i> 17:135-139
Canada	Malek S, <i>et al.</i> (2014) A questionnaire examining attitudes of collegiate athletes toward doping and pharmacists as information providers. <i>Can Pharm J (Ott)</i> 147: 352–8. <a href="https://doi.org/10.1177/1715163514552559">https://doi.org/10.1177/1715163514552559</a>

Country	Research publication
	Smith-Morris AD, et al. (2018) pharmacist assessment to prevent inadvertent prohibited substance use among competitive strength athletes. <i>Can Pharm J (Ott)</i> 151: 372–6. <a href="https://doi.org/10.1177/1715163518790990">https://doi.org/10.1177/1715163518790990</a>
Ethiopia	Hailu HG et al (2021) Doping knowledge, attitude and practice of pharmacists in Dessie, Northeast Ethiopia. <i>Integrated Pharmacy Research and Practice</i> 10:43-50
Finland	Lemettila M et al (2021) Anti-doping knowledge and educational needs of Finnish pharmacists. <i>Performance Enhancement &amp; Health</i> 9(2): 100195. <a href="https://doi.org/10.1016/j.peh.2021.100195">https://doi.org/10.1016/j.peh.2021.100195</a>
France	Laure P, Kriebitzsch-Lejeune A. (2000) Retail pharmacists and doping in sports: knowledge and attitudes. A national survey in France. <i>Science and Sports</i> 15: 141–6. <a href="https://doi.org/10.1016/s0765-1597(00)80018-0">https://doi.org/10.1016/s0765-1597(00)80018-0</a>
	Duyar M et al (2018) Self-medication and positive doping controls in athletes. <i>Actualites Pharmaceutiques</i> 57(575):41-45
Iran	Bastani, P. et al (2017) Knowledge, Attitude and Practice of Iranian pharmacists, Body Builders, and Their Coaches Regarding Sports Supplements. <i>J. Res. Pharm. Pract.</i> 6, 166–172.
Japan	Kasashi K (2009) Antidoping reference for pharmacists. <i>Yakugaku Zasshi</i> 129(12):1475-1481
	Sports pharmacist. <i>Sports pharmacist</i> [Internet], 2010. <a href="https://www.sp.playtruejapan.org/">https://www.sp.playtruejapan.org/</a>
	Asakawa S. (2011) [Current situation and measures to promote anti-doping activities in Japan]. <i>Yakugaku Zasshi</i> 131: 1755–6. <a href="https://doi.org/10.1248/yakushi.131.1755">https://doi.org/10.1248/yakushi.131.1755</a>
	Kato H. (2011) [Pharmacy student's approach on dope prevention education]. <i>Yakugaku Zasshi</i> 131: 1757–60. <a href="https://doi.org/10.1248/yakushi.131.1757">https://doi.org/10.1248/yakushi.131.1757</a>
	Saito Y, et al. (2013) Survey on the attitudes of pharmacy students in Japan toward doping and supplement intake. <i>Biol Pharm Bull</i> 36: 305–10. <a href="https://doi.org/10.1248/bpb.b12-00315">https://doi.org/10.1248/bpb.b12-00315</a>
	Kato T (2014) The role of pharmacists and student pharmacists in educating and providing advice about over the counter (OTC) medications. <i>Yakugaku Zasshi</i> 134(2):223-235
	Shibata K, et al. (2017) Knowledge of pharmacy students about doping, and the need for doping education: a questionnaire survey. <i>BMC Res Notes</i> 10: 396. <a href="https://doi.org/10.1186/s13104-017-2713-7">https://doi.org/10.1186/s13104-017-2713-7</a>
	Imanishi T et al (2019) Current status of doping in Japan based on Japan Anti-Doping Disciplinary Panels of the Japanese Anti-Doping Agency (JADA): A suggestion on anti-doping activities by pharmacists in Japan. <i>Yakugaku Zasshi</i> 137(7):883-891
	Nakajima R et al (2020) Conditions and hardships related to pharmacists' provisions of anti-doping activities in Japan <i>International Journal of Sport and Health Science</i> , 18 (0) pp. 172-179, 10.5432/ijshs.202023
	Japan Anti-Doping Agency. <i>Play True 2020 Sports pharmacist</i> [Internet]. 2020.
Kawaguchi-Suzuki M, et al (2021) Reconsidering sports pharmacists and anti-doping education as the world celebrates the Olympic and paralympic games. <i>Am J Pharm Educ</i> 85: 8695. <a href="https://doi.org/10.5688/ajpe8695">https://doi.org/10.5688/ajpe8695</a>	
Malaysia	Chiang LM, et al (2018) The readiness of community pharmacists as counsellors for athletes in addressing issues of the use and misuse of drugs in sports. <i>Lat Am J Pharm</i> 37: 1049–55.
	Chan SY et al. (2019) Knowledge, attitude and perception of Malaysian pharmacy students towards doping in sports. <i>J Pharm Pract Res</i> 49: 135–41.
	Voravuth N et al (2022) Engaging community pharmacists to eliminate inadvertent doping in sports: A study of their knowledge on doping. <i>PLOS ONE</i> Published: June 10, 2022, <a href="https://doi.org/10.1371/journal.pone.0268878">https://doi.org/10.1371/journal.pone.0268878</a>
Norway	University of Oslo Sports pharmacy and anti-doping <a href="https://www.uio.no/studier/emner/matnat/farmasi/FARM5140/index-eng.html">https://www.uio.no/studier/emner/matnat/farmasi/FARM5140/index-eng.html</a>
Pakistan	Ali A. et al (2016) Measuring the perceptions of pharmacy students of doping preventions: Case study of a Pakistani Universities. <i>SindhUniv. Res Journal</i> 48(4): 761-768.
	Khan N et al (2018) Sports pharmacy as an emerging health science field; a perspective on the global and national scope. <i>Int J of Endorsing Health Science Research</i> 6(1):58-61.
Qatar	Awaisu A, et al. (2015) Knowledge and perceptions of pharmacy students in Qatar on anti-doping in sports and on sports pharmacy in undergraduate curricula. <i>Am J Pharm Educ</i> 2015; 79: 119. <a href="https://doi.org/10.5688/ajpe798119">https://doi.org/10.5688/ajpe798119</a>
	Mottram D et al. (2016) Perspective of pharmacists in Qatar regarding doping and anti-doping in sports. <i>J Sports Med Phys Fitness</i> 56: 817–24.

Country	Research publication
	Awaisu A, et al. (2018) Instructional design and assessment of an elective course on the use of drugs in sport. <i>Curr Pharm Teach Learn</i> 2018; 10: 1124–31. <a href="https://doi.org/10.1016/j.cptl.2018.05.020">https://doi.org/10.1016/j.cptl.2018.05.020</a>
Senegal	Dieye AM et al (2003) Retail pharmacists and doping in sport: Survey on knowledge and attitudes in Dakar in Senegal <i>Science &amp; Sports</i> 18:104-107
Serbia	Ivanović, D & Jancic Stojanovic, B. (2013) Sports pharmacy—pharmacists’ role in doping in sport. <i>Arhiv za Farmaciju</i> 63, 528–540.
Slovenia	Auersperger I, et al. (2012) Doping awareness, views, and experience: a comparison between general practitioners and pharmacists. <i>Wien Klin Wochenschr</i> 124: 32–8. <a href="https://doi.org/10.1007/">https://doi.org/10.1007/</a>
South Africa	Davis, S. (2017) Managing common sport injuries in the pharmacy. <i>SA Pharm. J.</i> 84, 35–37
	Oltmann, C. (2018) Sports pharmacy in South Africa—Need or nonsense? <i>SA Pharm. J.</i> 85, 50.
	Starzak, DE et al (2016) Anti-doping knowledge and opinions of South African pharmacists and general practitioners <i>Journal of Sports Medicine &amp; Doping Studies</i> , 6 (3) pp. 1-7, 10.4172/2161-0673.1000181
South Korea	Stuart M, et al (2019) Pharmacy services at the PyeongChang 2018 Olympic and Paralympic Winter Games <i>Br J Sports Med</i> 53:1105-1110
Syria	El-Hammadi, M & Hunien B (2013) Exploring knowledge, attitudes and abuse concerning doping in sport among Syrian pharmacy students <i>Pharmacy</i> , 1 (2) pp. 94-106, 10.3390/pharmacy1020094
United Arab Emirates	GMU College of Pharmacy launches a new course on DRUGS IN SPORT <a href="https://gmu.ac.ae/cop_news/gmu-college-of-pharmacy-launches-a-new-course-on-drugs-in-sport/">https://gmu.ac.ae/cop_news/gmu-college-of-pharmacy-launches-a-new-course-on-drugs-in-sport/</a>
UK	Stuart M & Mottram D. (2010) Sports pharmacy. <i>J Pharm Soc Wis</i> 13: 38–40.
	Mottram D & Stuart M (2013) The emerging specialty of sports pharmacy. <i>Aspetar Sport Med J</i> 2(1):66-71
	Stuart, M. et al. (2013) Innovations in Olympic and Paralympic pharmacy services. <i>Br. J. Sport Med.</i> 47, 404–406.
	File, H. et al (2015) Case study of the London 2012 Olympic and Paralympic pharmacy service preparations. <i>Int. J. Pharm. Pract.</i> 23, 212–220.
	Stuart M. et al (2013) Development and delivery of pharmacy services for the London 2012 Olympic and Paralympic Games. <i>Eur J Hosp Pharm</i> 20, 42–45
	The Pharmaceutical Journal. New Certificate from the International Olympic Committee for Sports pharmacists [Online]. 2019. <a href="https://pharmaceutical-journal.com/article/letters/new-certificate-from-the-international-olympic-committee-for-sports-pharmacists">https://pharmaceutical-journal.com/article/letters/new-certificate-from-the-international-olympic-committee-for-sports-pharmacists</a>
	File H, et al (2015) Impact of the London 2012 Olympic and Paralympic Games on the personal and professional development of pharmacy volunteers <i>Eur J Hosp Pharm</i> 22:120-122
	Thomas, T. et al. (2016) Advising patients on prevention and management of sporting injuries. <i>Pharm. J.</i> 297, 102–105.
	Atkinson, AM et al. (2021) Performance and image enhancing drug interventions aimed at increasing knowledge among healthcare professionals (HCP): Reflections on the implementation of the Dopinglinkki e-module in Europe and Australia in the HCP workforce <i>Int J Drug Policy Article</i> 103141, 10.1016/j.drugpo.2021.103141
	Mottram DR. <i>Drugs in sport: Eighth edition.</i> Mottram DR, Chester N, editors. London, England: Routledge; 2022.
USA	Hetey SE & Kalash LD (2002) pharmacists play pivotal roles at Olympic Games. <i>Amer J Health-System Pharmacy</i> , Volume 59(4):326, <a href="https://doi.org/10.1093/ajhp/59.4.326">https://doi.org/10.1093/ajhp/59.4.326</a>
	Ambrose PJ. (2003) Drug use in sports: a veritable arena for pharmacists. <i>J Am Pharm Assoc</i> 44: 501–14; quiz 514–6. <a href="https://doi.org/10.1331/1544345041475698">https://doi.org/10.1331/1544345041475698</a>
	Howard MS, et al. (2003) Perspectives of athletes and pharmacists on pharmacist-provided sports supplement counseling: an exploratory study. <i>J Am Pharm Assoc</i> (2003) 2018; 58: S30–6. e2. <a href="https://doi.org/10.1016/j.japh.2018.05.003">https://doi.org/10.1016/j.japh.2018.05.003</a>
	Boyce EG & Vadher D (2003) Introduction: Sports medicine and Pharmacy: Challenges for pharmacists and other health care professionals <i>J Pharm Prac</i> 16:3

Country	Research publication
	Ambrose PJ. (2008) An advanced pharmacy practice experience in sports pharmacy. <i>Am J Pharm Educ</i> 72: 19. <a href="https://doi.org/10.5688/aj720119">https://doi.org/10.5688/aj720119</a>
	Ambrose PJ. (2011) Educational opportunities and anti-doping roles and responsibilities for pharmacists. <i>Yakugaku Zasshi</i> 131: 1761–4. <a href="https://doi.org/10.1248/yakushi.131.1761">https://doi.org/10.1248/yakushi.131.1761</a>
	DellaVecchia MJ, et al. (2020) Rebooting a sports pharmacy advanced pharmacy practice experience: utilizing medicinal chemistry as a foundational approach to get pharmacists back in the game. <i>Curr Pharm Teach Learn</i> 12: 981–1003. <a href="https://doi.org/10.1016/j.cptl.2020.04.009">https://doi.org/10.1016/j.cptl.2020.04.009</a>
	Gregory DF, Holmes ER, Singletary SR, Wilson MC. <i>Sports pharmacy: Performance enhancing drugs, and the athlete</i> . Washington, D.C., DC: American pharmacists Association; 2020.
	Lott BE et al (2021) Expanding pharmacists' roles: pharmacists' perspectives on barriers and facilitators to collaborative practice. <i>J Amer Pharm Ass</i> 61:213-220

Multiple published surveys spanning two decades illustrate limited access to formal education and an associated lack of confidence among pharmacists in addressing questions related to doping or anti-doping. The consequences for athlete health, reputation or career remain clear, and pharmacists are willing to learn where to find the best answers to avoid these consequences. When first asked about the status of specific classes of medicines, pharmacists may not immediately recognise the WADA status of medicines or the existence of other anti-doping authorities' banned lists. However, with an introduction to credible resources and proper training on interpreting the prohibited substances lists, pharmacists' existing knowledge base helps them quickly comprehend medicines within this context. This reflects the need for more widespread and standardised global training to resolve the issue described in the literature.

## 1.6 Guiding sports pharmacy qualification

Two parallels in advancing sports pharmacy are developing simultaneously. Pharmacists and student pharmacists exploring their professional interest of drugs within the context of exercise, sports, or nutrition. They seek additional information to incorporate these topics into pharmacy practice. At the same time, a specialty of sports pharmacy has arisen, in which pharmacists specialise through advanced studies and the application of drugs in sport to be called sports pharmacists.

The Japan Anti-Doping Agency (JADA) Sports Pharmacist System exemplifies one model for nationwide training of pharmacists. JADA partnered with the Japan Pharmacists Association to create the programme. Pharmacists in Japan receive training to provide accurate drug information to help avoid doping and support athletes to ensure fair competition. Since its inception in 2009, JADA now has registered over 12,000 officially certified sports pharmacists. FIP member Shigeo Yamamura describes the training (see Section 8.1.6 — Roles and activities of the sports pharmacist in Japan):

*“Pharmacists who want to be certified as a sports pharmacist must attend two types of courses: a basic course and a practical course (with content related to anti-doping), and then take an exam to confirm their level of knowledge. After completing a prescribed course and passing the test, pharmacists are certified as a sports pharmacist by the Japan Anti-Doping Agency. The qualification is valid for four years and must be renewed every four years.”*

JADA sports pharmacists also have goals that extend beyond patient-athlete or elite athlete education into public health, as further described in the submission for this report:

*“The activities of sports pharmacists are becoming well known to athletes, but not yet to the general public. Doping is not only an individual athlete’s problem, but also a social issue. It is necessary for the activities of sports pharmacists to be widely recognised to promote social acceptance and awareness of fair and doping-free competitions.”*

## 2 Sports pharmacy qualification and education

Formal higher education in the field of sports pharmacy is currently not widely available. Professional certificates or diploma programmes to introduce pharmacists to sports pharmacy are only delivered by a few universities and the International Olympic Committee. While many anti-doping online modules provided by numerous national anti-doping organisations around the world are free and accessible to any pharmacist,<sup>17</sup> awareness of them among pharmacists is inconsistent and often lacking.

Literature exploring the general knowledge of anti-doping and exercise medicine has grown in pharmacy. Themes found in the literature reviews illustrate that the pharmacist is often an under-utilised medicines expert by most athletes and the anti-doping community, in part because of knowledge gaps between pharmacists created by lack of access to standardised and formalised quality training on sports pharmacy.

Existing sports pharmacy education has been developed from the experiences and standardised operations of practitioners or small groups in pharmacy who were working independently. While these pioneers carved a path, demonstrating the intrinsic value of pharmacists' professional involvement in sport, this is only the beginning. With the increasing importance of sports pharmacy over time, academic capacity to produce sports pharmacists needs to be established based on quality education standards. Gradually, those pioneers collaborated across international borders to share standardised operations and training. Despite the collaborative effort, there has been a lack of consistency in the classification of sports pharmacy in formal pharmacy education. At the time of this report, a small, but growing global construct of schooling for pharmacy students and pharmacists can be found.

To serve athletes and members of the wider public who seek information about drugs in sport, pharmacists need an up-to-date knowledge of classes of medicines that are prohibited and must be able to interpret that information within the pharmaceutical rules and regulations of their local jurisdiction. For instance, pharmacists should know that many common medicines are prohibited in sport, such as insulin, amphetamines, beta-blockers or beta-2-agonists, to name a few. Also, the use of these substances must be interpreted within the context of the WADC and national drug laws to accurately address athlete enquiries.

With campaigns on health improvement and well-being increasing every day, particularly in response to the COVID-19 pandemic, patient-facing pharmacists are required to have knowledge and skills for providing pharmaceutical services to the active population. Pharmaceutical counselling on supplements, and disease or complication prevention services for physically active people who may live with chronic diseases will require basic sports and exercise knowledge and skills.

### 2.1 Sports pharmacy education

In a collective effort to coordinate education in sports pharmacy on a global scale, this section of the report traces sports pharmacy education development and delivery in different parts of the world. Establishing a standard and quality curriculum will enrich pharmacy involvement in sports, potentially inspiring pharmacy students to pharmacists to support athleticism for more of their patients and provide a scope of practice expansion for the pharmaceutical workforce. Accessibility of competent pharmacists for athletes increases by incorporating instruction into pharmacy curricula that would potentially further reduce inadvertent doping.<sup>9</sup>

Pharmacists and pharmaceutical scientists alike address questions from patients, students and the public on medicines-related information, self-medication or prescriptions used to enhance good health and well-being and support a healthy ageing process. Pharmacists study and work with medicines that people seek for energy, stamina, strength and endurance. Pharmacy education should explicitly address the potential of doping with these chemicals and train student pharmacists with strategies for prevention of drug misuse or abuse by athletes or the wider public.

Several pharmacy students provided examples of current educational experiences in response to the FIP call for expressions of interest in March 2022, demonstrating that pharmacy students and pharmacists alike have an enthusiasm for sports pharmacy, with many others reaching out with interest in opportunities to practise

sports pharmacy. However, a lack of formalised training has resulted in some pharmacists not understanding the unique care that athletes who use medicines require.

Even though this represents a small portion of the students enrolled in schools of pharmacy, all students could be benefiting from exposure to the topic and formal education because the physically active population and athletes represent a good portion of overall society. Also, physical exercise is often offered as a preventive measure that requires specialised pharmaceutical services on sports pharmacy, as it prepares pharmacists for serving their communities and recognises athletes as a subpopulation with unique medication mandates which they are obligated to apply.

This report has attempted to showcase existing sports pharmacy courses offered at schools of pharmacy in Asia, Africa the Americas regions and around the globe. There may be some courses designed and taught by individual lecturers that this report did not discover. Examples are set out in Table 2. Most have a duration in existence of three years or longer, and Table 2 offers course descriptions based on interviews conducted with the curriculum creators and lecturers of those courses. This list is not exhaustive but seeks to identify, promote and support ethics-based, scientific and clinical courses in sports pharmacy intended for pharmacists and student pharmacists.

Table 2 — Sports pharmacy education examples

Country	University/school of pharmacy	Course title(s)	Course description
<b>Undergraduate electives</b>			
Australia	University of Tasmania College of Health and Medicine School of Pharmacy and Pharmacology	<a href="#">Sport Doping, Performance Enhancing Drugs and their Detection</a>	Overview of the socio-political aspects of drug use in sports, recognising drug classes that may enhance athletic performance and the legal and ethical issues of sports doping detection.
Korea	Korean Anti-Doping Agency	<a href="#">KADA Anti-doping</a>	Online lectures and in-person programmes on anti-doping offered to healthcare professionals, young elite athletes and sport trainers.
Norway	University of Oslo	<a href="#">Sports Pharmacy and Anti-Doping</a>	Introduction to use of medicines for athletes in relation to anti-doping rules, focusing on the pharmacist's role in avoiding inadvertent doping or complacency of doping.
Qatar	Qatar University College of Pharmacy	<a href="#">Drugs in Sport</a>	Introduction to use of medicines for athletes in relation to health care of athletes, anti-doping rules and governance
Turkey	Anadolu University Faculty of Pharmacy	<a href="#">Sports Pharmacy</a>	An elective semester course in sports pharmacy.
Turkey	Lokman Hekim University Faculty of Pharmacy	<a href="#">Sports Pharmacy</a>	Integrative elective course including lectures from the National Olympic Committee, Turkish Anti-Doping Commission manager and lab, physicians, International Olympic Committee certified sports nutritionist, an associate professor of sports science, various departments of sports ministry, pharmacy law, experts of prostheses care and athlete health, and from sports scientists who are also athletes themselves.
United Arab Emirates	Gulf Medical University College of Pharmacy	<a href="#">Drugs in Sport</a>	Introduction to use of medicines for athletes in relation to health care of athletes, anti-doping rules and governance.
United States	Palm Beach Atlantic University School of Pharmacy	Sports Pharmacy Advanced Pharmacy Practice Experience	Elective rotation for pharmacy students to apply didactic knowledge of pharmaceutical sciences and clinical pharmacy practices to understand therapeutic use or potential abuse of drugs and supplements by athletes.



Country	University/school of pharmacy	Course title(s)	Course description
United States	University of Colorado United States Anti-Doping Agency (USADA)	Anti-Doping Advanced Pharmacy Practice Experience	(Archived/not currently available.) Elective rotation for pharmacy students to spend six weeks learning the policies and procedures of USADA, including introduction to the WADA Prohibited List, athlete resources, doping control, and developing monographs of drugs as substances for possible addition to the Global Drug Reference Online platform.
United States	University of Mississippi School of Pharmacy	Drugs and Human Performance	Exploring scientific evidence and lore of drugs used with the intent for cognitive enhancement, sexual endurance and athletic performance, preparing community pharmacists to address these topics in practice or in private, including the process for athletes' legitimate medical use of prohibited drugs.
United States	West Coast University	<a href="#">Sports Pharmacy</a>	Elective course in therapeutics and pharmaceutical care in sports. Topics include sports focus on asthma, glucocorticoids and other performance-enhancing drugs, medical implications of the WADA Prohibited List. Also, exercise in patients with metabolic syndrome, nutrition in sports, brain injuries, musculoskeletal injuries and pain management.
<b>Master of sports pharmacy</b>			
Turkey	Lokman Hekim University Faculty of Pharmacy	Master of Sports Pharmacy	Beginning in 2022, a two-year degree programme began in-house to allow study of the full scope of sports pharmacy, covering anti-doping, nutrition, operations, sports medicine and clinical care. This course also collaborates with veterinary pharmacy, forensic pharmacy and traditional complementary medicine practice.
<b>Professional certificate courses or continuing education and professional development in sports pharmacy</b>			
Online	International Olympic Committee (IOC) administrated by Sportsoracle, an organisation that delivers online programmes on behalf of the IOC	<a href="#">IOC Certificate in Drugs in Sport</a>	Expert lecturers offer healthcare professionals; clinical use of drugs in sport for injury and illness; prevention of misuse and abuse of drugs in sport; safe, evidence-based supplement use; promoting the health of the athlete through effective medicines use.
France	International Council of Sport Science and Physical Education University of Paris Nanterre	<a href="#">Master in Doping Studies and Analysis of Anti-Doping Policies</a>	A hybrid programme, online and in-person offered to international students interested in anti-doping policy and research in doping.
India	Delhi Pharmaceutical Sciences and Research University Academy of Sports Science and Research Management	Diploma course in <a href="#">Sports Pharmacy</a>	Taught by pharmacists, physiotherapists and other faculty members, this two-year course is for sports scientists, coaches or players to learn sports and exercise science, to increase awareness of athletes' therapeutic use or doping use of substances.
Japan	Japanese Anti-Doping Agency	<a href="#">Play True 2020 Sports Pharmacist System</a>	National campaign to train pharmacists in anti-doping to ensure readiness for Tokyo 2020 Olympic Games and improve athlete access to competent pharmacists who are registered as sports pharmacists.
Turkey	Lokman Hekim University	Current Developments in Sports Pharmacy Training Programme	Online session providing an overview of the development of undergraduate course and master degree programme in sports pharmacy.

Country	University/school of pharmacy	Course title(s)	Course description
Online	<a href="#">International Sports Pharmacists Network</a>	Clinical Pearls in Sports Pharmacy	An online sports pharmacy resource developed by experts offering documents and lectures for pharmacists and students who plan to work with athletes in clinical settings.
Online	International Sports Pharmacy Symposium	2021 Entrepreneurs in Sports Pharmacy 2022 Pharmacy Volunteerism at Sporting Events 2023 Sports Pharmacy Education 2024 Athlete Perspective for Sports Pharmacists	Multi-national conference hosting webinars and networking sessions for pharmacists practising as sports pharmacy specialists, students of sports pharmacy, and sports pharmacy supporters.
International	World Anti-Doping Agency Anti-Doping Education e-Learning	<a href="#">ADEL for Medical Professionals</a>	Clean sport education designed for healthcare professionals, including pharmacists, who work with athletes, to encourage pharmacists to provide accurate anti-doping advice to positively influence athletes' values and behaviours.

Countless healthcare professionals, including pharmacists, have completed free online education from national anti-doping organisations and through the Anti-Doping eLearning Platform programme offered online by WADA. These programmes deliver a worthwhile introduction to drugs in sport and anti-doping.

Additionally, a well-regarded programme available for pharmacists seeking to become sports pharmacists is offered through the International Olympic Committee. From the inaugural graduating class in the winter cohort in 2018 until the spring cohort of 2022, eight cohorts of students have completed the programme. Over 100 pharmacists have been awarded the International Olympic Committee Drugs in Sport Certificate as of the publication date for this report.

## 2.2 Curriculum for sports pharmacy education

FIP has recognised the important role that pharmacists can play in protecting the health of athletes and the physically active population, and promoting the safe, effective and legal use of drugs in sport. To achieve this goal, pharmacists who aspire to become specialists in sports pharmacy must be appropriately trained and qualified.

A major component for the professional development of sports pharmacists is the provision of quality education and CPD programmes. These education programmes may form a core or elective component of undergraduate pharmacy degree programmes or be delivered as postgraduate level CPD courses.

In the development of this report, a global online search and nearly 40 video, email or telephone interviews were conducted to investigate the availability of education and training on drugs in sport within schools of pharmacy or for pharmacists and athlete support personnel (ASP). Countries represented in the contacts included Australia, Canada, Costa Rica, Cyprus, Egypt, India, Japan, Nigeria, Norway, Poland, Qatar, South Africa, South Korea, United Arab Emirates, United Kingdom, and 12 different states in the United States.

This type of education and training includes formal educational offerings where pharmacists are involved in the development and delivery of teaching in:

- Higher education institutions to ensure that future generations of pharmacists and other healthcare professionals are aware of the issues around drugs in sport;
- Postgraduate educational programmes for athletes and ASP; and
- Public sector education for schools, colleges, sports clubs and other organisations.

## 2.3 The aims of education programmes in sports pharmacy

Harmonising topics internationally would allow for the establishment of a trusted credentialing process while supporting local pharmacy practices to determine content and mode of presentation. Education programmes in sports pharmacy should train and equip pharmacists to advise and support athletes in making healthy choices regarding effective clinical drug or nutritional supplement options while ensuring compliance with the rules of the World Anti-Doping Code, sports federations and national anti-doping agencies.

Sports pharmacy curricula should include: the key concepts relating to drug use and misuse in sport; how the problem is being tackled internationally through new research and surveillance; the role of sports pharmacists in the ongoing care of athletes in preventing doping in sport; and how sports pharmacists can make a significant contribution at major sporting events. Pharmacists should be able to discuss the health benefits of exercise and sports restrictions against the use of certain medicines. Practical skills in patient counselling should be practised to encourage appropriate use of medicines and avoid misuse or abuse of substances, including risks and benefits of dietary supplements. Additionally, pharmacists should demonstrate and practise their knowledge on the governance and laws around transporting medicines or substances, case law in doping, and legal guardrails for pharmacy involvement in clean sport. To prepare pharmacists to meet these standards, exposure should be offered as part of the undergraduate programmes.

While additional sports pharmacy degree programmes are in development, not all schools of pharmacy offer sports pharmacy as part of the undergraduate degree yet. Guidance on education from the Council of Europe in 2016 offers recommendation to integrate anti-doping education into the degree programme where a sports pharmacy degree programme is unavailable.<sup>5</sup>

To emphasise the significance of anti-doping education for public-facing professionals, the Council of Europe recommended a scale of relevance to the profession for six anti-doping topics. Twenty professional degree programmes, including sports pharmacists, are included in this list. The Council of Europe stated that any percentage over 15% indicates higher importance for that profession. Table 3 presents the suggested relevance of anti-doping topics to three professions as a comparison. These are only a few examples of the 20 degree programmes listed. As the sports pharmacy curriculum develops, comparing the focus for sports pharmacists with other professions may help in solidifying the role of sports pharmacists.

Table 3 — Excerpt of professions the Council of Europe lists recommending a focus on anti-doping topics within degree programmes

Council of Europe anti-doping topic	Suggested percentage of focus on anti-doping topics		
	Sports pharmacists	Physicians (all types of doctors)	Primary school teachers
Introduction to anti-doping	10%	10%	15%
What is doping?	25%	20%	10%
Why, when, and where is doping being used?	25%	20%	10%
Who is using doping?	20%	20%	15%
Why is doping prohibited?	10%	25%	25%
What actions are being taken against doping?	10%	5%	25%

## 2.4 Schools of pharmacy sports pharmacy programme structure

The delivery of sports pharmacy programmes may involve a variety of teaching methods, including lectures, workshops, tutorials, web-based materials, programmes of guided reading and on-line discussion forums. Case study presentations should be used throughout a programme to illustrate “real-life” situations. Delivery may be in person, remote or a hybrid teaching model. Students should be provided with a comprehensive portfolio of directed study, including review papers and original research publications.

Partnership or working in collaboration with authorities in sports and anti-doping have proven to be successful models for sports pharmacy courses. Where possible, collaboration should be sought with national sports organisations, established national sports medicine practices, and professional pharmacy associations such as:

- National and international Olympic and Paralympic Committees;
- National and international sports federations
- National and international anti-doping organisations;
- National WADA accredited laboratories;
- Specialised sports medicine hospitals or clinics; and
- National professional pharmacy associations.

This collaboration could include expert input on curriculum development. Several established sports pharmacy courses have invited lecturers who are international subject experts. Practical experience and on-site experiential learning in anti-doping, including doping control processes, laboratory analysis and clinical care of athletes, offer enhanced learning opportunities for student pharmacists. Therefore, multidisciplinary collaboration through the education and training programmes is critically important.

FIP members submitted case reports of courses offered or taken as students. One case example submitted by Dr Carmen Oltmann (see Section 8.1.5 — Sports pharmacy elective course for pharmacy students) describes an elective course for pharmacy students in their final year of schooling about the roles and impact they could have when working with athletes. The elective course emphasises the importance of pharmacists providing quality sports pharmacy services to athletes, addressing the topics of exercise physiology and nutrition as well. Pharmacy students learn through lectures, student presentations, analysis of video clips, discussions of case studies and group work. The students are also tasked with creating informational leaflets for athletes and writing a journal article.

The importance of involving national anti-doping agencies in planning was shared by several sports pharmacy educational programme designers, including Qatar, United Arab Emirates (UAE), Turkey and Korea. This partnership was also the foundation for the Japanese Sports Pharmacist System.

The case report provided by Prof. Sherief Khalifa and Prof. Dixon Thomas exemplifies how collaboration was instrumental to introducing the “Drugs in sport” course to the pharmacy curriculum at Qatar University. When Prof. Khalifa started work at Gulf Medical University, UAE, a “Drugs in sport” course was added to the PharmD curriculum as an elective course. Gulf Medical University signed a memorandum of understanding with the UAE National Anti-Doping Agency (NADA) for training, education and research collaboration. The president and board members of UAE NADA provided lectures during the 2020 and 2021 courses. The collaboration continues with research and further education. Below is an abstract from the case report (see Section 8.1.5 — Sports pharmacy elective course for pharmacy students):

*“For effective conductance of the course, collaborations with UAE NADA and international experts were identified to add value.*

*“Resources of UAE NADA were made available to students at GMU by bringing a mobile sample collection unit and properties and policies used for sample collection.*

*“Hands-on training with resources in the real world of anti-doping practice in the UAE was provided to GMU PharmD students as part of the Drugs in Sport course. All the teaching and*

*training by UAE NADA was without any financial charges. In return, students volunteer to take part in training to become chaperones for UAE NADA.*

*This training motivated students to learn the anti-doping mission and put it into practice. All the students applied for further training by UAE NADA in order to become chaperones at monitored sporting events.*

*The pharmacy institution and NADA partnership can be very productive for this good cause.”*

Likewise, in Turkey, Somer Helvaçi, sports pharmacy educator at Lokman Hekim University, reports on the development of a sports pharmacy programme he successfully designed, beginning with a small session aimed at working pharmacists and which grew and evolved into an undergraduate elective course. The sports pharmacy elective programme invited subject experts in sports nutrition, forensic pharmacy for antidoping laboratory analysis, clinical sports pharmacy practice, veterinary medicine, and therapeutic use exemptions. A Master of Sports Pharmacy programme began in 2022. Partnerships with the national anti-doping agency, government representatives and other medical disciplines strengthened the course. He designed the degree programme by incorporating the framework of anti-doping education and exercise medicine, recruiting expert lecturers for several topics. This sports pharmacy programme drew on the existing veterinary pharmacy and forensic pharmacy offerings at the same university, where curricula overlap. It provides a model of a robust sports pharmacy programme.

## 2.5 Sports pharmacy learning outcomes

As a supplementary guide in developing curricula, suggested learning outcomes for sports pharmacy education and training are described in Table 4. This is developed from current models in pharmacy curriculum and expert recommendations. This education may be delivered at a variety of levels of study from undergraduate to postgraduate. Upon successful completion of the respective level of the programme of study, students should be able to demonstrate an ability to meet the learning outcomes proposed.

Table 4 — Learning outcomes for a potential undergraduate sports pharmacy curriculum

Topic	Level of study	Learning outcomes
Introduction to use and preventing the misuse of drugs in sport	Foundation	<ul style="list-style-type: none"> <li>• Define the role of athlete support personnel, including sports pharmacists.</li> <li>• Explain the circumstances under which drugs may be taken by those who participate in sport.</li> <li>• Identify some of the key historical events that have shaped the current state of doping and anti-doping in sport.</li> <li>• Describe the pharmacist’s role in the anti-doping movement.</li> <li>• Summarise the roles and responsibilities of national and international organisations responsible for anti-doping programmes.</li> <li>• Describe the inclusion criteria and the classification of substances and methods that appear on the WADA Prohibited List.</li> <li>• Describe the procedures for the doping control process.</li> <li>• Describe the results management process for an athlete after an adverse analytical finding.</li> <li>• Identify the influence of exogenous substances on the body to ascertain systemic effects when the substance is no longer detectable.</li> </ul>
Pharmaceutical care for athletes for prevention, treatment of acute and chronic medical conditions	Foundation	<ul style="list-style-type: none"> <li>• Provide pharmaceutical services required for athletes and para athletes’ prevention and management of medical conditions, including all age groups.</li> <li>• Advise on pharmaceutical and alternative prevention and treatment options specialised for athletes.</li> <li>• Identify the most common classes of medicines and supplements used for the medical treatment of para athletes and other athletes.</li> </ul>

Topic	Level of study	Learning outcomes
		<ul style="list-style-type: none"> <li>• Understand the process for the application, review, and appeal process of therapeutic use exemptions, and the responsibility of the healthcare provider throughout this process.</li> <li>• Interpret the benefits or risks of supplement use.</li> <li>• Advise on the prevention of inadvertent doping.</li> <li>• Counsel athletes on the risks associated with dietary supplement use and ways to reduce those risks.</li> <li>• Summarise the unique needs of para athletes in relation to anti-doping code and medical devices or drug delivery systems.</li> </ul>
Sports and exercise sciences	Foundation	<ul style="list-style-type: none"> <li>• Understand the foundations of exercise sciences that influence athletes' pharmaceutical needs and ways to potentially reduce the burden of certain chronic diseases to lower reliance on chronic medication.</li> <li>• Describe physiological, psychological, and biomechanical processes.</li> <li>• Demonstrate basic ability for physical assessment of common sports injuries.</li> </ul>
Sports integrity and the international regulation of anti-doping	Elective	<ul style="list-style-type: none"> <li>• Understand the disciplinary, health and social consequences for athletes who dope.</li> <li>• Explain the regulatory structure of anti-doping in sport.</li> <li>• Understand the role of the WADA-accredited laboratories in doping control.</li> <li>• Understand drugs in sport culture, and misuse by the physically active population and those who participate in sport.</li> <li>• Understand the foundations of sports ethics and fair play.</li> </ul>
Career and professional development opportunities for sports pharmacists	Elective, specialty training	<ul style="list-style-type: none"> <li>• Categorise the essential medication management systems for medical and pharmacy services at major sporting events.</li> <li>• Undertake the roles and responsibilities of sports pharmacists applicable to the sporting context, including major sporting events.</li> <li>• Understand the foundations of sports psychology to guide pharmacists in adopting effective pharmaceutical care measures and refer to mental health professionals.</li> <li>• Advise on the prevention of inadvertent doping.</li> <li>• Explain the identification of drug use in sports.</li> <li>• Interpret laboratory values directly or indirectly related to drug use or manipulation of body fluids and samples.</li> <li>• Understand the principles of doping in sporting animals.</li> <li>• Explain human misuse of veterinary drugs.</li> </ul>

Sports pharmacy experts recommend that topics listed as foundation topics above would strengthen the pharmacy curriculum if incorporated into standard pharmacy education curricula, thereby establishing baseline knowledge and skills for pharmacists on the subject. To further clarify content per topic, Table 5 suggests the key topics that should be considered for inclusion in development of undergraduate or postgraduate programme of sports pharmacy. The consensus within this expert group is to include the section on international regulation of anti-doping within Table 5 in any undergraduate sports pharmacy programme.

Table 5 — Core curriculum concepts related to sports pharmacy

Topics and sub-topics	Content for the curriculum
<b>Introduction to use and preventing the misuse of drugs in sport</b>	
Intentions and behaviour associated with drugs use in sport	<p>A review of the reasons athletes may use drugs, including:</p> <ul style="list-style-type: none"> <li>• Treatment of medical conditions using <ul style="list-style-type: none"> <li>○ prescribed medicines</li> <li>○ over-the-counter self-medication</li> </ul> </li> <li>• Social and recreational use of drugs</li> <li>• Performance enhancement using: <ul style="list-style-type: none"> <li>○ Dietary supplements not known to be prohibited</li> <li>○ Prohibited substances and methods</li> </ul> </li> </ul>
The evolution of doping and anti-doping in sport	Timeline of key events in doping and anti-doping from the ancient Olympics to the present time, including landmark doping cases and significant development of anti-doping initiatives. These key events should be used to demonstrate their influence on the current position in the fight against doping in sport.
Prevalence of doping in sport	Assess the evidence for estimating the prevalence of doping in sport. This will include a review survey-based research studies and an evaluation of the statistical evidence from published sanctions and WADA laboratory data.
Roles and responsibilities of sports pharmacists and other athlete support personnel (ASP)	ASP are defined in the WADC and include the parents of athletes, teachers, coaches, sport scientists, administrators, and healthcare professionals. Emphasis should be given to the role of pharmacists.
<b>Pharmaceutical care for athletes for prevention, treatment of acute and chronic medical conditions</b>	
Prevention of inadvertent doping	Advising and supporting athletes in their choice and use of prescribed and over-the-counter medicines. The use of online tools, such as the Global Drug Reference Online platform or other drug-status-in-sport providers, to check the prohibited status of drugs and medicines.
Evidence-based approaches to safe sports nutrition and supplementation	Reinforcing healthy dietary choices and a food first approach for an active lifestyle and meeting the athlete workload, in addition to advising and supporting athletes in their nutrition supplement choice and use.
Methods of risk reduction with the use of dietary supplements	Identify the regulatory system for manufacturing and marketing of dietary supplements, addressing the weaknesses (for many countries) that lead to misbranding and mislabelling. Train on using tools to evaluate dietary supplements that are provided by independent third-party testing companies for product purity. The testing company must meet WADA standards for substance detection, at a sensitivity level required for athletes.
Management of pain and injuries in athletes	A review of sports injuries and the options for referral or drug treatment through prescription or self-medication. Particular emphasis should be given to the regulations concerning the use of glucocorticoids and other medicines on the WADA Prohibited List.
Asthma management in athletes	Addressing disease management and medication compliance issues relating to asthma and exercise-induced asthma, understanding the effectiveness and legitimate use of medicines, including beta-2 agonists and glucocorticoids, which are currently on the WADA Prohibited List.
Mental health management	A review of the therapeutic use of prohibited stimulants in the treatment of medical conditions such as attention deficit-hyperactivity disorder. Foundations of sports psychology.
Athletes with disability	A review of medical devices and medication concerns that athletes with disabilities live with to understand common lifestyle (or athletic) modifications for people living with disabilities.
<b>Exercise and sports sciences</b>	

Topics and sub-topics	Content for the curriculum
Basics of exercise science	Review research on physical activity and mental conditioning to suggest evidence-based practices for patients and reinforce patient education suggested by best practices of kinesiology, exercise physiology, diet and sports nutrition.
Physiopharmacology	Describe the effect of drugs and cell or gene therapies on normal human physiology to recognise increase cognition, endurance or strength.
Basics of sports medicine	Practise physical assessment and identification of common sports injuries. Review protocols of self-treatment and referral pathways for care of sports injuries and acute illness most common in sports.
<b>Sports integrity and the international regulation of anti-doping</b>	
The role of WADA	WADA is the key international organisation involved in the control of doping in sport. Emphasis should be placed on how WADA integrates with its stakeholders, including: <ul style="list-style-type: none"> <li>• National/regional anti-doping organisations, agencies or sports integrity authorities;</li> <li>• International sports federations;</li> <li>• Olympic and Paralympic Committees;</li> <li>• Major event organisers;</li> <li>• Court of Arbitration for Sport;</li> <li>• Governments; and</li> <li>• Athletes</li> </ul>
The WADC and international standards	The role of the WADC and the international standards, including: <ul style="list-style-type: none"> <li>• WADA Prohibited List;</li> <li>• Testing and investigations;</li> <li>• Laboratories;</li> <li>• Therapeutic use exemption;</li> <li>• Results management;</li> <li>• Protection, privacy, and personal information;</li> <li>• Code compliance by signatories; and</li> <li>• Education.</li> </ul>
The WADA Prohibited List	Detailed review of the substances and methods that are included on the WADA Prohibited List: <ul style="list-style-type: none"> <li>• Substances prohibited at all time;</li> <li>• Substances prohibited in-competition only;</li> <li>• Substances prohibited in particular sports; and</li> <li>• Methods prohibited in sport.</li> </ul>
Additional lists of prohibited drugs and methods” in	Detailed comparison of lists of prohibited substances or methods enforced for certain sports or as part of sporting codes of conduct: <ul style="list-style-type: none"> <li>• Professional sports;</li> <li>• Collegiate sports;</li> <li>• Esports (competitive video gaming);</li> <li>• Military forces;</li> <li>• Additional sport-specific restrictions; and</li> <li>• Event-specific restrictions (e.g., needle-free).</li> </ul>
Therapeutic use exemption	A review of the procedures and regulations that permit athletes to use prohibited drugs for valid therapeutic purposes.
Doping control and testing	The regulation of doping in sport including: <ul style="list-style-type: none"> <li>• The doping control procedures for in-competition and out-of-competition testing;</li> <li>• Athlete selection and whereabouts;</li> <li>• Laboratory testing procedures and sample analysis;</li> <li>• Doping control official records review; and</li> <li>• Results management.</li> </ul>



Topics and sub-topics	Content for the curriculum
Consequences of doping in sport	<p>Consideration of the consequences for athletes and other who contravene the doping control regulations, including:</p> <ul style="list-style-type: none"> <li>• Sanctions;</li> <li>• Short or long-term health concerns and compromised well-being; and</li> <li>• Social consequences.</li> </ul>
<b>Career and professional development opportunities for sports pharmacists</b>	
Within general work practice	<ul style="list-style-type: none"> <li>• Providing evidence-based pharmaceutical services to competitive athletes on issues relating to the safe, effective and approved use of drugs in sport.</li> <li>• Advising recreational athletes who participate in sport and exercise on the safe use of medicines and supplements.</li> <li>• Gaining a better understanding of the work conducted by practitioners in other disciplines and developing collaborative links. Providing a trusted information point of contact and resource for peers on issues concerning drug use in sport.</li> </ul>
Working with sports organisations	<ul style="list-style-type: none"> <li>• Developing relations with local and national sports clubs and associations to provide expert advice on anti-doping policies and procedures.</li> <li>• Becoming an advisor for a national anti-doping organisation (NADO).</li> <li>• Working with athletes through their national or international sports federations (IFs) on anti-doping policies and procedures.</li> <li>• Becoming an accredited doping control officer through a NADO, an IF or another agency.</li> <li>• Becoming a trained athlete chaperone.</li> <li>• Participating in discussions on anti-doping strategies, policies, and procedures through WADA.</li> </ul>
Major sporting events (MSEs)	<ul style="list-style-type: none"> <li>• Advising on the development and delivery of medical services or doping control procedures at MSEs, such as Olympic and Paralympic Games.</li> <li>• Providing expert service as a volunteer at MSEs through working in athlete village polyclinics.</li> </ul>
Education and research	<ul style="list-style-type: none"> <li>• Developing education programmes on use of drugs and supplements in sport for students, athletes, and ASP, in schools, colleges, sports clubs and beyond.</li> <li>• Undertaking research on issues concerning drug use and misuse in sport.</li> <li>• Participating in national and international conferences on sport-related and health-related themes.</li> </ul>
Additional areas of specialisation	<ul style="list-style-type: none"> <li>• Assuming roles in forensic pharmacy work in litigation and doping in sport investigation.</li> <li>• Anti-doping and veterinary pharmacy, including animal doping or misuse of veterinary drugs by humans.</li> </ul>

This section of the report on curriculum has set forth guidance on sports pharmacy education through suggested learning outcomes and curriculum content with key topics for a core curriculum. The extent and depth to which a curriculum may be adopted will depend on the circumstances under which education programmes are delivered and the pharmaceutical competence needs in each country for sports pharmacists.

## 3 Pharmacists in the anti-doping movement

Before the worldwide harmonised [WADA List of Prohibited Substances and Methods](#), pharmacists and doctors guided public drug education and handling of most medicines. In the early days of anti-doping, healthcare professionals took responsibility for anti-doping education and testing samples for doping.<sup>18, 19</sup> When the prescriber and those who provided access to medicines were the ones who also conducted testing of competitive athletes they treated, this created a conflict of interest. Independent non-medical organisations began to oversee anti-doping efforts. This separation may have driven distance between pharmacy and the anti-doping movement in some sectors but is simple to reconnect. A pharmacist's oath for professional ethics and standards aligns with the essential components in the modern anti-doping movement. Pharmacists are the medication experts most often involved in dispensing medicines and are well placed to provide drug information. Sports pharmacists would additionally identify and may educate others about research chemicals and designer drugs (sold without clinical research or government approval) available through channels outside of the pharmacists' purview.

This report highlights the essential role for pharmacists and pharmaceutical scientists in interpreting the status of drugs in sport, including details of route of administration, threshold concentrations and methods of doping. Other publications detail the status of prohibited substances and prohibited methods in sport; this report shows instances of sports pharmacists applying that drug information into context for individuals based on the type of audience and circumstances. For instance, sports pharmacists developing educational resources for anti-doping authorities, interpreting drug reference values or leading doping control training modules. Sports pharmacists who work consistently within anti-doping provide a valuable service to athletes and other healthcare professionals who care for patient-athletes. They ensure credible and accurate drug information is provided by anti-doping organisations.

### 3.1 Anti-doping education and drug resources

Pharmacists have an essential function in anti-doping, developing reliable, accurate drug resources. There are many nuances to be aware of when assessing medicines in terms of drug names, similar spellings, drug mechanisms, and other drug details to which pharmacists meticulously pay attention. When sports pharmacists are not involved in the development of drug information sports resources, publications may be inadvertently misleading or potentially incorrect, which risks losing athlete trust in the materials, accidental doping offence or clinical error. Education mandates from anti-doping authorities can be met with the aid of local pharmacists. WADA encourages athletes to find a competent pharmacist for consultation. Drug Free Sport International and some collegiate programmes state that athletes should use a credible, competent source when seeking drug or dietary supplement recommendations.<sup>20-22</sup> This report proposes that resource is sports pharmacists.

On a global scale, the WADA List of Prohibited Substances and Methods, commonly known as the Prohibited List, is the official WADA International Standard and primary source of prohibited examples.<sup>23</sup> WADA updates this list at least annually based on emerging scientific evidence and trends in use that indicate a substance or method meets the WADA inclusion criteria for doping. In addition to designer chemicals with no approved clinical indications or investigational drugs not yet market-approved, this list includes some common prescription medicines, over-the-counter drugs, herbal derivatives, dietary supplements, and common methods of therapeutic drug administration. At a minimum, properly interpreting the list requires an understanding of pharmaceuticals, drug nomenclature and chemical structures for classifying drug activity.

Many national anti-doping organisations employ or contract with pharmacists to ensure drug information accuracy; some pharmacists play much larger roles in these anti-doping organisations and are involved with the management of anti-doping programmes or education and training services. Pharmacists work with education teams to create drug information resources for their athletes based on the status of medicines according to the prohibited substance list. For example, the Korean Anti-Doping Agency has at least one pharmacist involved in anti-doping education who provides education through the Korean Pharmacists Association and sports trainers' groups, which is a common role pharmacists fill for some anti-doping authorities, especially when they are also educators or experienced lecturers.

Another highly successful model of a pharmacy association working in alliance with their national anti-doping authority, was developed when the Japanese Anti-Doping Agency partnered with the Japan Pharmaceutical Association to train pharmacists in the lead up to the Tokyo 2020 Olympic and Paralympic Games. This collaboration continues to train and register official sports pharmacists. The major role of a JADA-trained sports pharmacist is to provide information on the proper use of medicines and anti-doping for athletes, as well as anti-doping information within school education. Additionally, sports pharmacists may publicise themselves with the “sports pharmacist” title and offer anti-doping activities in the community or to teams of elite athletes. An example is reported by Shigeo Yamamura, director of the Japanese Association of Community Pharmacy (see Section 8.1.6 — Roles and activities of the sports pharmacist in Japan):

*“Sports pharmacists provide education for athletes, doctors, nutritionists, trainers, supervisors, coaches, and other support staff participating in national competitions. Sports pharmacists may set up a booth at sports event venues, where pharmacists educate athletes, families, team staff, and spectators about anti-doping knowledge.”*

## 3.2 Sports pharmacy collaboration for student-athlete health and anti-doping

Many universities have pharmacy services on campus for students, staff and the families of staff. Student-athletes view pharmacists as a good resource for drug information.<sup>24</sup> Early publications can be found describing pharmacist oversight of prescription use and substance education for athletes on colleges campuses in the United States.<sup>25</sup> Collegiate anti-doping rules and regulations may differ from the WADA Code and Prohibited List. Sports pharmacists assist with interpreting these differences, based on the classes of drugs listed and by contacting the anti-doping authority.

Several pharmacies have sites on university campuses, but the amount of attention paid to student-athletes as a unique patient population is inconsistent and unpublished, yet anecdotes from experts offer insight into pharmacists’ contribution to student-athletes’ health. The existence and success of on-campus programmes appears to relate directly to the level of individual commitment by dedicated pharmacists. Pharmacists in the United States, for instance, connect to students through on-site pharmacies for dispensing, or through athletic directors and athletic trainers. In several cases, these pharmacists practise with an awareness of athletes’ pharmaceutical needs and collegiate-athlete requirements for legitimate therapeutic use of prohibited prescription medicines but may not be dedicated to sports pharmacy as a specialty. Their role is that of a community pharmacist.

Younger athletes, in primary or secondary school, may also find value in connecting with a trusted sports pharmacist. Japanese FIP members provide a successful educational event hosted by sports pharmacists in their case example (see Section 8.1.6 — Roles and activities of the sports pharmacist in Japan):

*“At the request of the university, sports pharmacists conducted outreach activities for doping awareness and prevention at university-sponsored athletic events. Participants included university, high school and junior high school students. During the event, sports pharmacists educated the participants on the importance of anti-doping and also tested participants’ knowledge using a quiz format. After participants took the quiz, sports pharmacists explained the answers and provided additional anti-doping information. At first, many high school and junior high school students thought it was irrelevant to them, but these pharmacists were able to convey the importance of anti-doping to athlete conduct. Sports pharmacists’ experience at the event indicates further the need to begin anti-doping education from a young age.”*

Providing education on anti-doping is a team effort. Sports pharmacists use proven anti-doping teaching resources when participating in the anti-doping movement. More pharmacists could be recruited to extend this effort to more athletes.

### 3.3 Drugs in sport databases

Pharmacists play a critical role for anti-doping authorities in the integration and maintenance of drug education and online drug databases. Designing or selecting a model for a search engine for drugs in sport is one opportunity in which sports pharmacists participate. The constant demand to review the pharmaceutical market and the need to accurately reflect multinational drug databases frequently results in disparate drug variables for pharmacist consideration. The discerning eyes of a pharmacist catch details overlooked by those outside the profession.

Pharmacists serve an essential function for anti-doping authorities by ensuring the accuracy of data entry and maintenance of drug details in drug reference databases for use by staff or athletes. Pharmacists take a lead role in determining inclusion and exclusion criteria for the database. Pharmacists trained in anti-doping provide guidance on drug database development, display and maintenance. Sports pharmacists determine and evaluate the mandatory components for a reliable, trustworthy drug database for drugs in sport, including:

- Accuracy of drug details;
- Assurance of international drug nomenclature;
- Limited drug details to necessary components for clarity;
- Precision in drug formatting for display appropriate for the users;
- Routine updates of the drug information; and
- Responsiveness to drug market changes.

Online searchable databases and mobile apps provide unlimited public access to determine the status of medicines at any time of day, from anywhere. In Norway, the information on the status of medicines has been incorporated in the Norwegian Pharmaceutical Product Compendium, which illustrates with coloured icons if doping issues are associated with specific prescription medicines.<sup>26</sup> In Japan, as reported in the case example submitted to FIP for this report, “a search app (Dixpro) for prohibited doping substances has been developed and is operated free of charge” for users.

In another example, the Global Drug Reference Online platform (Global DRO; [www.globaldro.com](http://www.globaldro.com)) was originally developed as a resource by at the Canadian Centre for Ethics in Sport, the United States Anti-Doping Agency and the United Kingdom Anti-Doping Agency, and later expanded to include Australia, Switzerland, Japan and New Zealand. These countries shared similar robust drug regulatory frameworks common to each country. The Global DRO platform was introduced to the public in 2009 as an online search engine.<sup>27</sup> This multinational partnership provided the most robust drug database referencing the status of all known prohibited substances and nearly all drugs with therapeutic indications (both prohibited and not prohibited). The Global DRO allows athletes or ASP to check a medicine’s compliance with the WADC. It provides an answer and reference number for the searcher. The Global DRO also provides links to other countries’ searchable drug databases for athletes outside the Global DRO.

Selecting, building, and maintaining a searchable drug database is one instance where anti-doping authorities should seek sports pharmacist consultation. Alex Lui, a pharmacist who previously worked with the Australian Sports Anti-Doping Authority (ASADA; known now as Sport Integrity Australia), in the case example submitted for this report, describes the essential role he had with the conversion to the Global DRO (see Section 8.1.1 — The introduction of Global DRO at ASADA):

*“Many anti-doping authorities around the world provide their athletes with drug information related to the WADA Prohibited List, outlining what cannot be used in sport, both in competition and out of competition. WADA updates this list annually to include examples of common prescription medicines and over-the-counter drugs.*

*“The Global DRO was originally launched in 2009 as a partnership between the United States, United Kingdom, and Canadian anti-doping authorities. It allows athletes to check the status in sport before taking a medicine, confirming compliance against the WADA Prohibited List.*

*“Anti-doping authorities used experienced Global DRO pharmacists and local staff pharmacists in a multi-step process to confirm data sourcing, review drug ingredients, and check accuracy of drug formulation as they link ingredients that display the status of medicine in sport.*

*“A pique of interest while introducing the Global DRO to ASADA was learning elements of drug inclusion and exclusion for the platform based on the policies written by Global DRO pharmacists. As a pharmacist, reviewing individual details of drugs to determine the status in sport proved to be an educational experience and useful in training various staff. ASADA staff used this deeper understanding of drug evaluation to update educational material and stay up to date with the trends for medicines of doping interest.”*

## 3.4 Sports pharmacists in doping control

Doping control is often a separate division of anti-doping from the development and delivery of education and drug information resources. Doping control officers (DCOs) interact with athletes and are present at sporting events for doping deterrence. DCOs may be employed by or contracted to anti-doping authorities or testing agencies. Pharmacists can be DCOs,<sup>28</sup> and may also be trained to volunteer as chaperones, who are required to accompany an athlete during the doping control process.

### 3.4.1 Doping control Officers

Doping Control Officers work directly with athletes to collect samples of urine and possibly other bodily fluids, as part of the anti-doping process for competitive athletes. Daniel Sanabria is a sports pharmacist and DCO. In his presentation at the 2022 International Sports Pharmacy Symposium, he detailed his involvement as a pharmacist in the doping control process.<sup>29</sup> This may incorporate design and management of test distribution plans, meaning athlete selection and notification. In his experience, he organises, coordinates and supervises test management by the doping control testing groups. Additional duties could include identifying events for delivery of outreach programmes, athlete education, sample collection, doping control documentation (e.g., whereabouts failures) and promoting academic research.

When a pharmacist is a trained DCO, they help ensure the steps in the process are met for fairness and transparency. The process is described here by Daniel Sanabria:

*“When the athlete shows up to the doping control station, the athlete will have a chaperone. The athlete selects the sample container of their choice to guarantee no interference in container selection. Then the athlete supplies a urine sample to at least a minimum volume in the presence of the DCO and chaperone to prevent diversion of the sample. The sample is sealed, specific gravity is measured for verification and packaged for transportation to the WADA certified laboratory for testing.”*

During the sample collection process, the athlete completes a Doping Control Official Record, on which the athlete declares all substances used. This list should indicate the substance name, including medicines or dietary supplements, sometimes topical medicines, illicit substances, and other declarations. The route of administration should also be indicated.

The presence of the substance in the body is just one of several measures of doping. Other circumstances of doping as described in the [WADC Code](#) are outlined below and should be of interest to all pharmacists. Circumstances related to the athlete directly include:

- Attempted use or possession of a prohibited substance;
- Refusal to take a test or not being available during the required timeframe; and
- Manipulation of the sample.

Additionally, the pharmacist must be aware of the doping code that informs their work with athletes, including:

- Trafficking prohibited substances;
- Administration of prohibited substances;

- Complicity for doping; and
- Prohibited association with former ASP listed by WADA who are forbidden from working with athletes.

## 3.5 Therapeutic use of prohibited medicines

### 3.5.1 Therapeutic use exemption

Athletes may have an illness or medical condition that requires treatment with a particular medicine. If this medicine contains a banned substance, the athlete may need to demonstrate to the anti-doping authority the medical necessity for its use. In terms of the WADC, the athlete would apply for a Therapeutic Use Exemption (TUE). Sports pharmacists remain aware of these processes to apply for such exemptions for legitimate therapeutic use and assist athletes in collecting and submitting the paperwork.

Therapeutic use of prohibited substances, including any prescription drugs, requires competitive athletes to apply to and receive approval from the respective anti-doping authority for use (even prescribed use) before taking the medicine. After sports pharmacists help determine that no alternative therapeutic option can be substituted, the athlete seeks approval for the medically necessary use of a prohibited substance by applying for a TUE.

At major sporting events, a TUE must be obtained by the athlete before a prohibited medicine is dispensed. Informed consent of the athlete is used to verify awareness that a prohibited substance is being prescribed and dispensed. The sports pharmacists ensure documents contain signatures from the athlete, doctor and pharmacist at the time of prescribing and prior to dispensing. The signatures indicate the athlete was fully informed about the prohibited status of the medicine. Informed consent includes educating the athlete about the consequences of using a medicine that is prohibited in sport. Failure to submit an approved TUE indicating the clinical necessity for use of a prohibited drug may result in an anti-doping rule violation.

Administration of prohibited treatments which are essential for any emergency, urgent or life-threatening situation is permissible without the pre-approval of a TUE but a retroactive-TUE application must be made soon after the medical incident is resolved. In an emergency, the health of the athlete takes priority, survival is an absolute goal, and the doctor must treat the athlete, including the use of prohibited substances or prohibited methods when clinically necessary, then apply for a retroactive TUE soon afterwards.

### 3.5.2 Recognising prohibited substances and recommending alternatives

Pharmacists may reduce the need for a TUE by identifying an alternative treatment that is not prohibited and reducing overuse of medicines. Pharmacists assist in the appropriate selection of a medicine for treatment following diagnosis and ensure the doctor or other prescriber considers options that are not prohibited in sport. When alternatives that are not prohibited can be used instead, the TUE is no longer necessary. Sports pharmacists evaluate when a prescription is clinically appropriate and will not risk athlete health or long-term well-being.

### 3.5.3 Medical documentation for appropriate clinical use and sports pharmacy audits

Sports pharmacists may offer an audit and review for completeness prior to a TUE submission. Athletes and their families often welcome a sports pharmacist's assistance in navigating the TUE submission process. Pharmacists may advise competitive athletes on which organisation they need to submit the TUE to, such as their appropriate international federation (IF) or relevant national anti-doping organisation (NADO).

Pharmacists may help prepare the medical documentation required as part of a TUE submission for a patient-athlete and their physician to ensure the application is fully completed according to WADA information requirements.

### 3.5.4 Pharmacists on therapeutic use exemption committees

Some pharmacists are directly involved as members of TUE committee. A TUE committee comes together for the review of an individual athlete's case and TUE application. Each TUE committee member will consider if the use of the prohibited substance returns the athlete to a presumed baseline of health. They consider if use of the medicine would enhance the performance for the applicant. The TUE committee will approve or deny the application based on the records submitted.

For example, sports pharmacists on a TUE committee would review use of medicines, including retrospective use emergency medicines, as part of the retroactive TUE review process. One case example offered by a sports pharmacist involved with TUE reviews, as a confidential source to safeguard privacy of the patient-athlete, states:

*“An example of a retroactive TUE was for use of normal saline IV 1,000 ml in a medical tent on-site at a national event. The paramedic evaluated the athlete and began the IV fluid as emergency treatment. Because the rehydration fluid was given intravenously in a volume that was deemed prohibited by WADA, a retroactive TUE was submitted after the incident.*

*“Another example of a retroactive TUE submission is use of a glucocorticoid injection for an acute inflammatory condition, such as a severe systemic allergic reaction to poison ivy. An athlete may submit the TUE after they have received urgent treatment seeking retroactive approval because they needed to start it urgently as soon as prescribed.”*

## 3.6 Pharmacist risk assessment of dietary supplements

Dietary supplements and nutritional products provide an important opportunity for pharmacist intervention. As cases of inadvertent doping due to dietary supplements are common among athletes, sports pharmacists remain keenly aware of the risks of dietary supplements, including:

- Differences in quality control between manufacturers;
- Absence or limited scientific studies on safety or efficacy;
- Heavy marketing of products directly to athletes, recreational or competitive; and
- Unfounded user testimonials and often lack of peer review or an evidence-based approach to recommendations for use or benefit.

Each of these points of awareness may open discussion with athletes, as these products continue to increase in popularity, many without evidence of effectiveness.<sup>30,31</sup> More concerning is that these products continue to be intentionally or accidentally contaminated with prohibited substances.<sup>32-35</sup> This well-documented concern for athletes may occur as a result of misidentification of raw ingredients, intentional addition of ingredients to those listed on the label, addition of designer chemicals and untested or unproven ingredients, contamination during manufacturing or mislabelling of products.

Some sporting organisations place blanket statements recommending against any use of dietary supplements unless advised by medical professionals. Different anti-doping authorities have different approaches to handling education about dietary supplements with athletes, based on local patterns of use and cultural norms, such as common use of herbal medicines or locally made treatments. The IOC published a consensus statement for use of dietary supplements by athletes.<sup>32</sup> The conclusion of this paper states:

*“Dietary supplements can play a small role in an athlete's sports nutrition plan, with products that include essential micronutrients, sports foods, performance supplements and health supplements all potentially providing benefits. Some supplements, when used appropriately, may help athletes to meet sports nutrition goals, train hard, and stay healthy and injury-free. A few supplements can directly enhance competition performance. However, it takes considerable effort and expert knowledge to identify which products are appropriate, how to integrate them into the athlete's sports nutrition plan, and how to ensure that any benefits outweigh the possible negative side effects, including the potential for an ADRV. A strict risk-benefit analysis involving a decision tree approach to the effectiveness, safety and risks should*

*identify the small number of products that may benefit the athlete. Such an analysis requires the input of a well-informed sports nutrition professional.”*

Sports pharmacy experts suggest that pharmacists practise due diligence when working with athletes, as the same due diligence is required of the athlete before using the product, according to WADA. From an athlete’s perspective, trusting a pharmacist’s advice may be the assurance they seek. Getting the information correct is imperative, as with providing any drug information. Sports pharmacists refer competitive athletes to other sports healthcare professionals where necessary, such as a sports dietician referral in lieu of upselling the patient-athlete vitamins and protein products.

Sports pharmacists use medical publications and credible resources to evaluate dietary supplements’ efficacy, quality and purity to ensure they meet the high standards for WADA testing, due to very low minimum levels of detection for prohibited substances.<sup>36</sup> In plain terms, this means the athlete using a product accidentally contaminated with trace amounts of a prohibited substance could test positive. Third-party certification for dietary supplements would need to be independent and complete from raw ingredient harvesting or synthesis, all the way through post-marketing product testing. A number of independent private testing companies offer information on batch-tested supplements for athletes.<sup>37</sup>

Some countries have well-defined rules for dietary supplements and herbal products, but online access to products allows athletes to bypass most quality control measures and official regulations, making risky supplement use a world-wide concern. Reviewing product labelling is insufficient to determine content safety for an athlete, but Table 6 attempts to classify categories of sports supplement terminology to suggest the associated level of risk sports pharmacists assign to products.

**Table 6 — Categories of sports supplements (not a “drug” and not a “food”) for sports pharmacy discussion**

Terminology sports pharmacists may use to distinguish products	Explanation	Assessment of risk if pharmacist is recommending use to athletes*
Bodybuilding supplement	Ingredients or multi-ingredient products marketed as muscle building and ergogenic aids to increase lean muscle mass, marketed primarily as dietary supplements and clandestine “research chemicals”.	High–very high
Dietary supplement	Single ingredient or multiple ingredient products, not classified as drugs or foods, that lack regulation and do not require clinical proof of effectiveness or safety before marketing. Precaution: Label may not match the contents of a product. Examples include creatine or other protein powders, amino acids, amino acid nutrients, synthetically modified chemicals.	Low–very high
Ergogenic aid	Substances used to benefit exercise performance. These are intended to go beyond health maintenance to take advantage of drug effects on the human capacity to function.	Moderate–very high
Herb/herbal medicine or traditional medicine	Whole or any portion of a plant or traditional nature-based medicine (mycological, marine, etc) used as a raw or traditionally manipulated formula, without modification in a laboratory to isolate chemicals and without synthetic components.	Low–very high
Medical food	Processed foods scientifically formulated to be ingested and intended for medically supervised treatment of a diagnosed medical condition that benefits from a specialised diet; may be purchased without prescription.	Low
Nutritional supplement	Calorie, vitamin, mineral replacement, typically marketed as dietary supplements.	Low–moderate



Terminology sports pharmacists may use to distinguish products	Explanation	Assessment of risk if pharmacist is recommending use to athletes*
Phytochemical (phytopharmacy)	Plant product containing natural isolates with minimal to no modification from a naturally processed form. Ingredients may list a standardised amount of a natural phytochemical to demonstrate quality (e.g., St. John's Wort: standardised to 0.3% hypericin extract) and still include all other natural chemical constituents (e.g., contains St. John's Wort leaves and flowers). Excluding synthetic production of single chemical isolates (e.g., hypericin).	Moderate—high
Probiotic/prebiotic	Strains of microbes marketed for gut flora balance or digestive health.	Low
Sports supplement	Single or multi-ingredients products marketed as ergogenic aids, protein products, recovery aids, electrolyte replacement, pre-workout products, energy boosters, weight loss products, or other terms associated with sporting activities; marketed primarily as dietary supplements.	Moderate–high
Vitamin	Prescription grade quality: Single ingredient used for therapeutic indications for replacement or treatment of a vitamin deficiency or medical condition. Vitamins, minerals or multivitamins sold as dietary supplements: refer to “Dietary supplement” section above for precautions.	Prescription: low Dietary supplement: low–moderate
*If an athlete reports due diligence was taken by asking a pharmacist for advice, it should be advice from a competent pharmacist fully aware of these risks for athletes when recommending any products that potentially contain any detectable amount of prohibited substances.		

## 3.7 Forensic pharmacy and information gathering

### 3.7.1 Sports pharmacists as expert witnesses

A pharmacist may be sought out to testify as an expert witness because of professional experience. Sports pharmacists could be consulted in a case related to anti-doping. Sports pharmacists may provide testimony under oath for a seemingly simple task, such as identification of an intact tablet or stating the labelled dosing information found in a package insert or they may be called to state the standard concentration or preferred route of administration for a medicine. They may assist in research to investigate the medical appropriateness of unapproved clinical routes of administration or off-label prescribing or usage. Pharmacists may discuss prescriptive authority or drug rules and regulations as governed by the local region in which the patient-athlete was given the prescription.

### 3.7.2 Pharmacist anti-doping research and detection of substances

Examples are found of pharmaceutical scientists working to improve detection of substances, determining the ergogenic potential of drugs, or conducting research to elucidate dosages that provide treatment and the threshold above which it enhances performance. Pharmacists oversee laboratories that conduct testing of samples or review laboratories that evaluate drug detection to ensure that they meet WADA standards. Pharmacists may also interpret laboratory results to distinguish metabolites and pharmacokinetics, determine acute drug use, identify drug interference with laboratory results and review minimum detection limits.

### 3.7.3 Monitoring biological markers of doping substances

Detecting use of performance-enhancing substances with very short serum half-lives and rapid elimination has caused some difficulty in proving cheating by those suspected of doping. Anti-doping authorities around the world have analysed urine samples to detect use of prohibited substances by looking for the presence of specific medicinal chemicals or metabolites. These may have a concentration threshold that separates

therapeutic use from performance enhancement. Detection in other bodily fluids is also attempted with ever-advancing research.

Pharmacists trained in sports science understand the pharmacokinetics of medicines of interest to athletes that may be misused as doping agents or used to attempt to mask misuse. Sports pharmacist can often rule in or rule out specific classes of medication as agents of potential abuse. Predictive pharmacodynamics along with rates of elimination may be used to approximate physiological/biological changes in the Athlete Biological Passport (ABP), which is a profile of biological markers taken from individual athletes and tracked over a series of the individuals' samples. This information can then be customised in developing targeted testing regimens. The ABP is one approach to detecting and deterring doping. Detecting performance-enhancing substance use or methods of doping in sport can be summarised as follows (see Section 8.1.2 — A valuable addition to intelligence gathering: The Athlete Biological Passport):

*“Performance enhancement in sport has been a long-standing concern for sporting events, organisations and clean competitors around the world. As competitions become more competitive with bigger incentives to win, some competitors resort to illegal methods to enhance their performance, attempting to gain a competitive edge and win at all costs. Illegal methods in this space may include:*

- *Blood doping*
- *Substance doping, where a competitor will take a medicine (prohibited substance) which will enhance their performance (e.g., diuretics, beta blockers, opioids and pseudoephedrine)*
- *Micro doping, where a competitor takes smaller amounts of medicines to mimic physiological patterns or small amounts that still give the competitive edge but avoid detection”*

The ABP can be an extremely valuable tool in establishing if an athlete is suspected of performance enhancement. Interpreting the scope, scale and duration of drug effects beyond basic pharmacokinetics is a pharmacological discipline. In competitive sport, athletes who choose to enhance their performance have at times become more educated in medicine, science and methods to evade detection. Intelligence indicates athletes also micro-dose performance-enhancing substances, making detection even harder. Because the presence of either synthetic or biological substances can indicate doping, pharmaceutical science becomes a valued aid in interpreting physiopharmacological effects. In this instance, Alex Lui, while working as a sports pharmacist with the Australian Sports Anti-Doping Authority, offers insight into his professional experience in this area:

*“As a pharmacist assessing ABPs, understanding the athlete and the sport in which they compete allows a better understanding of the possible ways any WADA-prohibited substances may be used. In the ever-evolving world of anti-doping, athletes who choose to take prohibited substances or use prohibited methods to try to take advantage of pharmacokinetic tactics that attempt to evade detection. As a pharmacist, establishing the link between a suspicious profile and the suspected substance (or method) is critically important to enable efficient and effective use of the ABP as a tool of anti-doping.”*

The ABP is a useful anti-doping tool after a select set of data is evaluated in the context of anti-doping. If the consecutive samples that create an individual athlete's ABP are reviewed, the results may show indicators presumptive of doping. Where gaps appear in the ABP, anti-doping organisations may share information and collaborate across science and results management to fill them in. Interagency strategic information-sharing also aids the anti-doping movement.

When a substance is undetectable, the sample obtained would still show a competitor's physiological profile at that certain point in time. This becomes part of a series, used in trending results that may indicate possible suspicion of doping without triggering further investigations at that time. Competitors intentionally cheating through doping frequently understand the pharmacokinetics of the medicine they use, calculating when a DCO is likely to present and request for a sample, and timing doses to evade detection in their sample.

Anti-doping authorities may use the ABP as a complementary tool after samples are obtained. Results may be presumptive towards doping or show parameters that may dictate further testing. When infrared mass spectrometry is used as a next step in detection, the substance or the identifiable raised parameter may provide more information on the origin of the doping substance.

Certain indicators require further investigation to establish a case and trigger additional testing. For an anti-doping authority, gathering further intelligence establishes if the laboratory values being used as surrogate markers of doping and viewed in the database appear related to use of a prohibited substance or other legitimate medical or are more likely the result of lifestyle factors. Each result is a timepoint in an athlete's profile at the time of testing, and is not in itself proof of doping. The baseline is compared to trends over time. Gathering additional information for each case allows the authority to visualise innate changes or suspect external influence on the body.

Identifying critical points in ABP results can amplify the practical use of the ABP. Further education of anti-doping organisations around the world may be an opportunity for pharmacists to aid in more efficient use of the ABP as a valuable addition to intelligence gathering, as described in this case through the experience of Mr Lui during his tenure as ASADA (see Section 8.1.2 — A valuable addition to intelligence gathering: The Athlete Biological Passport):

*"I assessed and progressed several ABPs associated with individuals that could be labelled as suspicious or extremely suspicious for doping.*

*"The value of having a pharmacist investigate the ABP is the skill to narrow the possible medicines to a class of a few prohibited substances which could modify the biological profile.*

*"Pharmacist expertise was employed to uncover enhanced use of the ABP by designing customised plans to demonstrate the likelihood of doping.*

*"The use of the ABP was once considered as a tool to use after the sample was obtained. With the assistance of a pharmacist, education of the staff and highlighting how this tool can be used to demonstrate whether an athlete is doping through challenging methods of detection, this tool is now used as part of intelligence gathering, proving to be a valuable addition to authorities' abilities to detect whether an athlete is suspected of doping."*

The pharmacist perspective on the ABP allowed use for its intended purpose and expanded with the potential that was not fully recognised previously. Trending biophysiological changes became part of intelligence gathering. Narrowing the target for anti-doping testing, which may increase probability of detection, sports pharmacists' assessments may potentially decrease downstream doping control resource use by focusing in on the target. By interpreting pharmacodynamics and residual biophysiological effects, sports pharmacists may be seen as having a critical part in purposeful testing. Sports pharmacists' involvement strengthens clean and fair competition.

## 4 Clinical sports pharmacy specialty

FIP guidelines “[The role of the pharmacist in the fight against doping in sport](#)” (2014) mentioned earlier in this report are relevant for all pharmacists, as that publication is directed at the broad pharmacy workforce. In the specialty of sports pharmacy services, the role described takes priority. Sports pharmacists keep updated on the anti-doping code, promote the benefits of exercise, and remain vigilant that medicines use is safe and for a legitimate medical indication, especially when used by competitive athletes.

A traditional community service of pharmacists often included giving advice to maintain health, improve vitality and reduce unwanted side effects in order to maintain energy, clarity or athleticism. Sports pharmacists counsel on these drug-related enquiries and advocate the health and long-term well-being of athletes. Sports pharmacists see a perspective that some medicines increase athleticism or potential performance in sport, while others reduce strength, stamina or power.

FIP’s article “Five keys for pharmacists working with athletes” provides guidance for pharmacists building their sports pharmacy awareness.<sup>38</sup> These keys are to identify which patients are athletes, gather additional patient-athlete demographics, and evaluate all therapies to determine appropriateness of use in that individual’s sport and the anti-doping status of all substances.

The clinical care of patient-athletes frequently involves direct care, interface with the public and personal interactions with patient-athletes to provide pharmacy services. Examples include consultation for self-care or non-prescription drug selection, prescription dispensing, therapeutic review and medication counselling. Telehealth and virtual pharmacy care of the patient-athletes became increasingly available throughout the COVID-19 pandemic, along with assistance with self-monitoring devices and online patient-provider applications. Indirect pharmacy services for patient-athletes include development of athlete-aware treatment protocols, proactively auditing medical records, retrospective medicines use evaluations, or consultation with healthcare professionals that provide care to patient-athletes.

### 4.1 Sports pharmacists in primary healthcare

Pharmacists may receive questions from athletes or the public, in community and secondary care settings, about services and therapies available for the treatment of sport- and exercise-related conditions. They may also be asked about performance-enhancing substances. For these drug enquiries, pharmacists may already liaise with other healthcare providers to provide guidance on appropriate selection of medicines and nutritional information. Trained sports pharmacists will have added knowledge to help determine pharmaceutical appropriateness, drug interactions and weigh the risk to benefit of drug treatment for athletes, while remaining fully aware of the boundaries of anti-doping. Counselling to avoid use of unproven chemicals outside of registered clinical trials is a topic sports pharmacists also address with some athletes. Cross-over knowledge for pharmacists is found mainly in fields of cell or gene therapy, neuropharmacology and endocrinology.

Sports pharmacists watch for ergogenic properties, sports drug culture, and other concerns of drug use related to sports and athletes. The demands on the body from exercise may lead to modifications of medication and nutrient regimens. Qualified sports pharmacists further educate themselves with the intention to describe nuances in drug selection for athletes that impact on appropriate therapeutic drug selection and monitoring. The full spectrum of a drug must be closely evaluated, including but not limited to the status of a substance, dose, route, activity of metabolites and effects on the ABP. Sports pharmacists remain mindful that a drug that is not prohibited today but raises suspicion and for which evidence is being gathered for it to be placed on the prohibited list, should also be avoided, as athlete samples can be retrospectively tested and found positive. Sports pharmacists working with competitive athletes think forward as if trying to predict the future potential of any substance that has a risk of being reassigned as prohibited in sport.

Examples submitted by Shigeo Yamamura (see Section 8.2.2 — Enquiries to sports pharmacists in Japan) illustrate typical enquiries addressed by sports pharmacists to avoid accidental doping or designing a plan to

meet the clinical needs of patient-athletes when a prescribed medicine is prohibited. For instance, a trainer of a Japanese national team athlete reported that the athlete had symptoms of asthma and sought medical attention. The trainer asked about the status in sport of the asthma treatments. The sports pharmacists determined one prescribed medicine contains a prohibited substance and suggested the prescribing doctor change it to an alternative medicine. Also, the sports pharmacist counselled about the new medicines the athlete could take. The athlete avoided taking a prohibited substance that was prescribed.

In another example, the mother of a teenage student-athlete expressed concern about sudden improvement in his performance. He had recently been selected to participate in a major national competition. The mother questioned if the medicines or supplements he usually uses would violate anti-doping rules. The sports pharmacist checked the athlete's medicines and supplements against the list of prohibited drugs and found no performance-enhancing substances. Because of the trusted relationship that was established, the mother and her son have understood the importance of anti-doping and regularly asked the sports pharmacist about medication and supplements.

While anyone can download and read the WADA Prohibited List, experienced sports pharmacists evaluate the drug classifications with similar chemical or biological effects and are aware of the details in the notes and exceptions. Rules are updated annually with different medication status, new examples of performance-enhancing substances or prohibited methods. Sports pharmacists keep pace with the updates. The WADA Prohibited List is a living document that may have substances added at any time but is routinely updated with enforcement of the annual list beginning 1 January. Sports pharmacists in some countries also remain aware of other lists of banned substances by which the athlete abides, but which do not match the listing of drugs on the WADA Prohibited List.

As with other drug information sources, this report suggests all pharmacists should be able to view and interpret the WADA Prohibited List in a clinical context. Pharmacists unfamiliar with anti-doping may only scan the list; although they may quickly identify medicine names with government-approved indications for use, some pharmacists may over-speculate on restrictions or misrepresent the list to the athlete.<sup>39</sup> Most pharmacists are capable of completing additional instruction needed to effectively interpret the WADA Prohibited List and using credible resources to find the correct drug answer for athletes.

Ashley Anderson works as a clinical sports pharmacy specialist and is an expert in anti-doping. She shared this anecdote from her experience in coaching pharmacists and healthcare professionals in addressing athlete drug enquiries:

*“A common pitfall many people stumble into when trying to interpret the WADA Prohibited List is overlooking the dose or route specifications associated with a commonly prescribed class of medications or specific drug. While precepting student pharmacists for USADA, for instance, they often mistook inhaled corticosteroids as prohibited. Glucocorticoids, when inhaled, are okay for an athlete to use for asthma control. We meticulously review the WADA Prohibited List and run through countless case simulations before most could consistently interpret the list with high accuracy.*

*“Pharmacists might also mistake a prescription order as being authority enough to permit athletes to use a medicine that is on the prohibited list, but this comes from a lack of awareness of the process. Pharmacists are meticulous and risk adverse. Pharmacists scrutinise drug details to tailor medication or to make recommendations for patients about drug interactions, renal impairment, pharmacogenomics, or patient demographics like advanced age. It takes training and experience to interpret prohibited substance restrictions in a clinical context. Pharmacists should give the same level of attention to modifications needed for athletes' wellness or to strictly abide by the anti-doping code an athlete follows, especially if the athlete will compete. This is because pharmacists need to be alerted to prohibited substances because they currently lack the training, not because they lack the ability. Pharmacists are the most suitable ASP to take on this task, in my experience.”*

Pharmacists are easily accessible without an appointment, meaning the public can connect with a highly educated healthcare professional who will address their personal health questions. Pharmacists frequently provide personalised expert drug advice to public health consumers and prescribe self-care products on-site. Pharmacists working with athletes describe building a relationship of trust with the community. The

opportunities exist for models of sports pharmacy practice to develop through repeated interactions with athletes in the community. Pharmacy continues to evolve. Being available to counsel patient-athletes could flow within the workload when most pharmacists have basic training to address athletes' general drug questions.

An innovative concept, supported financially by the Finnish Ministry of Education and Culture presents a model of pharmacists promoting healthy lifestyles and physical activity, with more attention to recreational athletes. This operating model called the "Exerciser's Pharmacy" is a joint venture of the Fit for Life programme, which includes the Organisation for Respiratory Health, the Association of Finnish Pharmacies, and regional sports organisations.<sup>40</sup>

Pharmacists seeking to extend sports pharmacy services, should remain vigilant to avoid the trap of inadvertent doping due to lack of awareness or lack of due diligence. To reiterate the impact of drugs in sport, the athlete is responsible for detection of any prohibited molecule found in the bodily fluid sample. Pharmacists without training may not fully recognise this.

#### 4.1.1 Vigilance in review of therapeutic indications for prohibited substances

As for all prescription medicines use, the pharmacist acts as a double check before the patient-athlete receives the drug. The initial review begins with verifying that an indication matches the treatment. Sports pharmacists help recognise and avoid use of ergogenic ingredients when they are not indicated or would be harmful to any patient. Pharmacists should use discretion when discussing performance-enhancing effects. At the same time, pharmacists may find the need to counsel on the adverse risks of intentional use of performance-enhancing substances as a lifestyle choice, such as in recreational bodybuilding.

Another demographic of patient-athletes exists. These are consumers who intentionally take performance-enhancing substances and do not plan to compete or pursue an athletic career. Be it the public gym member or bodybuilders, the risk of misuse of medicines and use of doping substances carries significant health risks. Bodybuilding consultations and risk reduction strategies or responding to the health consequences of performance-enhancing substance use are areas that many public-facing pharmacists encounter. Sports pharmacy experts would suggest that pharmacists consult with other healthcare providers to provide guidance on sensible use of medicines and protect the health of athletes.

Support of a multidisciplinary team encourages appropriate use of medicines. Pharmacists working in clinical settings collaborate with the other disciplines that also serve the patient-athlete, including primary care providers, behavioural health specialists, athletic trainers and other support personnel, to ensure that a comprehensive approach to care is achieved. The multidisciplinary approach serves athletes well.<sup>3</sup>

#### 4.1.2 Pharmacist interventions for self-treatment of sport-related conditions

Medicines available for general sale without a prescription (over-the-counter drugs or non-prescription medicines) are as popular among athletes as they are among general health consumers. Likewise, pharmacies may stock products such as personal hygiene products, beauty products, general first aid products, and general health maintenance products that athletes use, as do the general public. Those participating in sporting activities may approach a community pharmacist when seeking self-care advice or before purchasing non-prescription medicines. Pharmacists may optimise safe use of medicines by asking about physical activity and the dose the individual takes to confirm they will follow dosing direction. As an example, to avoid overdose or masking of an over-use injury with over-the-counter pain medicines, including ibuprofen and paracetamol, sports pharmacists would ask leading questions to reinforce appropriate indication, dose and duration. Other common minor ailments addressed by sports pharmacists include gastrointestinal discomfort, rashes and fungal skin infections, community-acquired viral infections and allergies.

The importance of addressing athletes' use of nutritional supplements or dietary supplements cannot be understated and has an entire section of this report dedicated to the topic (see Section 3.6 — Pharmacist risk assessment of dietary supplements). Often, sports pharmacists evaluate supplements as part of patient-athletes' self-care routine or self-treatment. An example from JADA-trained sports pharmacists illustrates this situation through a reported typical interaction between a sports pharmacist and a trainer (see Section 8.2.2 — Enquiries to sports pharmacists in Japan). A female track and field athlete had injured her leg during

practice. Because the athlete planned to participate in an international competition and was considering the use of supplements to speed her recovery, the trainer asked the sports pharmacist to review the ingredients listed on the product label. While the product label did not list prohibited substances or questionable proprietary blends, the sports pharmacist warned the trainer that the supplement was a potential risk because it used raw materials of animal and plant origin. Ultimately, the player and support staff discussed if it was necessary to use the product and decided to use it. Other trainers may encourage athletes to avoid all risks when a sports pharmacist determines any risk of testing positive exists.

#### 4.1.3 Travel planning pharmacy services

Elite athletes often plan demanding competition schedules that may involve international travel. The sports pharmacist may consider detailing a plan of medication management for the travel period and may also be asked to verify immunisation requirements. National competition schedules of athletes may also be demanding, which is an opportunity for more pharmacists to assist in review of self-treatment plans and address prescription medicine issues related to traveling or carrying medicines away from home. When a physician is traveling with a team and carrying medicines, coordination of medication management with the pharmacist worked as a verification step for the team physician, according to some sports pharmacists. Also, athletes may benefit from spending time in travel planning with pharmacists, as with medication management for travel described in the “Handbook of sports medicine and science: Training and coaching”,<sup>41</sup> one of many free resources from the International Olympic Committee, a well-known reputable online source of information for athlete healthcare used to prepare pharmacists for these cases.

The global COVID-19 pandemic placed additional pressure on most pharmacists, but also refreshed the public’s reliance on pharmacies for essentials and preventive health, including vaccinations. In a case submission from FIP members representing a Japanese Anti-Doping Agency registered sports pharmacist, this example of a common query is given:

*“A JADA-trained sports pharmacist received an enquiry from the mother of male teenage canoeing athlete. The mother had searched the internet to locate a pharmacy with a registered sports pharmacist to visit and asked, “may he be COVID-19 vaccinated? May he use OTC drugs for fever?” The response of the sports pharmacist was, “he can be vaccinated. Because some general cold OTC medicines for fever may contain prohibited substances, OTC cold medicines should be avoided. The pharmacist gave a copy of the prohibited substance list to the mother and recommended the teenager see a doctor to seek a prescription for paracetamol or purchase an OTC product containing only paracetamol.”*

Sports pharmacists recognise that athletes’ travel for events or training abroad and may carry their own medicines with them or plan to purchase them in the destination country. Questions of proper medicines identification by the athlete, despite different international names for the same ingredient or similar brand names for different drug formulations, can be difficult to navigate. A drug search engine may even provide incorrect results for the athlete based on location.

Pharmacists can assist individual athletes with interpreting information on drug importation when traveling. Developing travel plans for athletes with chronic conditions requires a medication review that would be undertaken by a sports pharmacist in collaboration with the athlete’s medical practitioner. Before traveling with medicines for oneself or carrying medicines as a medical volunteer with the team, the drug laws and policies of the host country must be observed. In some countries, importation of one’s own controlled substance prescription may be illegal. As previously mentioned in preparing for major sporting events, additional restrictions must be considered, for example, but not limited to, the needle policy of the event or the necessity for a therapeutic use exemption for a drug that is prohibited.

Pharmacists also assist team doctors in medical kit content documentation to submit the detailed lists of imported medicines to the medical services at the games and to government customs and importation authorities. Most teams will bring complete medical kits from their home countries, which include significant amounts of medicines and injury rehabilitation equipment. Host countries’ local customs and law enforcement agencies work with the major sporting event organisers to publish guidance on legal procedures for importing large quantities of drugs for therapeutic use.

#### 4.1.4 Sports team pharmacists

Employment of sports pharmacists by sports teams is becoming more common as pharmaceutical care for athletes becomes increasingly complex. In this setting, sports pharmacists often also address the topic of dietary supplements and health optimisation. Pharmacists may otherwise teach with or work with athletic trainers to indirectly serve a role on a sports team.

When visiting the site of training or events, circumstances may arise that warrant drug education. Matthew DellaVecchia provides a case report that illustrates clinical interventions to prevent inadvertent doping. Additionally, counselling on appropriate medicines use also protects the health of athletes. In this case, a student pharmacist's keen awareness of medicines use by athletes, is described (see Section 8.2.1 — What's in MY inhaler? What's in YOUR inhaler?):

*“Student-athletes on a women’s collegiate soccer team were reportedly leaving inhalers on the side-line/benches during practices and workouts. Occasionally, when an athlete required relief from exercise-induced asthma but did not bring their own inhaler to the practice or workout, they would utilise the inhaler brought by a teammate. While seeming to be a convenient solution to the problem, there are the following concerns:*

1. *Sharing prescription medication is prohibited*
2. *Inhalers can contain a multitude of pharmaceutical ingredients with a variety of mechanisms of action. Using the inhaler of a teammate does not guarantee that the athlete is receiving the same medication prescribed to them by their healthcare provider. Common inhalers include either:*
  - a. *short acting beta2-agonist (e.g., salbutamol) to facilitate bronchodilation for patients with asthma, or*
  - b. *glucocorticoids (e.g., budesonide) to aid with inflammation associated with asthma; both chemical compound categories can be found on the National Collegiate Athletic Association (NCAA) banned substance list.*
3. *Most, if not all, medicines can receive NCAA medical use exception if applied for; however, should an athlete inadvertently ingest a medicine that is not prescribed to them, there is the potential to: not receive the necessary therapy, which could exacerbate their respiratory distress and*
4. *Be in violation of NCAA policy for having a banned substance in their system with no therapeutic use exemption.”*

In one unique example, an Esports pharmacist led a team of Esports athletes in the role of a coach before appreciating his role as their team pharmacist. Over time, this pharmacist recognised the drug information and self-treatment advice the team appreciated hearing from him was also a novel opportunity for other pharmacists.

#### 4.1.5 Sports pharmacists involvement in emergency medical services

The health and longevity of an athlete is paramount, as is treating them as a whole person with medical need, saving life and longevity. Protocols establish treatment approaches to ensure patient-athletes receive optimal medical care with the awareness of the status for every treatment, including drug of choice, route of administration and dose. Emergency care kit lists of example medicines from organisations introduce pharmacists to drugs used on the playing field as part of events.<sup>42</sup>

In an emergency scenario, the immediate health of an athlete must prevail, and no drug should be withheld based on status in sport when needed for life-saving or essential urgent care. However, if a prohibited medicine is administered during the emergency, a retroactive TUE application must be submitted. Pharmacists assist by reviewing protocols and taking part in the planning process and ensuring medicines access.



#### 4.1.6 Sports pharmacists in hospital and orthopaedic perioperative care

The health of a patient-athlete must be the primary focus for acute illness or injuries. Sports pharmacists balance the focus of medicines use or methods of treatment for returning an athlete to health and return to play. Hospitals often provide treatment modalities that are prohibited in sport but commonly administered to inpatients. If a hospital is not designated to care for athletes, a pharmacist with awareness of sports pharmacy could help avoid inadvertent doping. Pharmacists' oversight of drug and blood products or cell/tissue products varies significantly based on local regulation and practice. Competitive athletes are held accountable for any substance detected in their doping control sample, and the sample can be stored and tested for up to 10 years after the sample is provided. An astute sports pharmacist would evaluate the status in sport of the products containing drugs, body fluids, cell, tissue, placental, hormone or genetic therapies.

General hospital pharmacists may already assist in pre-surgical planning for gathering a full list of medicines and supplements used by the surgical candidate, then consult with the surgeon and primary care provider for stopping chronic medication for surgery. Sports pharmacists working with an orthopaedic surgical team would do the same tasks.<sup>43</sup> Medication assessment by the astute sports pharmacist may lead to interventions offering a therapeutic-equivalent that is safer for the patient-athlete. When a drug of choice or combination of medicines carries a higher risk of damage to muscle, tendons and connective tissue, experienced sports pharmacists assess for potential detrimental short-term or long-term effects within the clinical context for the athlete and any potential return to play during or after medicines use. Knowledge on documentation and application for necessary clinical use of a prohibited medication also aids the medical team, to ease the TUE process.

When athletes find themselves planning for an elective procedure or following a sports injury requiring surgical intervention, pharmacists in general practice may be involved in developing pain medication protocols that include review of interactions with all other medicines and dietary supplements, and a return-to-training plan where the medicine used is prohibited. JADA sports pharmacists in acute surgical care and hospital settings may provide specialised care for athletes.<sup>44</sup> Discussing the medicines from a sports pharmacy perspective for each step of the surgical process may help the medical team and athlete recognise the importance of the drug planning and planning return to play with a medicines use plan.

## 5 Pharmacy services at sporting events

Contribution to sport by pharmacists may be most evident and substantial as pharmacy services provided for major sporting events. Pharmacists working within sporting events oversee the safe and effective use of medicines, utilising their expertise of drug regulation, drug management and pharmacotherapy. Sports pharmacy expertise is an essential component in planning and successfully executing major sporting events, including each Olympic and Paralympic Games, FINA World Masters, and FIFA World Cup events.<sup>45-47</sup> Sports pharmacists consult on international coordination of pharmacy systems, protocol/policy development, and every detail necessary to facilitate best pharmacy practices for the event.

While this section of the sports pharmacy report details sports pharmacists' involvement at international sporting events and direct patient-athlete care at a polyclinic, it encourages pharmacists to gain experience through local sporting activities and competitive sporting events. At the annual International Sports Pharmacy Symposium of 2022, registered attendees heard several accounts of pharmacists that gain valuable experience through volunteering at local sporting events. Local sporting events may be a starting point for pharmacists to experience sports pharmacy.

Elite athletes strive to be selected for major international sporting events as the pinnacle of their sporting careers. Likewise, sports pharmacists train and prepare for volunteering at major sporting events as if that will be the height of their professional careers.

### 5.1 Major international games and sporting events

#### 5.1.1 Pre-event organisation of pharmacy service

Pharmacy services for international games are a complex and integral part of delivering these huge events. The design and planning of medical and pharmacy services is undertaken many years prior to the games and involves creating new facilities and coordinating local and national healthcare services across the host country. These events present unique professional challenges for healthcare professionals, requiring specialist attention to the safe and effective use of drugs in sport, anti-doping issues and the specific requirements of specialised sports medicine for elite athletes. Games pharmacy services are at the forefront of promoting safe and effective medicines use in sport and have a key role in the education of athletes and other healthcare professionals in preventing doping in sport.

Decades of consistent involvement by dedicated sports pharmacists who assist in planning and oversight for medication management at major sporting events ensures the continuum of premium pharmacy services. Pharmacy intelligence gained and lessons learned from previous events is shared among the sports pharmacist community and helps to inform the training that is delivered locally to the pharmacists working for each upcoming sporting event.

#### 5.1.2 Governance and policies

Medication management standards and requirements are often stipulated by games governing organisations such as the International Olympic Committee. Comprehensive policies and standard operating procedures are required at international games around the use and management of medicines, with a particular focus on use within regulations of the World Anti-Doping Code. These standards ensure a safe and standardised approach to medicines management by all members of the medical and pharmacy team and ensure the drug management complies with drug laws of the host country.

There are very tight procedures, and a specific Olympic and Paralympic prescription form requiring multiple checks before a banned drug is dispensed to ensure that the athletes do not inadvertently take a banned substance without the necessary TUEs in place. Strict protocols for dispensing prohibited drugs are in place to ensure that drugs issued to athletes comply with WADA regulations.

Examples of other operating procedures include medicines storage and handling, drug dispensing and specific needle-use policies applicable to the event (such as the IOC Needle Policy). As in any pharmacy setting, drug and clinical data are meticulously collected at the time of dispensing and in the medicine procurement process.

### 5.1.3 Prescribing and dispensing

A drug formulary from which a physician may dispense is developed using evidence-based medicines data and taking into consideration access to government-approved medicines for a host city. In 2019, the first Olympic and Paralympic Model Formulary was published by the IOC, in collaboration with the International Paralympic Committee (IPC). This model formulary represents the essential list of medicines, and international standard for medicines provision at all Olympic and Paralympic Games. It presents a set of around 300 medicines mandated by the IOC and IPC to be available through the polyclinic medical services and all competition and non-competition venues. Such guidelines exist to avoid inadvertent doping while providing a rational selection of medicines for clinicians to provide high quality care. The focus of medical treatment at international games is to provide care for newly acquired injuries or disease rather than treating or diagnosing existing conditions. This is reflected in the list of drugs available for prescribing in the polyclinic. The range of medicines stocked in the pharmacy needs to reflect those known and used by the global medical community as well as those frequently used in the host country.

The WADC holds athletes strictly liable for detection of prohibited substances in their samples or suspicion within an ABP; thereby, all healthcare professionals need to support individual athletes in navigating medicines use rules. For a minority of athletes, the deliberate use of prohibited substances or methods is perceived as a shortcut to improve performance. However, there have been many cases in which the use of a prohibited substance by an athlete has been inadvertent, also resulting in firm penalties. At major games, sports pharmacists meticulously review every drug-related detail to deliver accurate advice and evidence-based clinical recommendations. Clearly, any pharmacists recommending or dispensing prescriptions, self-care medicines or nutritional supplements to athletes during a competition require high-quality education and training to fulfil this role effectively.

At major sporting events such as the Olympic Games, sports pharmacists need to have access to international medicines information publications to be able to provide accurate information to athletes from various countries around the world. One example of concern to sports pharmacists would be a brand name cough and cold product containing decongestant tablets that contain pseudoephedrine, which is a prohibited substance at certain doses, but is formulated in other countries with phenylephrine, which is not a prohibited substance.

Planning for events in unique environments and different seasons requires anticipating medical complications that may arise, such as altitude sickness or frostbite at winter events or heat exhaustion during the summer. Drugs supplied for winter versus summer games may differ considerably. The medical services must consider having access to drugs for conditions that may not necessarily be endemic or common in the host country, and pharmacists in the international games setting should be prepared for such interventions. For example, at the 1996 Atlanta Olympic Games, eight cases of malaria were reported, which is not a common presentation usually encountered in this region.

### 5.1.4 Host city pharmacy organisations and community

In delivering major games, local and national pharmacy organisations often work together to distribute information for community and hospital pharmacies to raise awareness of drugs in sport and anti-doping issues relevant to pharmacists. Over the 10 years prior to Tokyo 2020 Olympic and Paralympic Games, JADA and JAPhA partnered to create an accreditation for pharmacists, providing anti-doping education to certify each sports pharmacist through the “Play true” programme (described in Chapter 2 — Sports pharmacy qualification and education). Additionally, JADA developed a public awareness campaign on drugs in sport and anti-doping aimed to educate school age citizens and the wider community about the health risks of doping in sport and the spirit of fair play.

### 5.1.5 Pharmacy workforce vetting and training

Serving as a sports pharmacist at an international sporting event can be a highly competitive process and often hundreds of pharmacists apply for a small number of volunteer positions. The provision of games medical services requires pharmacy volunteers to have knowledge and skills in a variety of areas beyond normal professional duties, particularly with respect to the provision of medicines to athletes, including knowledge of prohibited drugs and the pharmacology of specific drugs used routinely in sports medicine. Intensive and specialist training on drugs in sport is provided for all doctors, pharmacists and other healthcare professionals working in the games environment, which usually occurs the year before the start of the games.

Workforce vetting, selection, and training could draw parallels with the team selection and training of athletes. While recruitment is relatively broad, the final group is selected based on experience that can be applied in the sports setting. Recruitment of a pharmacy workforce usually begins one or two years in advance, during the planning and organising stage of the games. While the Chinese government required pharmaceutical manufacturers to label any product containing stimulants with the warning “Caution athletes” in preparation for hosting the 2008 Olympics, most countries have not taken such steps to clearly label prohibited substances. Workforce training in advance of the games is best practice.

Pharmacists volunteering as part of the Olympic and Paralympic Games complete compulsory training modules. Advanced training in performing basic physical assessment for a sport injury or sports-related illness, coupled with enhanced knowledge of self-medication options appropriate for athletes, bolster pharmacist competence as a valuable volunteer at events. At the time of writing this report, with the exception of the Olympic Games, credentials for sports pharmacists are not yet harmonised for all sporting events, leaving event organisers to determine the desired qualifications and training. For the Olympic and Paralympic Games, a description of the volunteer role is provided by the IOC, which includes the role of pharmacists when working at the Olympics or Paralympics.

As part of the interview process, pharmacy volunteers, most often local pharmacists, begin by confirming that they meet host country requirements for licensing with a registration in good standing. They may then be asked to undergo an interview process to assess their knowledge and skill applicable to the sports setting. Pharmacists ultimately make up a small portion of the medical volunteers at the Olympic and Paralympic Games. Table 7 shows the numbers of pharmacists at a few Olympic and Paralympic Games.

Table 7 — Comparison of the numbers of pharmacy volunteers with total medical volunteers

Olympic and Paralympic Games	Year	Approximate or actual total medical volunteers at major event	Estimated number of pharmacy volunteers
Tokyo	2021	Not available	37
PyeongChang	2018	2,128	17
London	2012	4,500	100
Sydney	2000	4,500	Not available
Atlanta	1996	400 specialist doctors, 400 nurses, and 400 physiotherapists	Not available

Organisers additionally identify designated hospitals and may also designate local pharmacies as preferred locations for athletes and their entourages.<sup>42, 48</sup> Pharmacies designated for partnership with major games may initiate additional training for existing staff to ensure they are aware of the anti-doping and clinical issues relevant to athletes they may care for during the event.

### 5.1.6 Medical workforce training requirements

Specialised training, beyond the foundational knowledge of pharmaceutical care, must be acquired prior to arrival at a sporting event. This is done for the safety and health of the athletes and to meet the expectations of the wider medical team operating at the event. Healthcare professionals must be familiar with the WADA List of Prohibited Substances and Methods, and the regulations for the provision of drugs that are subject to certain restrictions, such as being only prohibited in certain sports or at specified doses. To advise athletes appropriately, ASP must also be aware of medicines that require prior application and approval of a TUE before they are taken.

WADA launched the “Sports physician toolkit” in 2016 to improve physicians and other healthcare professionals’ readiness for the Rio 2016 Olympic Games, particularly around issues of drugs in sport. Since then, completion of modules created for specific games have been compulsory for all team physicians at the Olympic Games. Topics covered in this training, which pharmacists must understand as well to provide pharmacy services, include:

- Identifying drugs and methods prohibited in sport;
- Applying for TUEs in the Olympic environment;
- Steps to prescribe prohibited drugs for therapeutic use at the games;
- The IOC Needle Policy and needle use compliance; and
- Understanding the process for importing medicines to the games host country for their own team use.

## 5.2 Pharmacy services at major sporting events

### 5.2.1 Pharmacists in polyclinics

Many pharmacists volunteering at major sporting events will work within a polyclinic setting and have direct interaction with athletes and the athlete support team. These polyclinics offer acute and urgent care for walk-up visits or wellness checks. A polyclinic is essentially a self-contained comprehensive primary healthcare facility that offers free services for the entire duration of the event. The polyclinic provides a full spectrum of interdisciplinary care across all medical disciplines, including pharmacy.

Polyclinic pharmacies operate in a similar style to a hospital outpatient dispensary; they are also the coordinating point of medicines supply for the athlete and spectator medical facilities across all venues, and other clinical departments of the polyclinic such as dentistry, ophthalmology or the emergency department.<sup>49</sup> Each Olympic Village has a pharmacy stocked with medicines from the formulary to meet the medicines requirements of athletes, team officials, and the residents of the athlete villages.

At some games, including the London 2012 Olympic and Paralympic Games, pharmacists in the polyclinic may also offer professional consultation services for non-athletes presenting with minor conditions. A limited selection of over-the-counter medicines for a range of minor conditions can be recommended and dispensed by pharmacists to named and accredited individuals. The patient may be referred by the pharmacist to a specialist doctor or other appropriate healthcare professional if necessary.

At Olympic Games, medical services open when athletes begin arriving in the Athletes’ Village about two weeks before the games and remain open until a few days after the closing ceremony. Drug usage commonly peaks just before the opening ceremony and continues until the end of the first week of competition. After this time there is typically a gradual decline in dispensed prescriptions until the closing ceremony, then a dramatic drop in drug usage occurs as the athletes start to leave the village.

### 5.2.2 Drug use evaluations to improve services

Sports pharmacists planning future events assess medicines usage from previous games to predict the quantity and type of drugs needed. Pharmacists dispense a huge volume of prescriptions at the Olympic Games. For example, during the PyeongChang 2018 Winter Olympic and Paralympic Games, 5,313 prescriptions were dispensed. During the London 2012 Olympic and Paralympic Games, a total of 5,200 prescriptions were dispensed through the three polyclinic pharmacies.

To illustrate the most prescribed drugs in the games setting, Table 8 lists the most frequently prescribed drugs, shown as a percentage of total prescriptions for London 2012. Sports pharmacists analyse such data closely with each organising committee of Olympic and Paralympic Games to assess the drug requirements for the next edition of the games.

Table 8 — Drug dispensing rates at the Olympic Games in London, 2012

Name of drug dispensed (London 2012)	Percentage of total prescriptions
<b>Analgesics/anti-inflammatories</b>	
Paracetamol 500mg tablet	10.95%
Diclofenac sodium 50mg gastro-resistant tablet	3.17%
Diclofenac 1% transdermal gel	1.44%
Diclofenac sodium 75mg modified-release tablet	1.37%
Ibuprofen 400mg tablet	3.89%
Ibuprofen 200mg tablet	2.30%
Hydrocortisone 1% topical cream	1.90%
<b>Allergy/antihistamines</b>	
Cetirizine 10mg tablet	1.75%
Loratadine 10mg tablet	1.73%
Xylometazoline 0.1% nasal spray	1.85%
<b>Antibiotics</b>	
Amoxicillin 500mg capsule	2.09%
Amoxicillin 250mg capsule	1.87%
<b>Other</b>	
Antiseptic throat lozenges (benzocaine?)	2.30%
Omeprazole 20mg gastro-resistant capsule	1.51%

## 5.3 Pharmacists at local sporting events

Gaining volunteer experience with local sporting events builds confidence in providing care to athletes.<sup>50</sup> Consistently volunteering at local sporting events may provide an environment for maintenance and development of clinical skills, best practices and use of anti-doping concepts. Local events, such as youth sports, marathons or races, provide an opportunity to serve the community and share key messages about safe and effective medicines use in sport. Sports pharmacists may support emergency medical services in the selection and management of medicines at an event or may have other roles assigned, such as the provision of rehydration stations, or set up self-medication kiosks for the competitors and provide treatments for minor ailments that may present. As with most sporting event medical services, the pharmacist coordinates with the medical director for the event.

## 6 What is the future of sports pharmacy?

This report provides the framework to identify learning outcomes and competencies development in pharmacy undergraduate education and describe characteristics for the provision of sports pharmacy specialty education and training. Additionally, the aim is to designate sports pharmacy as a specialty practice. Pharmacists may have worked in sports and with athletes for as long as drugs, herbs and substances have been used to improve human mechanics and physiology, and the contemporary pharmacy profession has the opportunity to harness that knowledge. The evolution of the pharmacy profession must keep pace with the changing environment of medicines within the context of sport to assist in preserving athlete health and to avoid inadvertent or intentional doping. Sports opportunities definitively exist for pharmacists seeking career advancement to become qualified as sports pharmacists. Even though stakeholders in sport recognise the usefulness of qualified sports pharmacists, limited countries specify registration to prove qualifications or to register recognised sports pharmacists, with Japan providing the most substantial example and Turkey rapidly developing exemplary educational models. In regions of the world where credentialing is still developing, evidence of education and demonstration of skills are preferred and strongly recommended by experts before calling oneself a specialist in sports pharmacy. The credentialing of sports pharmacists internationally still lies ahead. Alignment with professional standards of other healthcare professionals in exercise medicine and sports medicine help establish a globally recognised system of accreditation standards in sports pharmacy.

Sports pharmacists are characterised by their commitment to uphold the health of athletes and fairness in sport, their dedication to remain current on evidence-based recommendations for health in sport and the anti-doping movement, which will optimise safe and effective use of medicines. This dedication distinguishes sports pharmacists from pharmacists with general awareness of exercise, athletic competition and doping control.

To advance pharmacy expertise, this FIP global report on sports pharmacy calls for the acknowledgement of sports pharmacy as a professional specialty, while drawing attention to the need for:

- Sports Pharmacy curricula, which would require:
  - awareness of safe and effective use of medicines in sport
  - appreciation of the impact of medicines use by athletes and anti-doping regulations
  - ability to apply pharmaceutical quality and regulatory principles to sports pharmacy;
- Standardised credentials that distinguish qualified sports pharmacists; and
- Successful models of sports pharmacy professional practices.

As with any developing therapeutic discipline, future research and conferences would benefit sports pharmacy development to secure its place as a specialty. The value of sports pharmacists based on anecdotal evidence may motivate the profession. Further research topics may be extrapolated from research that shows pharmacists' positive impact on patients or public health to place pharmacy services within the scope of athletes' health and supporting the sports medical team. For pharmacists currently in practice and student pharmacists inspired by athletes and the spirit of sport, sports pharmacy experts call for more awareness and participation within the profession to drive this specialty forward.

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## 8 Case reports in sports pharmacy

To fully explore the ways in which pharmacists currently work within sports or with athletes, FIP sent out a call to all members on 30 March 2022 requesting submission of case examples of education and practices in sports pharmacy. The cases were then divided into operational case studies (Table 9) and clinical case studies (Table 10). In this call, the requirements for expertise in sports pharmacy could be met by demonstrating a depth of experience within one or more of the following areas:

- Working in a professional clinical setting with athletes;
- Working at sporting events in the capacity of a pharmacy or anti-doping role;
- Working in the fields of anti-doping, testing, laboratory work or athlete education;
- Working with a national sports organisation or anti-doping organisation and contributing to issues on drugs in sport; or
- Working in a clinical field related to sports medicine or sports injury.

We received submissions that did not meet criteria for inclusion but offered insight into sports pharmacy research to directly assess pharmacists' anti-doping knowledge, and these data are currently under peer review for publication. We also received personal statements from student pharmacists who attended elective courses in sports pharmacy. These did not meet inclusion criteria for the case studies but were considered in the development of this report.

After a review of each submission, the cases in Tables 9 and 10 were selected as they highlight the rapid growth in this specialty over the past decade and include examples which illustrate the successful implementation of courses in sports pharmacy and the growing demand for sports pharmacy services.

Table 9 — Case reports demonstrating operational success in sports pharmacy

Author	Title of the operational case study	Country
Alexander Lui	The introduction of Global DRO at ASADA	Australia
Alexander Lui	Athlete Biological Passport: A valuable addition to intelligence gathering	Australia
Carmen Oltmann	Sports pharmacy elective course for pharmacy students	South Africa
Shigeo Yamamura	Roles and activities of the sports pharmacist in Japan	Japan
Dixon Thomas, Sherief Khalifa	GMU-UAE NADA collaboration in drugs in sport education and research	UAE

Table 10 — Clinical case studies demonstrating sports pharmacy via a direct involvement of the care of athletes or providing drug information directly to athletes

Author	Title of the clinical case study	Country
Matthew J. DellaVecchia	What's in <i>MY</i> inhaler? What's in <i>YOUR</i> inhaler?	USA
Shigeo Yamamura	Enquiries to sports pharmacists in Japan	Japan

## 8.1 Operational case studies

### 8.1.1 The introduction of Global DRO at ASADA

By Alexander Lui

#### Abstract

When the Australian Sports Anti-Doping Authority (ASADA) medicines database was outdated and in need of improvements, ASADA pharmacists played a key role in identifying and implementing a newer system. The drug database source information required close review by pharmacists who could identify current drugs on the market, as well as prohibited substances.

The introduction of the Global Drug Reference Online (DRO) platform for ASADA offered a comprehensive public platform that was easier to navigate for both ASADA staff and for athletes checking the status of medicines according to the WADA Prohibited List. The partnership combined resources of anti-doping authorities around the world already using Global DRO, including those in the US, Canada, the UK and Japan.

The role of the pharmacist in the introduction and maintenance of Global DRO was critical. To preserve the integrity of the data, secured access allowed only approved staff to make amendments to the drug database or the website layout. Pharmacists were authorised to interpret the drug information based on WADA rules. A triple-check system including verification by at least two practising pharmacists prior to the go-live. As a pharmacist involved in the conversion and launch of a new drug database for ASADA, I ensured that only medicines currently on the Australian market were included in the database and correctly classified according to the WADA Prohibited List.

#### Introduction

Many anti-doping authorities around the world provide their athletes with drug information related to the WADA Prohibited List, outlining what can be used in sport, both in competition and out of competition. WADA updates this list annually to include examples of common prescription medicines and over-the-counter drugs.

Global DRO was originally launched in 2009 as a partnership between the United States, United Kingdom, and Canadian anti-doping authorities. Global DRO allows athletes to check the status in sport before taking a medicine, confirming compliance against the WADA Prohibited List. This international drug database structure requires input of data specific to the local jurisdiction, such as brand names or ingredients preferred for use locally, some of which are not approved as medicines in other countries.

Anti-doping authorities used experienced Global DRO pharmacists and local staff pharmacists in a multi-step process to confirm data sourcing, review drug ingredients and check accuracy of drug formulation as they link ingredients that display the status of medicines in sport. Modifications were uncommon (less than 10%) but were crucial to drugs in sport accuracy, making the use of pharmacists vital to spotting important details.

Global DRO includes all known prohibited substances, as listed as examples on the WADA Prohibited List or as discovered throughout the years by any anti-doping authority that verifies the prohibited status with WADA. As a pharmacist involved with the country launch of Global DRO and drug database maintenance, researching unfamiliar substances was part of my reviewing of ingredients for addition to the database. At times these included ingredients not approved for use by the Therapeutic Goods Administration and prohibited for use in sport.

ASADA set a four-to-six-week implementation timeline for at least two pharmacists to complete the Australian drug market database review. The pre-existing Global DRO database consists of over 5,000 ingredients, including medicines and prohibited substances that have no approved clinical uses. ASADA pharmacists initially reviewed the database to determine drug availability in Australia while also confirming these existing ingredients were correctly classified against the WADA Prohibited List, adding another layer of drug database validation by pharmacists. Given the number of medicines for review, processing the full database took about 80 hours between two local pharmacists, along with the additional hours contributed by the Canadian Centre

of Ethics in Sport, the United States, and United Kingdom Global DRO pharmacist and staff who reviewed ingredient changes in a subsequent two-step authorisation process.

A pique of interest while introducing Global DRO to ASADA was learning elements of drug inclusion and exclusion for Global DRO based on the policies written by Global DRO pharmacists. For me as a pharmacist, reviewing individual details of drugs to determine the status in sport proved to be an educational experience and useful in training various staff. ASADA staff used this deeper understanding of drug evaluation to update educational material and stay up to date with the trends for medicines of doping interest.

### **Case presentation**

At the time of introducing Global DRO, the associated anti-doping authorities required a team of existing Global DRO pharmacists to work with a local pharmacist and local anti-doping authorities to review the drug database. The Australian drug data was compared to existing drug data in the system, discrepancies were resolved by pharmacists and new drug data were incorporated into the system. The multistep process was required to ensure accuracy, for example, the Australian pharmacist reviewed data input based on the local market and drug status in sport; then, one or more Global DRO pharmacists reviewed data for correct formatting and drug status in sport; and finally, a designated ASADA staff member confirmed the information before publishing online.

Drug data review required pharmacist awareness of drug categories and formulations. Excluded from the data were drug devices and hygiene products, which pharmacists would recognise and remove. Dietary supplements and nutritional products without government-approved therapeutic indications were not included in the database unless they were specifically prohibited by WADA. This was an additional lesson learned by the local pharmacists about the risks to athletes of complementary medicines in the forms of dietary supplements or herbs.

Drug review for the upload took dedicated pharmacist time of about five business days and with coordinating international schedules, completing the 5,000 drug product review and integration was done within a six-week window. Rapid throughput completed by pharmacists trained for anti-doping meant the authority was able to roll out the new platform earlier than anticipated and return full attention to its normal work tasks.

Based on Global DRO searches, targeted messaging of the most commonly searched medicines could be displayed on the website landing page. ASADA pharmacists also customised educational messages for athletes about common medicines searches on Global DRO, to clarify appropriate clinical use of the medicines based on the status in sport. Development was triggered for further education and online resources for athletes and their support staff about the use of any complementary medicines or substances that have questionable quality and lack government-approved uses.

After the successful rollout and introduction of Global Dro, periodic updates of drug market data were reviewed and processed through similar multi-step verification. Maintenance updates were much smaller, reflecting drug changes on the market to modify the Global DRO drug database. With direct pharmacist access to database management, drugs could also be rapidly edited for display in the Global DRO search engine. A triple-check system was always used to ensure updates were consistent in format and included accurate drug information.

### **Outcomes**

The introduction of Global Dro at ASADA meant a quality online service was provided for athletes to check their substances against the WADA Prohibited List. This change decommissioned the old ASADA platform, which was outdated and challenging to navigate for athletes and internal staff that managed the database. It was positively received as it also allowed ASADA to introduce specific targeted messaging on substances of interest to augment educational opportunities with athletes as they searched for the status of their medicines. When a search has no results, the message indicates this to the user and may direct them to other ASADA information on drugs in sport or a how to contact the anti-doping authority.

### **Discussion**

One important element identified before ASADA selected a new platform was the level of confidence an Australian-based athlete would have searching for a medicine purchased from another country. The first step

for an athlete to use Global DRO is to select the flag representing the nation from which the medicine has been purchased. Pharmacists and anti-doping authorities, who are most familiar with the country drug data, provide and maintain the national drug details. By selecting the nation of purchase, the athlete narrows search results to display only that country's products. Global DRO results allows the athlete a higher level of confidence in the result when the exact match of a brand name or medicine label is found within the database, clearly displaying the status in sport.

Another concern pharmacists raised was accuracy of the drug information in the database for the current Australian market and how the system would interpret the WADA Prohibited List. Because Global DRO is a multi-national platform sharing technology and knowledge across several anti-doping authorities, Global DRO pharmacists have assigned tiers for ingredient review and approval that improve data integrity. Because Global DRO database managers collaborate, meet virtually, and discuss the status of medicines or ideas to improve the platform, they draw on experience in their local countries to clearly interpret the information. The collaboration strengthens doping status interpretation, improving consistency for athletes when the status of ingredients is agreed upon and verified by numerous anti-doping authorities.

As a pharmacist playing a major role in selection and implementation of the drugs in sport search platform for Australia, the experience of dedicating time to evaluating thousands of drugs in detail to determine the status in sport, was an opportunity to excel in anti-doping expertise and then share my knowledge within the anti-doping authority. The international collaboration also provided the opportunity to learn from experienced anti-doping pharmacists.

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## 8.1.2 A valuable addition to intelligence gathering: The Athlete Biological Passport

By Alexander Lui

### Abstract

In this ever-evolving world of competitive sport, athletes who choose to enhance their performance are becoming more educated in how they use medicine, science and methods to evade detection. Intelligence also indicates athletes micro-dose performance-enhancing substances, making detection even harder. The Athlete Biological Passport (ABP) is a portfolio of laboratory results for an individual athlete. These biological markers from one individual athlete are tracked over a series of samples. ABP can be a valuable tool in establishing if the associated athlete is suspected of performance enhancement.

When laboratory results of an individual's ABP are viewed within anti-doping context, it is used as an anti-doping tool. Interpreting the scale, scope and duration of drug biological effects beyond basic pharmacokinetics requires pharmacology knowledge. Reviewing consecutive samples that create an individual athlete's ABP, the results may show indicators presumptive of doping. This tool may be used as part of intelligence gathering to narrow the target for anti-doping testing, which could increase probability of detection.

Where gaps are present in the ABP, anti-doping organisations may share information to collaborate across science and with a results management team to fill in gaps. Interagency strategic information sharing aids the anti-doping movement. Having pharmacist involvement to interpret physiopharmacological results supports clean and fair competition.

### Introduction

Performance enhancement in sport has been a long-standing concern for sporting events, organisations and clean competitors around the world. As competitions become more competitive with bigger incentives to win,

some competitors resort to illegal methods to enhance their performance, attempting to gain a competitive edge and win at all costs. Illegal methods in this area may include:

- Blood doping;
- Substance doping, where a competitor will take a medicine (prohibited substance) which will enhance their performance (e.g., diuretics, beta blockers, opioids or pseudoephedrine); and
- Micro doping, where a competitor takes smaller amounts of medicines, to mimic physiological patterns or small amounts that still give the competitive edge but avoid detection.

Anti-doping authorities around the world have analysed blood and urine samples for years to identify doping. Where results are positive, the sample would show the presence of a prohibited substance or metabolite according to the WADA Prohibited List. The use of science confirms that when a substance is undetectable, the sample would still provide a competitor's physiological profile at that certain point in time. This becomes part of a series, used in trending results that may indicate a possible suspicion of doping without triggering further investigations at that time. Competitors intentionally cheating through doping frequently understand the pharmacokinetics of the medicine they use and ensure the substance is out of the body by the time a doping control officer is likely to present and request for a sample to be collected. This could reduce the probability of their sample returning a positive result, yet it provides pharmacodynamic effect of the substance. Though the drug may be undetectable, the sample will still provide clues as it assists in building the ABP for that particular athlete.

Anti-doping authorities may use the ABP as a complementary tool in addition to drug detection samples. ABP laboratory results may be presumptive towards doping or show parameters dictating the need for further testing. Detection of a substance is also considered. When infrared mass spectrometry is used as a next step, if a substance is detected or a raised parameter indicates suspicion in the result, pharmacy knowledge helps provide information on possible substance and origin. The origin may be synthetic or biological. Certain indicators require further investigation to establish a doping case, which may include additional sample testing.

For a pharmacist assessing ABPs, understanding the athlete and the sport in which they compete allows a better understanding of the possible ways any WADA prohibited substances may be used. In the ever-evolving world of anti-doping, athletes who choose to take prohibited substances or use prohibited methods try to take advantage of pharmacokinetic tactics in an attempt to evade detection. For a pharmacist, establishing the link between a suspicious profile and the suspected substance (or method) is critically important to enable efficient and effective use of the ABP as an anti-doping tool.

Further educating anti-doping authorities around the world to understand the ABP allows these authorities to use this tool more efficiently. Rather than use the ABP as a retrospective tool, during my tenure with the Australian Sports Anti-Doping Authority (ASADA), the ABP was used as part of intelligence gathering to narrow which athlete profiles indicated the probability of doping. The pharmacist may play a critical part in interpreting drug effects on physiology and fulfilling the purpose of the ABP to gather antidoping intelligence. As a pharmacist, demonstrating the value of the ABP by identifying critical points in the results laid the foundation to amplify the proactive, meaningful use of ABP.

### **Case presentation**

During my tenure with ASADA, I assessed and progressed several ABPs associated with individuals that could be labelled as suspicious or extremely suspicious for doping. My assessments may find high suspicion for performance enhancement if a profile skews towards doping and peaks just before a competition. This assessment takes into consideration other forms of intelligence gathering, including but not limited to tracking location changes in altitude or climate affecting an individual's systemic hydration. After gathering intelligence to produce an athlete profile, a testing regimen is designed to provide evidence towards doping or show instead natural human cycles or, much less commonly, a potential idiopathic dyscrasia. Not knowing what the suspected substance was made it even more exciting from the forensic pharmacy perspective. The value of having a pharmacist investigate the ABP is the skill to narrow the possible medicines to a few prohibited substances which could modify the biological profile.



When a testing plan I proposed on a highly suspicious case was discussed and approved, the authority provided the resources and assistance to successfully execute it. Full support of ASADA staff with assistance of the operations team ensured the testing remained on schedule. International coordination and cooperation among WADA testing laboratories allowed us to fast-track analyses for quick results and progression to the next step in the plan.

If the ABP remained highly suspicious, we requested analysis by the international federation associated with the athlete involved. If that federation agrees with the suspicion, it will conduct confirmatory testing and handle the results management process. Even in a case where a profile does not yield detection of doping leading to a sanction, the use of a pharmacist in analysing the ABP data as a predictive tool for further investigation charts new territory against doping.

Working in collaboration with international partners to obtain additional information reinforced the potential of this tool. Pharmacist expertise was employed to uncover enhanced use of the ABP by designing customised plans to demonstrate the likelihood of doping. Evidence from ABP profiles would not confirm suspicion of doping, but may be supportive or may help in ruling out doping.

### **Outcomes**

Pharmacy knowledge was employed to discover enhanced use of the ABP to demonstrate the likelihood of doping in some highly suspicious profiles.

Using a pharmacist to interpret drug influence of biological data was a systematic approach in use of the ABP as an anti-doping tool. Feedback from international partners was that a pharmacist interpreting drug influence of biological data improved the efficiency of the ABO as an anti-doping tool.

### **Discussion**

Use of the ABP as a predictive and retrospective indicator of doping required training to correctly evaluate the laboratory data. Anti-doping authorities have very large pools of athletes which they might consider for doping control using drug testing. While cursory review of ABP from a pool of athletes may indicate numerous suspicious profiles, clinical interpretation and forensic pharmacy may help eliminate unnecessary data collection and identify more valuable targets.

The pharmacist perspective on the use of the ABP allowed use for the intended purpose and expanded potential not recognised previously within the authority. Previously, the use of the ABP was only considered as a tool to use after a sample was obtained. With my assistance, education of the staff and highlighting how this tool can be used to demonstrate whether an athlete is doping through challenging methods of detection, this tool is now used as part of the intelligence gathering, proving to be a valuable addition to the authorities' abilities to detect whether an athlete is suspected of doping.

The anti-doping authority was supportive of the recommended testing schedule to put in place based on pharmacist knowledge. The testing panel and series could be considered to demonstrate the likelihood of doping which could support information gathered through other channels of investigation. The use of the ABP for this purpose was previously uncharted territory for the authority. Even if a recommended testing series did not lead to proof of doping, the authority recognised the ABP as a valuable addition to intelligence gathering as it could be used in reinforcing the suspicion of an athlete doping in the future.

## **8.1.3 Sports pharmacy elective course for pharmacy students**

**By Dr Carmen Oltmann**

### **Abstract**

Many people participate in exercise and sport at all levels. Participants may require advice, information and support about injuries, supplements, banned substances, doping and other health-related issues pertaining to sport. Pharmacists can offer these and other services to all athletes, regardless of their level of participation. Pharmacists can also be involved in offering pharmacy services before, during and after sporting events. To facilitate this practice, I developed the sports pharmacy elective in order to educate pharmacy students about the roles and impact they could have as practising pharmacists.

## Introduction

Based on my research and experience, pharmacists could play an important role in ensuring correct advice and information is provided to athletes. Pharmacy students in South Africa can choose in their final year an elective course introducing the roles and impact they could have as practising pharmacists. This case presents a “sports pharmacy” elective as part of the BPharm degree in South Africa, which is believed to be the first elective of this type in the country.

## Case presentation

Final year students in the BPharm programme in the faculty of pharmacy at Rhodes University may choose to do the sports pharmacy elective. At the end of this elective students will be able to:<sup>1-3</sup>

- Apply the principles of exercise physiology and exercise nutrition to athletes and sporting situations;
- Understand doping control and be able to advise athletes appropriately;
- Design appropriate and user-friendly information leaflets about doping for particular sporting codes;
- Provide correct and up-to-date individualised information to athletes about dietary matters, supplements, over the counter medicines, prescription medicines etc;
- Understand common sports injuries and be able to respond to them appropriately;
- Use their expertise in medicines selection and dosing to meet the unique needs of athletes for treatment and prevention of injuries and conditions; and
- Write a journal article.

I developed this elective in 2016. Since then, I continue to coordinate and facilitate the course. The course consists of lectures, student presentations, analyses of video clips, discussions of case studies, group work and the creation of information leaflets. Students also have to write a journal article which is assessed as part of the course.

Students are evaluated during and at the end of the elective, with the intent to provide graduates with some insight into their potential in the area of sports pharmacy. Feedback from students who completed the course has been positive. In 2016, the course development shared in a presentation called “Sports pharmacy elective” at the Pharmaceutical Society of South Africa Border and Eastern Districts Branch mini conference. Additionally, I also wrote a short article that was published in the *South African Pharmaceutical Journal* in 2018.

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## 8.1.4 Roles and activities of the sports pharmacist in Japan

By Shigeo Yamamura

### Abstract

There are sports pharmacists in Japan who provide athletes participating in sports events with correct knowledge about anti-doping and support them to ensure fair competition. A certified sports pharmacist in Japan is a pharmacist with knowledge of the latest anti-doping regulations. This case report introduces some anti-doping activities by certified sports pharmacists in Japan, namely, anti-doping activity with sports associations and anti-doping activity with Tokyo Gakugei University. The clinical case includes examples of typical enquiries about medicines and supplements sports pharmacists might address.

## Introduction

Anti-doping refers to various activities such as education, awareness-raising and testing to deter doping practices and to make sport competition viable and fair. There are pharmacists in Japan who provide athletes participating in sports events with the correct knowledge to avoid doping and support them to ensure fair competition. A certified sports pharmacist in Japan is a pharmacist with knowledge of the latest anti-doping regulations. The certification system began in 2009.<sup>1</sup> Pharmacists who want to be certified as a sports pharmacist must attend two types of courses: a basic course and a practical course (with content related to anti-doping), and then take an examination to confirm their level of knowledge. After completing a prescribed course and passing the test, pharmacists are certified as a sports pharmacist by the Japan Anti-Doping Agency. The qualification is valid for four years and must be renewed. The major roles of a JADA-trained sports pharmacist are to:

- Provide information on the proper use of medicines by athletes and anti-doping;
- Provide information on the use of medicines through anti-doping information in school education;
- Publicise the presence of sports pharmacists and anti-doping activities in the community; and
- Provide information and educational activities to prefectural athletic teams for national athletics meetings.

While some sports pharmacists are involved in international competitions, this report describes the actual activities of sports pharmacists in the local community within Japan.

## Case presentation

### *Anti-doping activities with associations*

Some Sports Pharmacists work together with sports associations: the Japan Lifesaving Association<sup>2</sup> and the Japan American Football Association.<sup>3</sup>

Major pharmacy activities with the associations are:

- Team support for anti-doping — As a member of the national team staff, the pharmacist checks for the presence of prohibited substances among players' medicines and supplements, maintains the players' medication history and explains to the players how to use the regular medicines they need so that they can prepare them individually.
- Education and enlightenment — Sports pharmacists provide education for athletes, doctors, nutritionists, trainers, supervisors, coaches and other support staff participating in national competitions. From a booth set up at sports event venues, pharmacists educate athletes, families, team staff and spectators about anti-doping. A search app (Dixpro) for prohibited doping substances has been developed and is operated free of charge.<sup>4</sup>
- Operation of doping testing in the competition — Sports pharmacists are involved in the management of doping control testing for domestic competitions.

### *Anti-doping activities with the university*

At the request of the university, sports pharmacists conducted outreach activities for doping awareness and prevention at a university-sponsored athletics event. Many participants including university, high school, and junior high school students attended this event. During the event, sports pharmacists educated participants on the importance of anti-doping and tested their knowledge using a quiz format. After the quiz and explanation of the answers, additional information about anti-doping rules was provided. At first, many high school and junior high school students thought it was irrelevant to them, but the pharmacists were able to convey the importance of anti-doping to athletes' conduct.

## Outcomes

Sports pharmacists working with sporting associations reported 500 cases of substance enquiries related to anti-doping in one year from 100 athletes. An electronic app for searching prohibited doping substances is useful to check whether prohibited substances are contained in commercially available medical products.

Recently, a number of high school and junior-high school students participated in international or national sports competitions and expressed the view that anti-doping education was irrelevant to them. Sports pharmacists' experience at the event indicates the need to begin anti-doping education from a young age.

## Discussion

Sports pharmacists in Japan routinely receive enquiries from athletes regarding doping substances. Enquiries are not only about drugs, but also about lifestyle, supplements and vaccinations.

The rules on doping have long been in place internationally. These rules are intended to protect the rights of athletes to compete in a fair and equitable environment, and to ensure the transparency and independence of the activities of anti-doping organisations and sports organisations themselves. These rules are applied not only to international competitions but to domestic ones too.

At anti-doping events, while sports pharmacists quizzed athletes, some event participants were unaware that the medicines they were taking were related to doping. Inexperienced athletes who are just beginning to compete have a higher potential for inadvertent doping based on their lack of knowledge that over-the-counter drugs and supplements may contain prohibited substances. To avoid this, it is important to inform young athletes and non-competitive athletes to seek advice from trained sports pharmacists.

Activities of sports pharmacists in Japan are widespread and include education, awareness-raising and testing to deter doping practices and make sportsmanship viable. These activities are becoming well known to athletes, but not yet to the general public. Doping is not only an individual athlete's problem, but also a social issue. It is necessary for the activities of sports pharmacists to be widely recognised to promote social acceptance and awareness of fair and doping-free competitions.

## Acknowledgement

I express thanks to the sports pharmacists who shared their practice experiences: Mr Hideyuki Okada, Sumire Pharmacy, director of Koga Pharmaceutical Association; Mr Kousuke Nishikiori, Japan Lifesaving Association; Ms Rikako Tsuizaki, Pfercos Pharmacy Hikari, director of Japan Wheelchair Curling Association; Ms Mayumi Kido, Neophist Academy, director of Japanese Association for Community Pharmacy. I am also grateful to the Japanese Association for Community Pharmacy (president, Yuko Yoshioka) for its assistance in compiling this report.

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## 8.1.5 GMU-UAE NADA collaboration in drugs in sport education and research

By Dixon Thomas and Sherief Khalifa

### Abstract

A Gulf Medical University (GMU) and United Arab Emirates National Anti-Doping Agency (UAE NADA) collaboration is mutually beneficial. For implementing the International Standard for Education as part of the World Anti-Doping Programme, the UAE NADA taught a few classes and conducted hands-on training for PharmD students at GMU. Future pharmacists have the potential to care for bodybuilders and athletes by preventing inadvertent doping and creating the right attitudes among people who care about performance enhancement. Interested students had the opportunity to join as chaperones with the UAE NADA. The collaboration of GMU and UAE NADA is instrumental in developing national capacity and advocacy with an educated and trained pharmacy workforce.

### Introduction

Many pharmacists were not taught about doping and anti-doping in their pharmacy education. Specialised training programmes are required for pharmacists to enable them to take care of athletes. Support of national policymakers, sports pharmacy experts and educators is required for building a sports pharmacy workforce.<sup>1</sup> Pharmacy students strongly desire to learn about the anti-doping and rational use of drugs among athletes.<sup>2</sup> Capitalising on these backgrounds, a “Drugs in sport” course was introduced to the PharmD curriculum at GMU.

It was the time when the UAE National Anti-doping Committee transformed into the National Anti-doping Agency in collaboration with GMU started.<sup>3</sup> The International Standard for Education (ISE) is part of WADA's World Anti-Doping Programme.<sup>4</sup> It is a mandatory standard that UAE NADA should implement. Educating future pharmacists is a kind of training-the-trainer opportunity as pharmacists provide care to people participating in competitive and non-competitive sports. For example, almost all pharmacists in the UAE encounter people seeking support in their gym training. In addition, nearly all pharmacies sell nutritional supplements for bodybuilders, and pharmacists are fully equipped to provide care to bodybuilders and athletes.

### Case presentation

It is always good to plan based on experience and existing evidence. Experience of introducing the “Drugs in sport” course at Qatar University<sup>2</sup> helped planning to introduce a similar course at GMU College of Pharmacy. UAE NADA is a strategic partner to give first-hand information on anti-doping efforts in the country. For effective running of the course, collaborations with UAE NADA and international experts were identified to add value. Sports pharmacy experts from the UK (Prof. David Mottram) and the USA (sports pharmacist Ashley Anderson) also contributed to teaching lectures to the students. Resources of UAE NADA were made available to students at GMU by bringing a mobile sample collection unit and properties and policies used for sample collection.<sup>5</sup>

Hands-on training with resources in the real world of anti-doping practice in the UAE was provided to GMU PharmD students as part of the “Drugs in sport” course.<sup>5</sup> All the teaching and training by UAE NADA was free of charge. In return, students volunteer to take part in training to become chaperones for UAE NADA. In addition, students and academics from the college of pharmacy jointly performed research with UAE NADA to create local knowledge on performance enhancement attitudes. Finally, a survey among students who completed the course was performed as an immediate evaluation of the effectiveness of the course.

### Outcomes

Students' satisfaction with the end-of-semester evaluation of the “Drugs in sport” course was 100% on all elements, including course organisation, course learning outcomes, hands-on training, assessment, resources for learning and course instructor feedback. Like in 2020, student satisfaction with the course was repeatedly 100% in all elements. In addition, the number of students electing to take the “Drugs in sport” course increased from 13 in 2020 to 22 in 2021.

The hands-on training in sampling techniques was received well by the students. The training provided a real-world opportunity for students on how serious the process of doping control is in sports. Understanding the principles of sampling and athletes' rights gave students an insight into fairness. A review of the responsibilities of the anti-doping team described the organisation and process of anti-doping efforts in the UAE, from selecting athletes to enforcing sanctions. This training motivated students to learn the anti-doping mission and put it into practice. All the students applied for further training by UAE NADA in order to become chaperones at monitored sporting events.

A group of students researched the performance enhancement attitudes of bodybuilders in the UAE; the research included had an intervention to improve the attitude of bodybuilders against unfair and unhealthy performance enhancement. Students presented their findings at DUPHAT 2021, one of the biggest international pharmacy conferences in the UAE.<sup>6</sup>

### Discussion

Partnering with UAE NADA was beneficial in developing the pharmacy workforce's anti-doping efforts. Doping or undue performance enhancement is a problem pharmacists face from bodybuilders and athletes. As an agent of rational drug use, pharmacists can play a vital role in people's health care in competitive and non-competitive sports. More research and advocacy efforts are needed in parallel to education to achieve the collaborative mission of anti-doping. The GMU partnership with the UAE NADA was very productive to support anti-doping.

### Acknowledgement

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## 8.2 Clinical case studies

### 8.2.1 What’s in MY inhaler? What’s in YOUR inhaler?

By Matthew J. DellaVecchia

#### Abstract

Student-athletes on a women’s soccer team were reportedly sharing inhalers used to treat asthma. A pharmacy student and a pharmaceutical science professor discussed the importance of using one’s own prescribed inhaler and not sharing with a teammate. The differences in the chemical composition of medicines and their unique mechanisms of action were discussed with the athletes. Athletes were cautioned that using the wrong inhaler can be detrimental to their health as well as lead to issues with the National Collegiate Athletic Association (NCAA) if a chemical that has not received a therapeutic use exemption is found in an athlete’s system.

#### Introduction

Most striking about this case is the simple way a student-athlete could inadvertently ingest a banned substance or innocently allow a teammate to mistakenly ingest a banned substance when the intent is solely to obtain relief from exercise-induced asthma symptoms. Furthermore, the solution to this issue is quite simple. Student-athletes could be educated to not share inhalers by explaining that some athletes require short-acting medicines while other athletes require different inhaled medicines. Students can be educated further that these medicines are chemically different and function very differently in the body, despite being packaged in and delivered by similar looking devices.

#### Case presentation

Student-athletes on a women’s soccer team were reportedly leaving inhalers on the side-line or benches during practices and workouts. Occasionally, when an athlete required relief from exercise-induced asthma but did not bring their own inhaler to the practice or workout, they would use the inhaler brought by a teammate. While seeming to be a convenient solution to the problem, there are the following concerns:

- Sharing prescription medication is prohibited.
- Inhalers can contain a multitude of pharmaceutical ingredients with a variety of mechanisms of action. Using the inhaler of a teammate does not guarantee that the athlete is receiving the same medicine prescribed to them by their healthcare provider. Common inhalers include short-acting beta2-agonists (e.g., albuterol) to facilitate bronchodilation for patients with asthma or glucocorticoids (e.g., budesonide) to aid with inflammation associated with asthma. Both chemical compound categories can be found on the NCAA banned substance list. Most, if not all, medicines can

receive therapeutic use exemption if applied for; however, should an athlete inadvertently ingest a medicine that is not prescribed to them, there is the potential to not receive the necessary therapy, which could exacerbate their respiratory distress, and to be in violation of NCAA policy for having a banned substance in their system with no therapeutic use exemption.

### Management and outcome

Student-athletes on the women's soccer team were invited to an informal seminar to discuss performance-enhancing drugs in general and, more specifically, NCAA guidelines regarding medicines used to treat asthma and other respiratory conditions commonly associated with exercise. A fourth-year pharmacy student under the supervision of a pharmaceutical science faculty member used the infographic found here ([The Chemistry of Asthma Inhalers](#)) —to help educate the student-athletes on the chemistry of inhalers used for asthma. A question-and-answer period was permitted after which athletes were asked to complete a questionnaire to provide their perceptions as to the usefulness of the information provided in the presentation as well as the discussion between pharmacy and athletics.

### Discussion

A summary of results of the questionnaire provided to the eight women student-athletes. Using a Likert scale agreement (1=strongly disagree, 2=disagree, 3=undecided, 4=agree, 5=strongly agree) the athletes responded as follows:

- I found this presentation to be informative and understandable (4.9).
- I now have a better understanding of what a performance enhancing drug is (5.0).
- Albuterol inhalers without a prescription are banned by the NCAA (3.6).
- I would attend a future discussion regarding performance-enhancing drugs, supplements or general medicines usage (4.4).
- If pharmacy students were routinely available via email or online to answer questions regarding performance-enhancing drugs or supplements, I would use this resource (3.9); the majority indicated that a monthly schedule would be ideal.

The pharmacy student who gave the presentation to the student-athletes on the women's soccer team said: "I was very pleased after reviewing the results of our survey of the women's soccer team. All of the athletes answered that they now had a better understanding of what a performance-enhancing drug is after my presentation. This was great to see because that means my presentation didn't simply serve as a vehicle to collect data, but it also helped educate the athletes on an important topic. Education and counselling patients are a huge part of what pharmacists hope to accomplish. This opportunity gave me confidence to know that when I am in the pharmacy setting and I counsel patients that I am conveying the information clearly enough for them to understand."

### Acknowledgement

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## 8.2.2 Enquiries to sports pharmacists in Japan

By Shigeo Yamamura

### Abstract

Enquiries from athletes or the public about use of medicines or supplements in sports can be addressed by certified sports pharmacists who are trained in using the most current and accurate resources. The clinical case includes examples of typical enquiries about medicine and supplements sports pharmacists might address.

### Introduction

Elite athletes in Japan are highly aware of doping and seek necessary information from certified sports pharmacists to avoid accidental doping. They visit sports pharmacists on an individual basis or through their sports associations. After athletes receive basic anti-doping education to help them interpret results independently, they can access a search app for prohibited doping substances. This is a useful tool to help athletes check whether a product contains prohibited substances, but some interpretation of the results is necessary.

Typical sports pharmacist activity involves responding to questions about medicines. The case presentation includes several examples of enquiries may demonstrate the value of a sports pharmacist in addressing medicines and supplement questions for athletes.

### Case presentation

*Question from a trainer of a female track and field athlete*

Q: She injured her leg during practice. She will participate in an international competition and is considering using supplements to help her recover quickly. I would like to know if the product I am planning to use could contain the prohibited substances.

A: Ingredients in the product did not contain the prohibited substances. However, the product is not totally risk-free because it uses raw materials of animal and plant origin.

Outcome: The players and support staff discussed the necessity to use the product and agreed to use it.

*Question from a trainer of a Japanese national team athlete*

Q: The athlete had symptoms of asthma and sought medical attention. I want to make sure that the prescribed three medicines do not fall under prohibited substances.

A: Since one prescribed medicine contains a prohibited substance, the pharmacist suggested to ask the prescribing doctor to change one medicine for another. The pharmacist also provided information on medicines the athlete could take.

Outcome: Until the requested appointment, the athlete took only two medicines without prohibited substances.

*Question from mother of a teenaged athlete*

Q: My son, an elementary school student, has suddenly improved his performance and has been selected to participate in a major national competition. I want to know if the medicines or supplements he usually uses are against the rules.

A: Sports pharmacists checked the list of prohibited drugs and answered that there were no problems with the medicines he usually uses.

Outcome: She and her son have understood the importance of anti-doping knowledge and they asked about his medicines periodically. After that, the pharmacist regularly received enquiries about medicines.

*Question from mother of male teenaged canoeing athlete*

Q: May he be COVID-19 vaccinated? May he use over-the-counter drugs for fever?

A: He can be vaccinated. Because some general cold OTC medicines for fever contain prohibited substances, OTC medicines should be avoided. The sports pharmacist gave her a prohibited substance list and recommended she see doctor to ask to prescribe paracetamol or buy OTC products containing only paracetamol.



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