Management of patients using anabolic androgenic steroids and other performance and image enhancing drugs (including peptides): A harm reduction approach

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Background
Performance and image enhancing drugs (PIEDs) include a diverse range of substances used to improve physical performance, muscle mass or appearance. While historically associated with elite sport and bodybuilding, use has expanded to broader populations. Most PIEDs used outside clinical settings are non-prescribed and obtained through informal or online markets, creating additional health risks.

Objective
This article aims to support general practitioners (GPs) in engaging with patients who use anabolic androgenic steroids and other PIEDs and to outline practical harm reduction strategies for monitoring and managing associated health risks.

Discussion
People who use anabolic androgenic steroids and other PIEDs might be reluctant to disclose use because of stigma, fear of judgement or concerns about confidentiality. A non-judgemental, harm reduction approach can facilitate disclosure and enable clinicians to provide appropriate monitoring, screening and education, as well as reduce potential harms by supporting safer practices and managing adverse effects.

PERFORMANCE AND IMAGE ENHANCING DRUGS (PIEDS) refer to a heterogeneous group of substances used to improve physical performance, muscle mass or appearance. The most widely recognised and used PIEDs are anabolic androgenic steroids (AAS), synthetic derivatives of testosterone that exert anabolic and androgenic effects.

Although historically associated with elite sport and bodybuilding, patterns of use have broadened to include recreational gym goers, occupational users, older men using these substances for perceived anti-ageing benefits and women for bodybuilding, mood and libido effect.[1,2] The Australian Secondary School Alcohol and Other Drugs Survey show that 2.3% of secondary school students have used anabolic steroids,[3] while the global estimate for lifetime use in men is 6–7%.[1]

Most AAS and other PIEDs used outside clinical settings are non-prescribed and commonly obtained through informal networks, online suppliers or imported products.[4,5] PIEDs that are often used in addition to AAS might include peptides, weight loss agents and ancillary drugs used to manage side effects[6] with uncertain composition creating additional safety concerns.[7] There is some prescribing of PIEDs by some clinics and doctors for non-medical purposes, which is considered illegal and inappropriate by regulatory authorities.

The health risks associated with AAS use are wide ranging and include cardiovascular disease, endocrine dysfunction, hepatic injury, psychiatric symptoms and reproductive complications.[8,9] These risks might be exacerbated by polypharmacy, prolonged exposure or the use of supraphysiological doses.[6]

Despite these potential harms, many people who use AAS and other PIEDs do not seek medical advice for monitoring or management[10] perceiving healthcare professionals as lacking knowledge about these substances and/or as being judgemental about their use, which can discourage disclosure and engagement with care.[10]

Harms associated with PIED use can be reduced through screening, early identification and treatment of complications, and ongoing monitoring. Research also shows that general practitioners (GPs) who adopt a harm reduction approach when engaging with people who use PIEDs positively influence their behaviour (eg modifying or ceasing use).[11]

Objective

To provide practical, evidence-informed guidance for GPs on the assessment and harm reduction management of people using non-prescribed AAS and other PIEDs. The aim of this approach is to prevent harm and facilitate behaviour change, but not be complicit in the behaviour engaged, by providing non-judgemental healthcare to these individuals.

Discussion

Engaging patients and facilitating disclosure

People who use PIEDs rarely disclose use spontaneously during clinical consultations.[9] This reluctance might reflect previous negative experiences with healthcare providers, concerns about stigma or fears about legal consequences.

For this reason, direct but non-judgemental enquiry is important.[11] Screening questions might be incorporated into routine lifestyle or substance use histories, or prompted by clinical indicators such as hypertension, dyslipidaemia, abnormal liver function tests, polycythaemia or requests for hormone testing.

When asking about PIED use, clinicians can clearly explain the reason for the enquiry, emphasising that the purpose is to support health monitoring rather than to judge or discourage patients from seeking care. Assurances regarding confidentiality are essential.

Normalising the discussion (eg by asking about supplements, gym training practices and performance enhancing substances alongside other lifestyle factors) can help reduce stigma and increase the likelihood of disclosure. For example, 'Do you take anything for your exercise/lifestyle, like drinks, food supplements or anything else that you think helps with your workout/lifestyle?'.

While targeting individuals who are gym-focused or who are very muscular might identify some of this cohort, data suggests that many who do not fit this demographic might also be using PIEDs. Women might present with some of the adverse effects of PIED use.

It is also important to recognise that many people who use AAS use additional substances concurrently,[5] including drugs intended to enhance effects, manage side effects or support hormonal recovery, which can complicate clinical assessment.[11] Table 1 outlines some of the other PIEDs that are used in addition to AAS.

Table 1. Other types of performance and image enhancing drugs used in addition to anabolic androgenic steroids[12]

Drug	Trade/other names	Purported reasons for use (by patients)
Tamoxifen, anastozole	Nolvadex Arimidex	Used as an oestrogen blocker to treat or prevent gynaecomastia
HCG	Pregnyl	Used to improve testosterone production, prevent weight loss, and to stop testicular atrophy
Clomiphene citrate	Clomid	Taken to 'kick start' the endogenous production of testosterone during an 'off cycle'
HGH	Somatropin	Used for anabolic effects and weight loss
Clenbuterol	Spiropent	A β2 agonist used for anabolic effects[A]
Diuretics	Furosemide Spironolactone	Used to enhance muscular definition, mask doping drugs and to reduce weight rapidly
Melanotan II (melanocortin peptides)		Used as a tanning agent, also used for enhancement of sexual arousal
Insulin (peptide hormone)		Used for anabolic effects and strength
SARMs	Examples: Ostarine (MK-2866) Ligandrol (LGD-4033) Testolone (RAD-140) Andarine (GTx-007, S-4)	SARMs mimic the muscle building effects of AAS (by binding to androgen receptors), with supposedly less side effects than AAS. There is however no empirical evidence to support this claim
Cabergoline		To treat increases in prolactin caused by AAS (especially nandrolone)
PDE-5 inhibitors	Viagra Cialis	For erectile dysfunction associated with AAS
Finasteride	Proscar Propecia	For hair loss associated with AAS
Benzodiazepines		To treat anxiety and insomnia associated with PIED use

[A] Clenbuterol: reported clinical effects include tachycardia, widened pulse pressure, tachypnea, hypokalemia, hyperglycemia, ST changes on ECG, elevated troponin, elevated CPK, palpitations, chest pain, and tremor.[41]

AAS, anabolic androgenic steroids; CPK, creatine phosphokinase; ECG, electrocardiogram; HCG, human chorionic gonadotrophin; HGH, human growth hormone; PIEDS, performance and image enhancing drugs; SARMs, selective androgen receptor modulators.

Understanding patterns of use and clinical risk

Once disclosure occurs, a detailed substance use history can assist with clinical risk assessment.

Important areas to explore include:

- substances used and dosing patterns
- duration of use
- route of administration (eg oral or intra-muscular AAS, nasal sprays or subcutaneous injections of melanotan)
- concurrent use of multiple substances ('stacking')
- use of ancillary drugs to manage side effects
- previous adverse effects.

Patterns of use vary considerably. Some people who use AAS follow 'cycling' patterns, involving periods of AAS use followed by periods of abstinence.[12] Others adopt a 'blast and cruise' approach, characterised by prolonged exposure with alternating higher and lower doses without full cessation.[12] Cycling is thought to help preserve the hypothalamic-pituitary-thyroid (HPT) axis, whereas blast and cruise strategies do not try to achieve this preservation but rather attempts to replace normal levels of testosterone in between blast cycles. Both strategies lack evidence.

These patterns might have different clinical implications, particularly in relation to endocrine suppression, cardiovascular risk and psychological effects. Continuous use patterns might result in greater cumulative dosing and prolonged suppression of endogenous testosterone production.[13] This approach is therefore generally associated with a higher risk of adverse health effects compared with patterns that include periods of abstinence.

Mental health assessment is also important. Symptoms such as anxiety, irritability, aggression, body image concerns and depressive symptoms might occur during use or during withdrawal.[12]

Table 2 provides an overview of common adverse effects to be aware of for people who use AAS and other PIEDs.

Peptides and emerging enhancement substances

In addition to AAS, peptides are an increasingly visible component of the PIED landscape.[14]

Peptides are short chains of amino acids that influence biological processes such as hormone signalling, metabolism and tissue repair. Some peptides are approved medicines used in clinical practice, while many others circulate in unregulated markets and are promoted online for enhancement purposes.[15]

Peptides are commonly marketed for goals such as muscle growth, fat loss, recovery from injury, anti-ageing, tanning or 'health optimisation'. Social media platforms and online forums have contributed to rapid dissemination of information and marketing claims regarding these substances.[16] However, many of these substances have limited clinical evidence and have not undergone the rigorous testing required for approved medicines.

For clinicians, peptides present several emerging challenges:

- rapidly evolving substances with significantly different activity and limited safety evidence
- minimal clinical guidance for healthcare providers
- widespread misinformation through social media.

A harm reduction approach involves creating opportunities for patients to discuss peptide use openly as well as providing education about potential risks, product uncertainty and safer injecting practices.

Table 3 provides an overview of peptides and peptide adjacent substances used for performance and image enhancement.

Table 2. Some reported adverse effects of anabolic androgenic steroids[12]

Cardiovascular	Hypertension, cardiomyopathy and dyslipidaemia, conduction abnormalities
Haematological	Polycythemia leading to thrombosis, stroke or myocardial infarction
Hepatic	Hepatic inflammation and hepatic failure (oral androgens)
Neuroendocrine (males)	HPT axis suppression (hypogonadism from withdrawal), infertility (sometimes irreversible) and gynecomastia
Renal	Secondary renal failure
Neuroendocrine (females)	Virilisation, acne, infertility (sometimes irreversible), voice change and secondary amenorrhoea
Neuropsychiatric	Mood disorders (eg depression, mania, hypomania), aggression, insomnia and AAS dependence
Brain and cognition	Cognitive impairment
Sleep disorders	OSA
Other	Infection risk (local and blood-borne virus), tendon rupture and dermatological issues (acne and balding), benign prostate hyperplasia

AAS, anabolic androgenic steroids; HPT, hypothalamic-pituitary-thyroid; OSA, obstructive sleep apnoea.

Clinical assessment and investigations

With supportive engagement and trust, GPs can provide information and develop monitoring plans to reduce health risks.

Baseline assessment might include:[12]

- full blood examination
- liver function tests
- lipid profile
- renal function tests
- testosterone and gonadotropins tests
- blood pressure and cardiovascular risk assessment
- screening for blood-borne viruses[17]
- mental health assessment (for underlying mental health conditions, conditions associated with PIED use and conditions associated with withdrawals)
- obstructive sleep apnoea assessment
- screening for sexual dysfunction
- screening for lower urinary tract symptoms.

Regular monitoring allows early detection of complications such as hypertension.

Some baseline testing and monitoring is suggested in Table 4.

Harm reduction counselling and management

Harm reduction strategies aim to minimise the health risks associated with AAS and other PIED use without requiring immediate cessation.

Table 3. Peptides and peptide adjacent substances used for performance and image enhancement[26-42]

Peptide class	Examples	Purported uses (non-medical)	Evidence base	Key risks and considerations	Regulatory status (Australia)
GLP-1 and GIP receptor agonists	Semaglutide liraglutide, Tirzapatide	Weight loss, appetite suppression and metabolic optimisation	Strong evidence for approved indications; increasing off-label use	Gastrointestinal effects, other listed AEs	Approved for listed indications
Growth hormone secretagogues/ GH related compounds	CJC-1295, Ipamorelin, GHRP-2, GHRP-6, MK-677 (Ibutamoren)	Muscle growth, fat loss and anti-ageing	Limited and early-stage human data	Metabolic effects (eg hyperglycaemia), endocrine disruption, OSA, OA, hypertension, oedema, tendon rupture, injection site reactions, lipoatrophy/hypertrophy, possible promotion of existing tumours, headaches and paraesthesiae, unknown long term safety	Not approved
Tissue repair/'healing' peptides	BPC-157, Thymosin Beta-4 (TB-500)	Injury recovery, regeneration and gut health	No reliable human clinical evidence	Unknown safety profile, unregulated products, injection related risks	Not approved
Melanocortin peptides	Melanotan II	Tanning and libido enhancement	Limited human data	Nausea, flushing, headaches, vomiting, loss of appetite, risk of skin cancers, renal impairment[42]	Not approved
Immune modulating and antimicrobial peptides	Thymosin Alpha-1, LL-37	Immune support, recovery and antimicrobial effects	Some clinical evidence (restricted contexts); largely experimental	Injection reactions, theoretical risks (eg immune or proliferative effects)	Not approved
Cognitive enhancement peptides/ nootropics	Semax, Selank, Cerebrolysin, Dihexa, Aniracetam, Epitalon	Cognitive enhancement, mood, anxiety and anti-ageing	Limited, non-Western or preclinical evidence	Neurological effects, anxiety, limited safety data	Not approved
Weight loss peptides (non-approved)	AOD-9604	Fat loss	No efficacy in clinical trials	Cardiovascular symptoms, lack of safety data	Not approved
Sexual function peptides	Bremelanotide (PT-141)	Libido and sexual performance	Some evidence internationally	Nausea, flushing, cardiovascular considerations	Not approved

AEs, adverse events; GH, growth hormone; GIP, glucose-dependent insulinotropic polypeptide; GLP-1, glucagon-like peptide-1; OA, osteoarthritis; OSA, obstructive sleep apnoea.

For individuals considering initiating AAS and other PIED use, discussing potential adverse effects might discourage initiation.[10] Harm reduction approaches in general practice might lead to meaningful changes in behaviour among people who use PIEDs, including improved health monitoring, treatment of adverse effects and modifications to patterns of use.[11]

Motivational interviewing using the FRAMES approach is useful in encouraging behaviour change in the long term (Table 5).[18]

For people who continue to use these substances, harm reduction strategies might include:[10,11]

- regular health monitoring
- management of emerging adverse effects

Table 4. Suggested testing for someone using anabolic androgenic steroids and other performance and image enhancing drugs[12]

Test	Laboratory abnormalities	Notes
Hormones including testosterone (serum), SHBG (serum), LH (serum)	↓ LH variable serum testosterone depending on substance	Useful to see how someone is recovering. Less useful when someone is still using
Cholesterol profile (HDL, LDL, triglycerides)	Might result in ↑ levels of total cholesterol (C), LDL-C and triglycerides and ↓ levels of HDL-C	Upon cessation of AAS use there will be gradual improvement
Hb and HCT	↑ Hb and HCT	This can ↑ risk of thrombus formation
Urea and electrolytes, or cystatin-C (non-MBS rebateable)	↑ creatinine levels	Might indicate kidney injury, ↑ muscle mass/rapid breakdown muscle tissue or consumption of creatine. Cystatin C could be considered if the patient has abnormal renal function on initial testing
Liver function tests	↑ ALT, AST, ALP, LDH and GGT	Hepatic abnormalities (worse with oral AAS). Might be because of intense activity as well
Semen analysis (if concerned about fertility)	↓ sperm count and motility, and abnormal morphology	Normalisation of sperm count lags behind normalisation of plasma testosterone
ECG and/or echocardiogram	LVH	AAS can cause LVH/cardiomyopathies
STI/BBV testing	Hepatitis B, hepatitis C, and HIV STI screening based on behaviour/risks	Consider if high risk behaviour (injecting or sexual)
PSA (may not be MBS rebateable)		Testosterone might stimulate prostate cancer growth. Prostate hypertrophy can occur with AAS
Fasting glucose and HbA1c	dysglycemia	Can occur with GH
Pregnancy test		AAS might impact the foetus. In case of positive test, it is recommended that the patient stops using immediately

AAS, anabolic androgenic steroids; ALP, alkaline phosphatase; ALT, alanine aminotransferase; AST, aspartate aminotransferase; BBV, blood-borne virus; ECG, electrocardiogram; GGT, gamma glutamyl transferase; GH, growth hormone; Hb, haemoglobin; HCT, haematocrit; HDL, high-density lipoprotein; LDH, lactate dehydrogenase; LDL, low-density lipoprotein; LH, luteinising hormone; LVH, left ventricular hypertrophy; MBS, Medicare Benefits Schedule; PSA, prostate-specific antigen; SHBG, sex hormone-binding globulin; STI, sexually transmissible infection.

Table 5. The FRAMES model of motivational interviewing

Feedback	Provide them with feedback based on what they have told you
Responsibility	Emphasise the choice to change, or carry on as they are, is theirs. Acknowledging personal responsibility is a key factor in motivating change
Advice	Deliver clear advice to change behaviour
Menu	Offer strategies to changing their behaviour
Empathy	Be reflective, empathic and collaborative, not confrontational or coercive
Self-efficacy	Communicate optimism, support self-efficacy and challenge helplessness

- cardiovascular risk assessments and advice on reducing risks
- safer injecting education (Needle Syringe Programs are a good resource)
- reduce risk of blood-borne virus transmission (injecting and sexual risks).

Education regarding safer injecting practices might reduce the risk of infections and transmission of blood-borne viruses.[14]

Importantly, clinicians should clarify that harm reduction does not involve prescribing medications solely to support non-medical AAS and other PIED use but rather involves monitoring health and managing complications when they arise.

Monitoring, withdrawal and recovery

Stopping AAS use should be encouraged, but might result in androgen induced hypogonadism,[19] characterised by symptoms such as fatigue, reduced libido, depression and signs of loss of muscle mass and testicular atrophy.

These symptoms take several months to recover[20] and discussion with patients will help manage expectations, reducing the risk of relapse.[21]

Some people use medications commonly referred to as 'post-cycle therapy' to stimulate endogenous testosterone production after stopping AAS.[22] While limited observational evidence suggests these approaches might alleviate some withdrawal related symptoms,[21] robust clinical evidence regarding their effectiveness and safety remains lacking and the substances used might carry additional health risks, especially using them in a non-medical setting method.

If endogenous testosterone production does not recover or menses does not resume after 3 to 6 months, referral to an endocrinologist with experience managing AAS-related complications might be appropriate.

Ongoing support from GPs is important, as relapse is common and patients might benefit from longitudinal care.[23] There are currently no guidelines available for management of AAS withdrawal.

Implementation considerations for general practice

GPs routinely manage chronic disease, mental health conditions and preventive care, all of which are relevant to people who use these substances.

Legislation regarding possession and supply of AAS and other PIEDs varies between Australian jurisdictions.[24] While trafficking offences apply to large quantities, there is currently no mandatory reporting requirement for PIED use,[25] and maintaining patient confidentiality remains essential to effective clinical engagement.

Management of these individuals might be very complex, and referrals are encouraged to other health professionals (eg mental health professionals, endocrinologists, cardiologists, sleep physicians) to assist in patient management. This might be done once trust by the individual has been gained.

Conclusion

Use of AAS and other PIEDs is increasingly relevant to general practice. Many people who use these substances avoid seeking healthcare because of stigma or concerns that clinicians lack knowledge about these substances.

GPs can reduce harms through non-judgemental engagement, structured assessment, brief interventions and ongoing monitoring. Emerging substances such as peptides are expanding the scope of substances encountered in clinical practice, further highlighting the need for clinician awareness and harm reduction approaches.

Supporting open communication between patients and healthcare professionals remains essential to reducing health risks and improving outcomes.

Key points

- PIEDs include a diverse range of substances, including AAS and peptides.
- Engage patients in discussion about the use of PIEDs using non-judgemental and reassuring language.
- Engagement in care can assist GPs in providing advice, modifying patient behaviour, and monitoring and treatment of adverse effects.
- Mental health considerations are important for this group of patients.
- Providing referrals to other appropriate specialists can be important in assisting recovery.

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