

Testosterone: Utilisation analysis

Drug utilisation sub-committee (DUSC)

October 2012

Abstract

Purpose

At its June 2012 meeting the DUSC noted a recently published research article highlighted an increase in Pharmaceutical Benefits Scheme (PBS)-subsidised testosterone prescribing¹. The DUSC considered it timely to review the utilisation of testosterone and requested a report be prepared for consideration at its October 2012 meeting.

This analysis examines the utilisation of PBS listed testosterone over the past decade (January 2002 to December 2011).

Methods

The analysis used de-identified pharmacy claim data for PBS-subsidised prescriptions, extracted from the DUSC database for the period January 2002 to December 2011. Data were extracted based on the date of prescription supply and so there may be small differences compared with publicly available Department of Human Services (DHS) Medicare date of processing data.

Key Findings

- Utilisation of PBS-subsidised testosterone has doubled over the past five years.
- The listing of two products, testosterone transdermal gel and intramuscular injection 1000 mg, have driven the growth in the market.
- There is a trend towards more general practitioners initiating therapy.
- In 2011, Government expenditure for testosterone preparations was \$14.6 million, up from \$5.6 million in 2005. This is a growth of 260 % over 5 years.
- Most initiations are for patients aged 40-79 years.

¹ Handelsman DJ. Pharmacoepidemiology of testosterone prescribing in Australia, 1992–2010. *Med J Aust* 2012; 196 (10): 642-645. doi: 10.5694/mja11.11277.

Purpose of analysis

At its June 2012 meeting the DUSC noted a recently published research article highlighted an increase in Pharmaceutical Benefits Scheme (PBS)-subsidised testosterone prescribing¹. The DUSC considered it timely to review the utilisation of testosterone and requested a report be prepared for consideration at its October 2012 meeting.

This analysis examines the utilisation of PBS listed testosterone over the past decade (January 2002 to December 2011).

Background

Therapeutic Goods Administration (TGA) approved indications, dosage and administration

The TGA approved indication, dosage and mode of administration for testosterone products listed on the PBS is detailed in Table 1.

Table 1: TGA approved indication, dosage and administration of listed products

Brand name and sponsor	Product	TGA approved indication	Dose and frequency of administration
<i>Primoteston Depot</i> [®] Bayer Australia Ltd	2114G Testosterone enanthate, Injection 250 mg in 1 mL	Androgen replacement therapy for confirmed testosterone deficiency in males	250 mg every 2–3 weeks
<i>Andriol Testocaps</i> [®] Merck Sharp & Dohme (Australia) Pty Ltd	2115H Testosterone undecanoate, Capsule 40 mg	Androgen replacement therapy for confirmed testosterone deficiency in males	120–160 mg daily for 2–3 weeks then adjust to 80–120 mg daily
Testosterone subcutaneous implant Merck Sharp & Dohme (Australia) Pty Ltd	8098F Testosterone Subcutaneous implant 100 mg	Androgen replacement therapy for confirmed testosterone deficiency in males	600–800 mg every 4–6 months
	8099G Testosterone Subcutaneous implant 200 mg	Androgen replacement therapy for confirmed testosterone deficiency in males	600–800 mg every 4–6 months
<i>Androderm</i> [®] Hospira Pty Ltd	8460G Testosterone Transdermal patch 12.2 mg (releasing approximately 2.5 mg per 24 hours)	Testosterone replacement therapy for confirmed testosterone deficiency in males	Apply 1 patch (5 mg/24 hr) each night. Adjust dose using (2.5 mg/24 hr). Usual range 2.5–7.5 mg daily
	8619P Testosterone Transdermal patch 24.3 mg (releasing approximately 5 mg per 24 hours)	Testosterone replacement therapy for confirmed testosterone deficiency in males	Apply 1 patch (5 mg/24 hr) each night. Adjust dose using (2.5mg/24 hr). Usual range 2.5–7.5 mg daily
<i>Testogel</i> [®]	8830R Testosterone	Testosterone replacement therapy for male hypogonadism	Apply 5 g sachet once

Brand name and sponsor	Product	TGA approved indication	Dose and frequency of administration
Bayer Australia Ltd	Transdermal gel 50 mg in 5 g sachet	when testosterone deficiency has been confirmed by clinical features and biochemical tests	daily. Adjust in 2.5 g (half a sachet) to max 10 mg daily
<i>Reandron 1000</i> [®] Bayer Australia Ltd	9004X Testosterone undecanoate, IM injection 1,000 mg in 4mL	Testosterone replacement in primary and secondary male hypogonadism	1000 mg every 10–14 weeks
<i>Sustanon</i> ^{®a} Merck Sharp & Dohme (Australia) Pty Ltd	2101N Testosterone esters, Injection 250 mg	Androgen replacement therapy for confirmed testosterone deficiency in males	250 mg every 2–3 weeks

a: deleted from the PBS as of Jan 2012.

Clinical context

The clinical signs and symptoms of androgen deficiency include reduced muscle strength, osteoporosis, fatigue, reduced libido, erectile dysfunction and mood changes.²

Hypogonadism can be categorised as primary or secondary and the causes may be congenital or acquired. Primary hypogonadism can be caused by liver and kidney disease, infection, radiation, surgery, some autoimmune disorders, and some congenital disorders such as Klinefelter syndrome.³

Secondary hypogonadism occurs as a result of disorders of the hypothalamus and pituitary.⁴

The incidence of hypogonadism is increased in patients with Type 2 diabetes and metabolic syndrome. Ageing is also associated with a decline in testosterone, with levels declining gradually after 30 years of age.²

The aim of androgen replacement therapy is to relieve the symptoms and signs of androgen deficiency.⁴

PBS listing details

The details of PBS-listed testosterone products as at 1 September 2012, including the date of listing are summarised in Table 2.

² Better Health Channel. Androgen deficiency in men. Melbourne: State Government of Victoria. Available from <www.betterhealth.vic.gov.au/bhcv2/bhcarticles.nsf/pages/Androgen_deficiency>

³ MedlinePlus Medical Encyclopedia. Hypogonadism. Bethesda: U.S. National Library of Medicine. Available from <<http://www.nlm.nih.gov/medlineplus/ency/article/001195.htm>>

⁴ Male hypogonadism [revised 2014 Feb]. In: eTG complete [Internet]. Melbourne: Therapeutic Guidelines Limited; 2015 Mar.

Table 2: PBS listed testosterone products as at 1 September 2012

Item code	Name, form & strength, pack size	Brand	Maximum quantity	Repeats	Manufacturer	DPMQ	Date listed
2114G	Testosterone enanthate, Injection 250mg in 1 mL	Primoteston Depot	3	3	Bayer Australia Limited	\$33.58	Pre-1974
2115H	Testosterone undecanoate, Capsule 40 mg, 60	Andriol Testocaps	60	5	Merck Sharp & Dohme (Australia) Pty Ltd	\$37.63	April 1990
8098F	Testosterone Subcutaneous implant 100 mg, 1	Merck Sharp & Dohme (Australia) Pty Ltd	6	0	Merck Sharp & Dohme (Australia) Pty Ltd	\$209.68	November 1996
8099G	Testosterone Subcutaneous implant 200 mg, 1	Merck Sharp & Dohme (Australia) Pty Ltd	3	0	Merck Sharp & Dohme (Australia) Pty Ltd	\$209.65	November 1996
8460G	Testosterone Transdermal patch 12.2 mg (releasing approximately 2.5 mg per 24 hours), 60	Androderm	1 pack of 60	5	Hospira Pty Ltd	\$95.94	November 2000
8619P	Testosterone Transdermal patch 24.3 mg (releasing approximately 5 mg per 24 hours), 30	Androderm	1 pack of 30	5	Hospira Pty Ltd	\$95.94	November 2002
8830R	Testosterone Transdermal gel 30 x 50 mg in 5 g sachet	Testogel	1 pack of 30	5	Bayer Australia Limited	\$95.22	August 2005
9004X	Testosterone undecanoate, IM injection 1,000 mg in 4mL	Reandron 1000	1	1	Bayer Australia Limited	\$147.51	August 2006
2101N	Testosterone esters, Injection 250 mg	Sustanon 250	3	3	Merck Sharp & Dohme (Australia) Pty Ltd	\$33.48 (as at Dec 2011)	Listed Pre-1966 Deleted January 2012

DPMQ = Dispensed price for maximum quantity.

All PBS-listed testosterone products currently have the same restriction. As at 1 September 2012 the restriction is:

Authority required

Androgen deficiency in males with established pituitary or testicular disorders;

Androgen deficiency in males 40 years and older who do not have established pituitary or testicular disorders other than ageing, confirmed by at least two morning blood samples taken on different mornings. Androgen deficiency is confirmed by testosterone less than 8 nmol/L, or 8-15 nmol/L with high LH (greater than 1.5 times the upper limit of the eugonadal reference range for young men);

Micropenis, pubertal induction, or constitutional delay of growth or puberty, in males under 18 years of age.

Relevant aspects of considerations by the Pharmaceutical Benefits Advisory Committee (PBAC)

The PBAC recommendations for testosterone products are summarised in Table 3. PBAC Outcomes are published on the [PBS website](#).

Table 3: PBAC outcomes for testosterone products

Drug name and formulation	PBAC Outcome and date of PBAC consideration
<i>Androderm</i> [®] Testosterone transdermal patch 12.2 mg (releasing 2.5 mg per 24 hours)	June 1998 PBAC meeting. Cost-minimisation with testosterone undecanoate capsules. Two patches 12.2 mg daily equi-effective to six 40 mg caps
<i>Androderm</i> [®] Transdermal patches 24.3 mg (releasing approximately 5 mg per 24 hours)	September 2002 PBAC meeting. Minor submission. Higher strength patch with smaller pack size. Same price.
<i>Testogel</i> [®] Testosterone transdermal gel 50 mg in 5 g sachet	March 2005 PBAC meeting. Cost-minimisation to patches, with the equi-effective doses being the gel 50 mg per day and patch releasing approximately 5 mg day.
<i>Reandron 1000</i> [®] Testosterone undecanoate I.M injection 1,000mg in 4 mL	November 2005 PBAC meeting. Cost minimisation with implants. The equi-effective doses were 1 g every 10-14 weeks and implant (600 mg) every 4-5 months.

When recommending the listing of testosterone undecanoate 1,000 mg intramuscular injection (*Reandron*[®]) in November 2005, on a cost-minimisation basis as compared to testosterone implant with a dose relativity of testosterone intramuscular injection 1000 mg every 10–14 weeks and testosterone implant (600 mg) every 4 months, the PBAC noted that the cost minimisation is reliant on an average 3-monthly rate of administration of the injection and requested that the DUSC monitor the use of the injection following PBS listing. In the event that PBS usage becomes more frequent, the PBAC considered it may

wish to revisit the dose relativities. For further details refer to the [Public Summary Document](#).

At the March 2012 meeting, the PBAC recommended the Authority Required listing of testosterone solution for topical administration (Axiron®) on a cost-minimisation basis compared with testosterone gel, following its deferral at the November 2011 PBAC meeting pending TGA approval. The equi-effective doses were considered to be testosterone solution 70 mg and testosterone gel 50 mg, albeit with some uncertainty.

The PBAC expressed concerns about the potential use of testosterone products in populations in whom the drug has not been evaluated as being cost effective. For further details refer to the [Public Summary Document](#).

Previous reviews by the DUSC

Previous reviews conducted by the DUSC for testosterone were undertaken in 2003 and 2004. The DUSC review in 2003 found that usage of testosterone capsules remained stable after the listing of the patches, and that the listing of patches resulted in an increased net cost to the PBS. The DUSC considered that use of the patches had stabilised following initial rapid uptake and may have indicated unmet need.

The 2004 DUSC review found that the listing of the higher strength of the patch strength reduced the use of the lower strength, but the total usage of both patches increased, as did the overall market of testosterone products on the PBS.

Methods

De-identified pharmacy claim data for PBS-subsidised prescriptions was extracted from the DUSC database for the period January 2002 to December 2011. The prescription data included the age and gender of the patient, the type of prescriber (GP or specialist) and the quantity of testosterone supplied on the prescription. Data were extracted based on the date of prescription supply and so there may be small differences compared with publicly available Department of Human Services (DHS) Medicare date of processing data.

The DUSC database combines data on PBS prescriptions submitted to the Department of Human Services (DHS) for payment of a PBS/RPBS subsidy by the Government, with an estimate of under general copayment prescriptions based on dispensing data from a sample of pharmacies to the end of August 2012, replaced by actual under copayment data from 1 April 2012. The DUSC database includes an estimate of private prescriptions based on dispensing data from a sample of pharmacies to the end of August 2012.

Results

Analysis of drug utilisation

Overall utilisation

Figure 1 illustrates the number of prescriptions for testosterone formulations across the study period (January 2002 to December 2011).

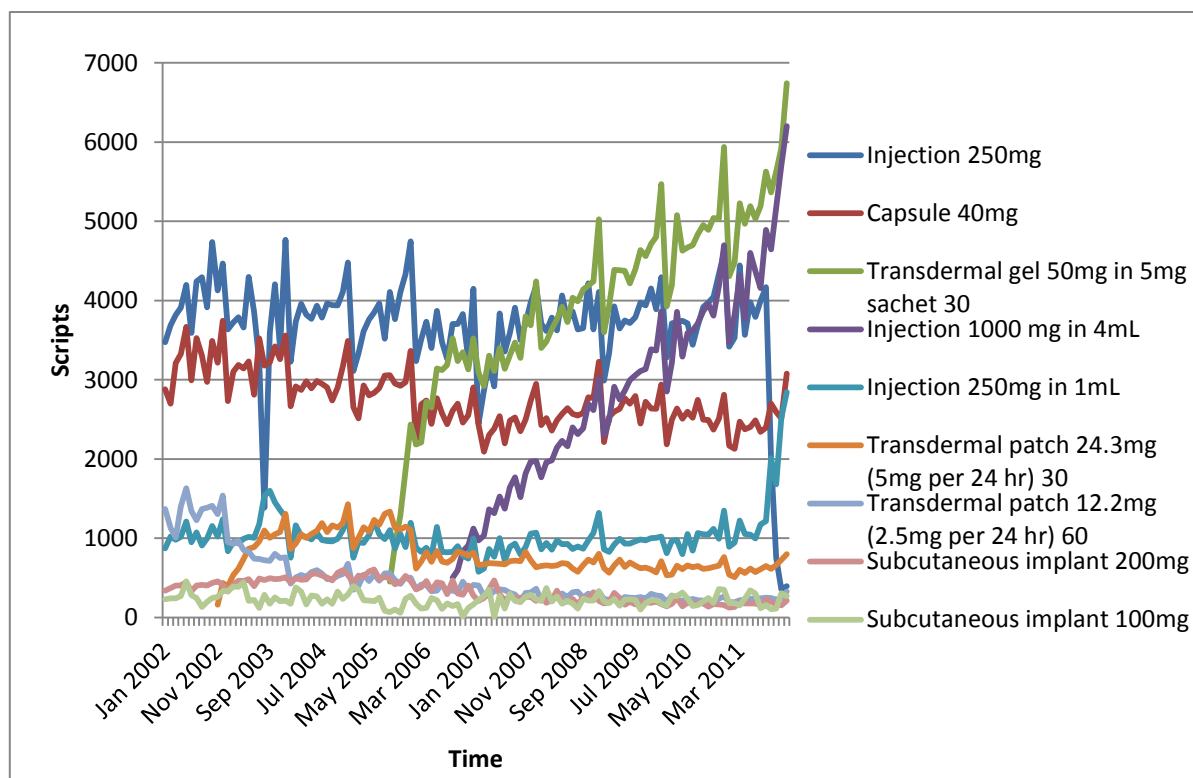


Figure 1: Number of prescriptions for testosterone including under patient co-payment and private prescriptions, January 2002 to December 2011.

Source: DUSC database accessed July 2012. Data includes PBS/RPBS and private prescriptions.

The number of prescriptions has increased dramatically, doubling in the past five years. Most of the growth can be attributed to the more recently listed products i.e. 1000 mg intramuscular injection and transdermal gel.

The transdermal gel has had the greatest market share according to the number of prescriptions since it was listed in August 2005. In the most recent month, a similar number of prescriptions for 1000 mg I.M. injections have been supplied. However prescription numbers are not directly comparable as one prescription of gel provides 30 days of treatment, whereas one I.M. injection provides 10-14 weeks of treatment.

Following deletion of testosterone esters 250 mg injection (Sustanon®) from the PBS, there has been increased use of testosterone enanthate 250 mg injection (Primoteston Depot®).

Figure 2 presents utilisation by Defined Daily Dose (DDD) per 1000 population per day for the PBS-listed testosterone products. The World Health Organisation (WHO) DDDs are based on testosterone use in substitution therapy in male hypogonadism. The DDDs for patches are given in amount of testosterone delivered. Individual DDD values are included in Appendix A of this report.

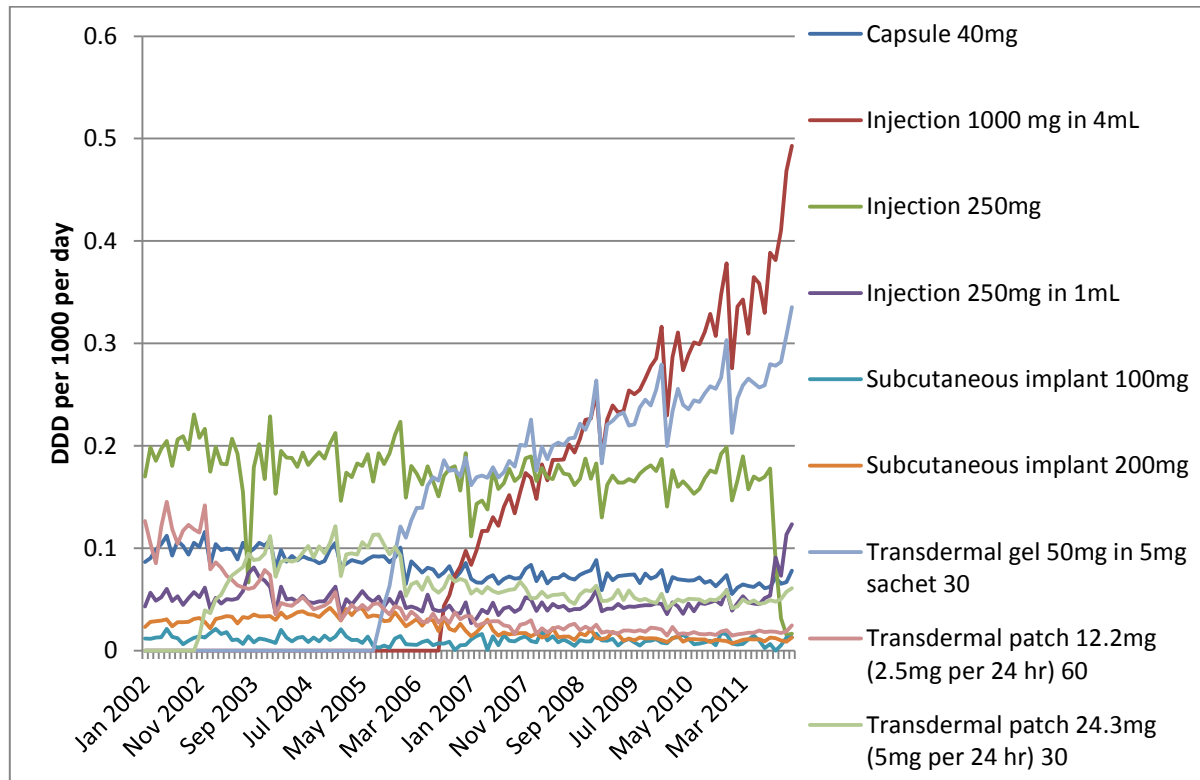


Figure 2: DDD/1000 population/day for all PBS-listed testosterone preparations, January 2002 to December 2011.

Source: DUSC database accessed August 2012. Data includes PBS/RPBS and private prescriptions

Note: The WHO DDDs are based on use in substitution therapy in male hypogonadism. The DDDs for patches are given in amount of testosterone delivered. Individual DDD values are available from www.whocc.no/

Figure 2 shows that there has been significant and constant growth in the use of testosterone from mid-2005 onwards. In this analysis, testosterone undecanoate I.M. injection (given every 10–14 weeks) is the market leader, followed by testosterone transdermal gel. Both of these products, listed on a cost-minimisation basis to existing products, resulted in growth of the total market following listing on the PBS.

Age of patients at initiation to testosterone

Figure 3 shows the number of patients by age initiating PBS-subsidised testosterone at two time points in the study period, 2004 and 2011.

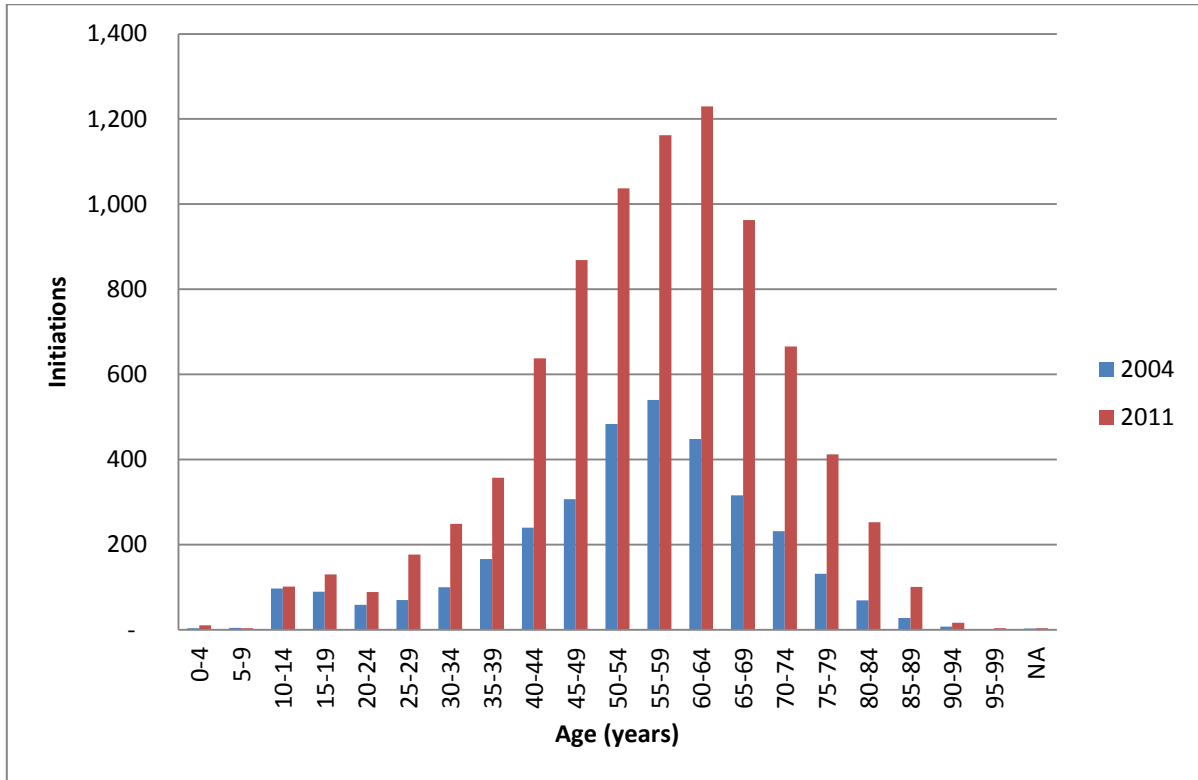


Figure 3: Number of patients by age initiating PBS-subsidised testosterone therapy, 2004 and 2011

Source: Medicare DHS, PBS Supplied Script database, extracted August 2012

Note: Data is not age-standardised

Figure 4 examines the age of patients initiating on PBS-subsidised testosterone as a proportion of total patients over time.

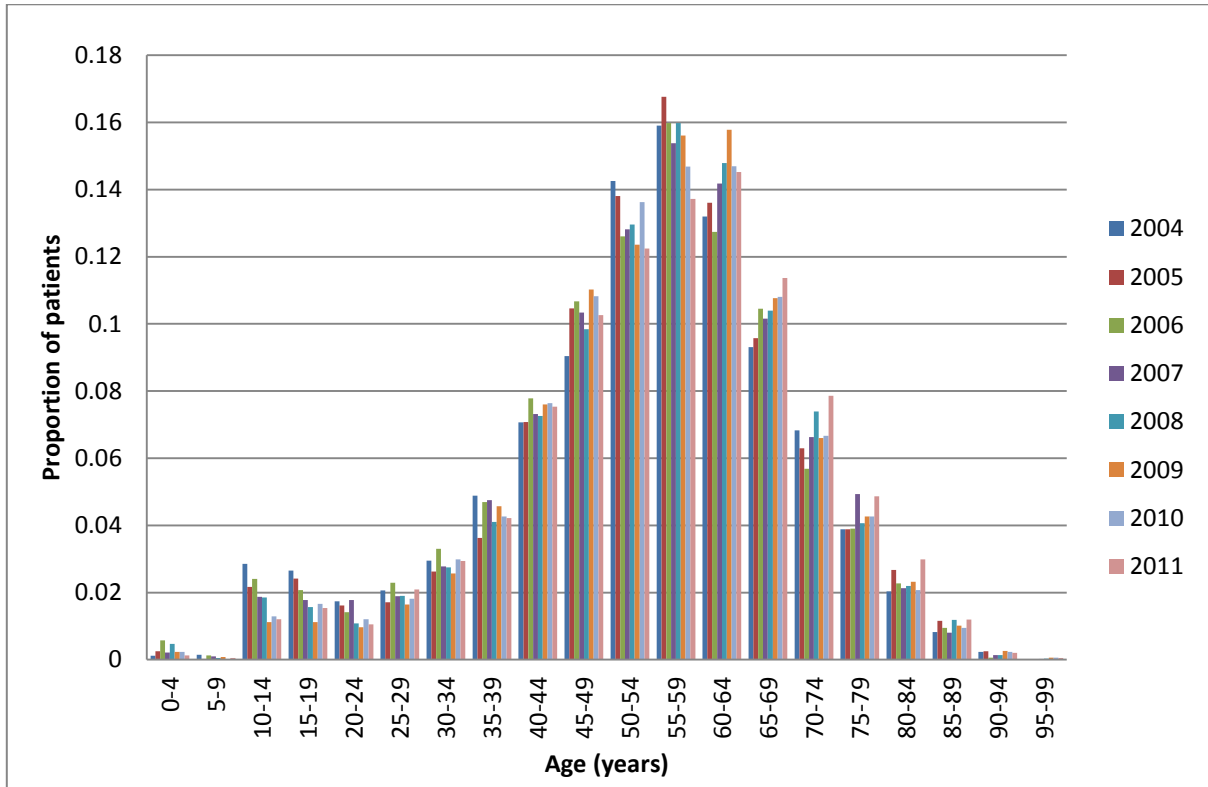


Figure 4: Proportion of patients by age initiating PBS-subsidised testosterone each year.

Source: Medicare DHS, PBS Supplied Script database, extracted August 2012.

In almost all age groups, except the very young, there has been an increase in the total number of patients initiating on testosterone over time. When considered as a proportion of all initiations, most initiations are for patients aged 40-79, however within this age bracket there are some varying trends. For example the proportion of patients initiating who are aged 50-54 and 55-59 has decreased over the study period, whereas the other age groups within the 40-79 bracket have increased.

Patient initiations to testosterone by prescriber type

Figure 5 shows the initiations to PBS-subsidised testosterone by prescriber type.

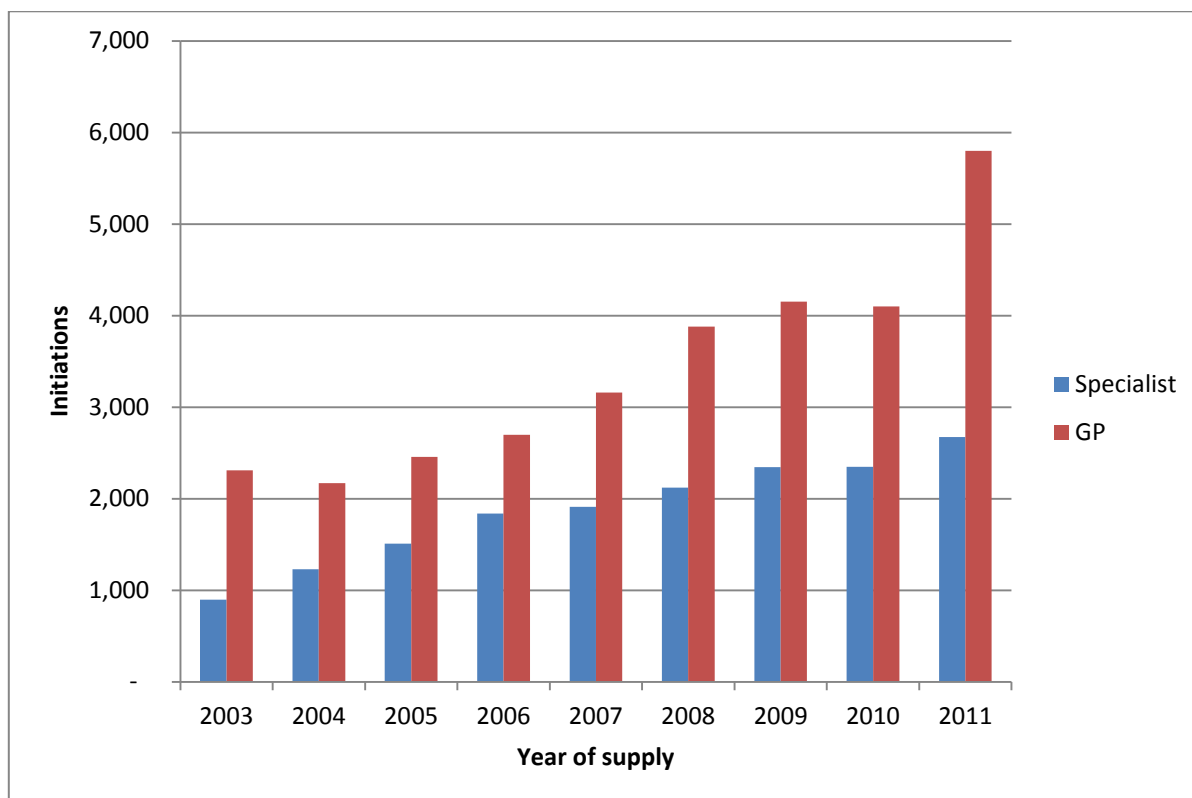


Figure 5: Number of initiations to PBS-subsidised testosterone by prescriber type

Source: Medicare DHS, PBS Supplied Script database, extracted August 2012

Note: Initiation is defined as no script for testosterone in at least the prior 12 months.

The proportion of initiations by general practitioners (GPs) has increased over time. In the most recent year of the analysis (2011), almost all of the growth was driven by GP prescribing.

R/PBS subsidised and private market comparison

To assess if there has been any shift in the proportion of use via the PBS and the private market, an analysis of prescription category was conducted. The results are shown in Figure 6.

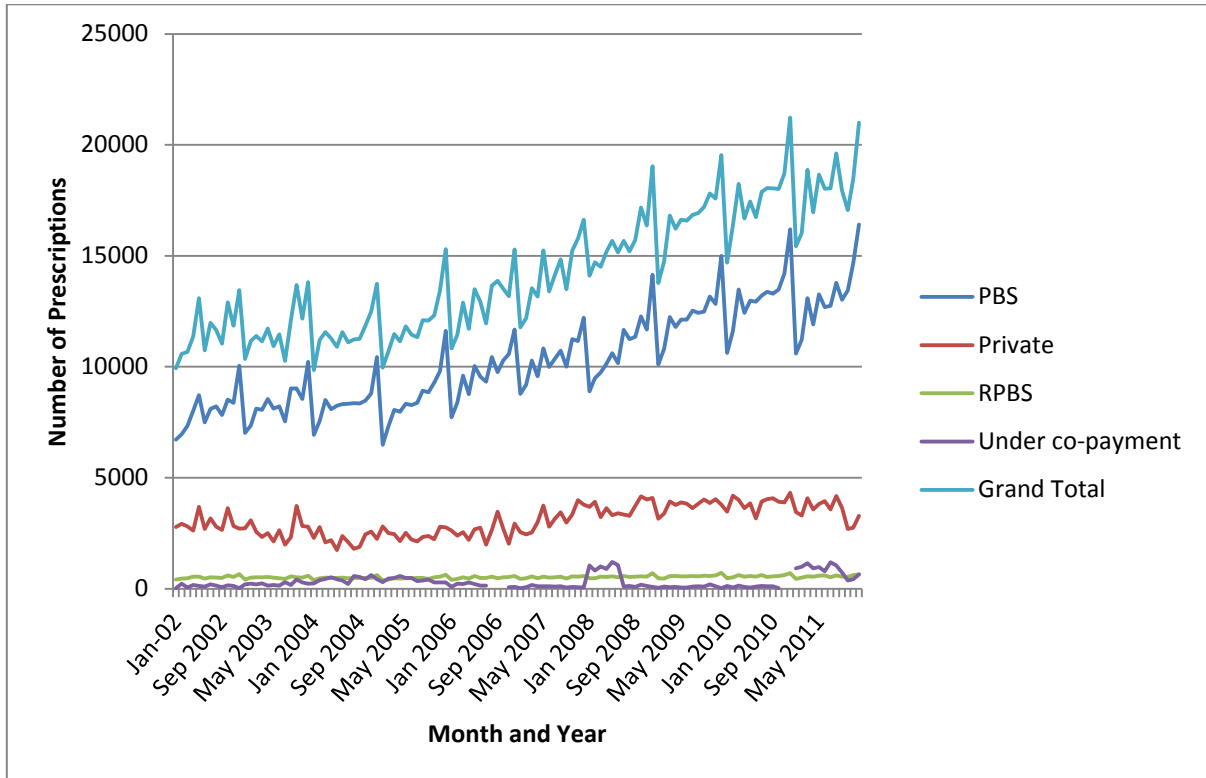


Figure 6: Number of prescriptions by category

Source: DUSC database, accessed July 2012.

Figure 6 illustrates that private prescribing has remained stable. Almost all growth in the testosterone market can be attributed to R/PBS supply.

Gender

Figure 7 presents the number of prescriptions by patient gender for PBS-subsidised testosterone for the period January 2010 to December 2011.

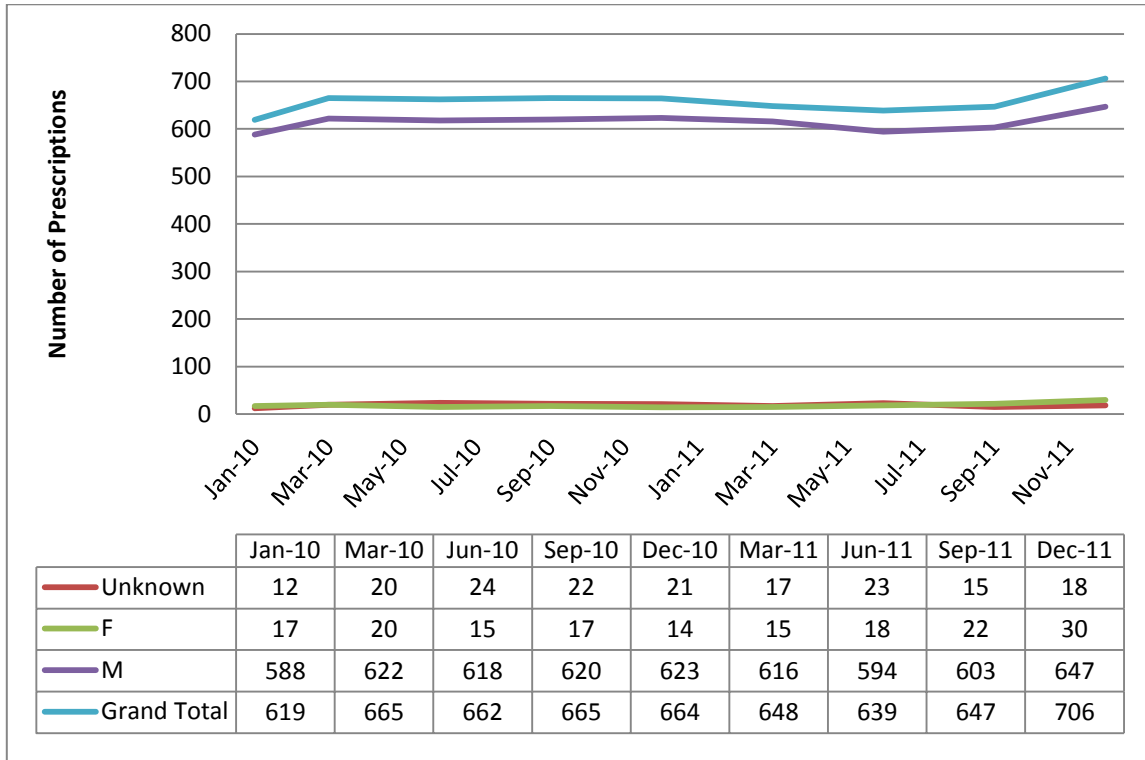


Figure 7: Prescriptions of testosterone distributed by gender.

Source: Medicare DHS, PBS Supplied Script database, extracted August 2012.

In the two year period presented in Figure 7 2.8 % of PBS-subsidised testosterone prescriptions were for females. This utilisation is outside of the PBS restriction. The DUSC considered that some of these prescriptions may be due to data errors, while some may be for transgender patients.

Analysis of expenditure

In 2011, Government expenditure for testosterone preparations was \$14.6 million, up from \$5.6 million in 2005. This is a growth of 260 % over five years.

Figure 8 shows the expenditure for all PBS-listed testosterone products.

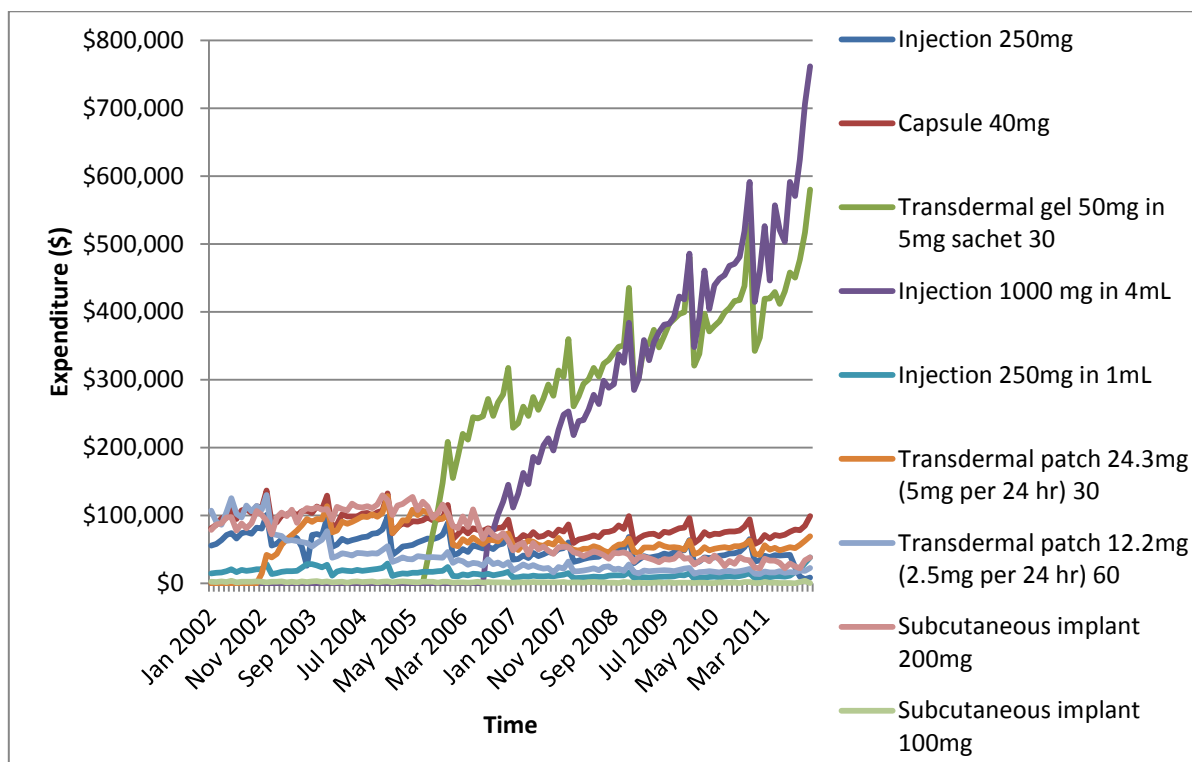


Figure 8: PBS/RPBS expenditure for all PBS-listed testosterone preparations

Source: DUSC database accessed August 2012

Figure 8 illustrates that the injection 1000 mg and transdermal gel are primarily driving the increased expenditure.

Table 4 compares the rate of growth, year on year, for prescription volume, DDD/1000 population/day and expenditure.

Table 4: Growth rates

Year of supply	2003	2004	2005	2006	2007	2008	2009	2010	2011
Prescriptions	0.65%	-1.56%	3.73%	8.09%	9.48%	11.28%	6.45%	5.71%	1.86%
DDD per 1000 per day	2.61%	-2.12%	2.86%	12.01%	15.58%	13.68%	7.42%	7.11%	5.42%
PBS/RPBS expenditure (\$)	9.36%	1.56%	4.44%	29.29%	20.48%	17.59%	14.47%	11.00%	11.72%

Source: DUSC database accessed July 2012 for prescription data and August 2012 for DDD and expenditure data.

Growth is not proportional across the various measures of utilisation. Each year, expenditure has grown faster than both the number of prescriptions and the DDD, with the difference in prescriptions and DDD/1000 population/day being due to relative differences in the quantity of testosterone provided in one prescription. This changes over time as the market share for products alters. The relatively higher growth in expenditure suggests that

the principles of cost-minimisation may not be realised and dose relativities may need to be reconsidered.

Discussion

There has been an increase in the total number of patients starting testosterone over time. Use has approximately doubled over the past 5 years. Utilisation in the younger age groups has remained constant. The DUSC considered that the overall increase in utilisation of testosterone is unlikely to be attributed to increased diagnosis and treatment of Klinefelter syndrome. The DUSC was concerned about the growth in initiations for patients in the 40–79 year age cohorts, because this large group of men may not have pathologically-based androgen deficiency. The DUSC also noted that use of testosterone is not without safety concerns, including possible increased cardiovascular risk in older men.

Expenditure by the Government has increased by 260 % over five years. Growth in expenditure is faster than growth in the number of prescriptions supplied and in DDD/1000 population/day. This suggests that the principles of cost-minimisation may not be realised and dose relativities may need to be reconsidered.

The DUSC observed that in the most recent year, almost all of the growth in prescriptions has been driven by GP prescribing. The listings of testosterone gel and intramuscular injection 1000 mg have driven the growth in the market.

The DUSC considered that increased public awareness campaigns associated with men's health may be a factor contributing to the increased use of testosterone, some of which may be beyond the intended PBS restrictions.

With regard to the testosterone PBS restrictions, the DUSC was concerned that a high degree of variability has been observed in measurement of testosterone levels depending on the assay methodology adopted.

The DUSC suggested that the PBAC should review the testosterone restrictions and consider input from the various stakeholders. The DUSC also requested that the PBAC review the dose relativities because expenditure has increased more than volume.

The DUSC noted that the quantities of testosterone supplied on the PBS are significantly less than those required for those seeking to build body mass. The DUSC considered that the results of this utilisation analysis did not indicate illicit diversion of testosterone for body building purposes.

DUSC actions

The DUSC referred the report to the PBAC and requested that the PBAC:

- Review the PBS restrictions for testosterone, with input from the various stakeholders;
- Consider if review of the dose relativities for pricing purposes are required.

The DUSC requested that this report be provided to the following stakeholders:

- The Royal Australian College of General Practitioners (RACGP);
- The Royal Australasian College of Physicians (RACP);
- The Endocrine Society of Australia;
- The Department of Human Services (Medicare) compliance area;
- The Department of Health and Ageing Medical Benefits Division.

Context for analysis

The DUSC is a Sub Committee of the Pharmaceutical Benefits Advisory Committee (PBAC). The DUSC assesses estimates on projected usage and financial cost of medicines.

The DUSC also analyses data on actual use of medicines, including the utilisation of PBS listed medicines, and provides advice to the PBAC on these matters. This may include outlining how the current utilisation of PBS medicines compares with the use as recommended by the PBAC.

The DUSC operates in accordance with the quality use of medicines objective of the National Medicines Policy and considers that the DUSC utilisation analyses will assist consumers and health professionals to better understand the costs, benefits and risks of medicines.

The utilisation analysis report was provided to the pharmaceutical sponsors of each drug and comments on the report were provided to DUSC prior to its consideration of the analysis.

Sponsors' comments

Actavis Pty Ltd: The sponsor has no comment.

Bayer Australia Limited*: The sponsor has no comment.

Besins Healthcare Australia Pty Ltd: The sponsor understands the important role of utilisation analyses in the management of the PBS. Although useful at the time the report was written, the sponsor notes that the DUSC analyses of testosterone replacement therapies do not predict the future market for testosterone.

Eli Lilly Australia Pty Limited**: The sponsor has no comment.

Hospira Pty Ltd***: The sponsor has no comment.

Merck Sharp & Dohme (Australia) Pty Ltd: The sponsor has no comment.

* At the time this report was considered by the DUSC in October 2012 Bayer Australia Pty Ltd was the sponsor of Testogel®. Besins Healthcare Australia Pty Ltd took over as sponsor of this product on 1 October 2014.

** At the time this report was considered by the DUSC in October 2012 Eli Lilly Australia Pty Ltd did not have a testosterone product listed on the PBS, however it was included in sponsor correspondence as Axiron® had received a positive recommendation from the PBAC in March 2012.

*** At the time this report was considered by the DUSC in October 2012 Hospira Pty Ltd was the sponsor of Androderm® products. Ascent Pharma Pty Ltd took over as sponsor of these products on 1 February 2013, and then Actavis Pty Ltd on 1 October 2013.

Appendix A

DEFINED DAILY DOSE

ATC G03 – Sex Hormones and Modulators of the Genital System - Effective Date: 07/10

Testosterone esters injection 250 mg and testosterone enanthate injection 250 mg are considered to be approximately equivalent. Testosterone implants were listed on the basis that 600 mg every four months was similar to 250 mg testosterone injection every two weeks. Testosterone transdermal patch was recommended on a cost minimisation basis compared with testosterone undecanoate capsule. The equi-effective doses are two patches 12.2 mg per day and 6 capsules testosterone undecanoate 40 mg per day.

Table A.1 shows the DDDs for testosterone from the WHO DDD Index, WHO Collaborating Centre for Drug Statistics Methodology, [Norwegian Institute of Public Health](#).

Table A.1: WHO DDDs for testosterone

ATC code	DDD	U	Adm.R	Note
G03BA03	0.12	g	O	
G03BA03	18	mg	P	
G03BA03	0.12	g	R	
G03BA03	3	mg	TD	
G03BA03	60	mg	SL	
G03BA03	30	mg	TD	gel

Source: WHO Collaborating Centre for Drug Statistics Methodology, [Norwegian Institute of Public Health](#).

The DDD for parenteral and oral testosterone is expressed as declared amount of ester e.g. undecanoate.

Disclaimer

The information provided in this report does not constitute medical advice and is not intended to take the place of professional medical advice or care. It is not intended to define what constitutes reasonable, appropriate or best care for any individual for any given health issue. The information should not be used as a substitute for the judgement and skill of a medical practitioner.

The Department of Health (DoH) has made all reasonable efforts to ensure that information provided in this report is accurate. The information provided in this report was up-to-date when it was considered by the Drug Utilisation Sub-committee of the Pharmaceutical Benefits Advisory Committee. The context for that information may have changed since publication.

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