

# Testosterone Replacement Therapy

## Pharmacoeconomics Unit

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# Executive Briefing

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- The current evidence for the cost-effectiveness of testosterone replacement therapy in all clinical areas where it is indicated is assessed and the economic impact of changes to the current funding status of testosterone replacement therapies is evaluated in this report.
- Only one relevant economic evaluation was identified; however, given the concerns with the methodological quality, no inferences regarding the cost effectiveness of testosterone replacement therapy can be made.
- In 2013, Ontario Public Drug Plan (OPDP) expenditure on testosterone replacement therapy was \$8.3 million (\$3.4 million for patients <65 years and \$4.9 million for patients ≥ 65 years).
- Without any changes to current testosterone replacement therapy reimbursement, testosterone replacement therapy expenditure is expected to surpass \$9.5 million by 2014 (\$3.9 million for patients <65 years and \$5.6 million for patients ≥ 65 years) and \$12.2 million by 2016 (\$5.2 million for patients <65 years and \$7.0 million for patients ≥ 65 years).
- Based on historical data from Ontario and data from other provinces, if topical and oral forms of TRT were moved to EAP, an overall reduction of 31.8% or savings of \$3.9 million respectively by 2016 is expected.
- Moving only topical forms of TRT under EAP would lead to an overall reduction of 20.0% or savings of \$2.4 million respectively by 2016.
- Moving all testosterone replacement therapy formulations under EAP would lead to the greatest amount saved (an overall reduction of 42.9% or \$5.2 million by 2016; a reduction of 36.3% for patients <65 years and a reduction of 47.9% for patients ≥65 years). The forecasted average number of testosterone replacement therapy users per quarter in 2016 would fall from 16,069 to 8,749.

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## List of Abbreviations

\$CAN	Canadian dollars
AIC	Akaike Information Criterion
CBV	cerebrovascular events
CIHI	Canadian Institute for Health Information
CV	cardiovascular events
EAP	Exceptional Access Program
ICES	Institute for Clinical Evaluative Sciences
INJ	injection testosterone replacement therapy
KAS	Kelley-Anne Sabarre
KT	Kylie Tingley
MB	Manitoba
MOHLTC	Ministry of Health and Long-Term Care (Ontario)
N/A	not applicable
NHS EED	National Health Service Economic Evaluation Database
NS	Nova Scotia
ODPRN	Ontario Drug Research Policy Network
ON	Ontario
OPDP	Ontario Public Drug Plan
PSA	probabilistic sensitivity analysis
QALY	quality-adjusted life year
T2D	type 2 diabetes
TRT	testosterone replacement therapy

## Executive Summary

### Research Questions

RQ1. What is the current evidence for the cost-effectiveness of testosterone replacement therapy in all clinical areas where it is indicated?

RQ2. What is the economic impact of alternative policies for reimbursing testosterone replacement therapies?

### Review of Economic Literature for Testosterone Replacement Therapy

One study met the criteria for inclusion in this review. This economic evaluation was a cost-utility analysis comparing testosterone undecanoate depot injection treatment to no treatment in patients with Klinefelter syndrome and in patients with late-onset hypogonadism, aged 20-88 years.<sup>1</sup>

The authors of the study are employed by the manufacturer of the product being investigated and concluded that testosterone replacement therapy was cost effective compared to no treatment. For the treatment of Klinefelter syndrome, the incremental cost utility ratio of testosterone undecanoate versus no treatment was \$24,617 per QALY in \$CAN 2014 [1€=1.4709 \$CAN] from a health care payer perspective and \$31,333 per QALY in \$CAN 2014 from a societal perspective.<sup>2,3</sup> For the treatment of late onset hypogonadism, the incremental cost utility ratio of testosterone undecanoate versus no treatment was \$18,346 per QALY in \$CAN 2014 from a health care payer perspective and \$36,596 per QALY in \$CAN 2014 from a societal perspective.<sup>2,3</sup>

Major limitations with this study with respect to the assumptions relating to treatment effectiveness and the applicability of the analysis to the Canadian context were noted.

Refer to Appendix A – A Systematic Review of Economic Evidence for a detailed report of the review of economic literature for testosterone replacement therapy.

### De novo Economic Evaluation

Given the broad perspective of the research question and unknown clinical benefit for many of the indications, a de novo economic evaluation to assess the value for money for testosterone replacement therapy in all clinical areas where it is indicated was not feasible.

### Reimbursement Based Economic Assessment

Total OPDP expenditure on testosterone replacement therapy (TRT) has increased significantly from \$2.3 million in 2000 to \$8.3 million in 2013. OPDP expenditure on TRT for patients under 65 years of age has risen from \$0.6 million in 2000 to \$3.4 million in 2013, while OPDP expenditure on TRT for patients 65 years and older has increased from \$1.7 million in 2000 to \$4.9 million in 2013.

Without any changes to current TRT reimbursement, TRT expenditure is expected to surpass \$9.5 million by 2014 (\$3.9 million for patients <65 years and \$5.6 million for patients ≥65 years) and \$12.2 million by 2016 (\$5.2 million for patients <65 years and \$7.0 million for patients ≥65 years).



If one (only topical forms), two (topical and oral forms) or all formulations of TRT were available under EAP, there would be a reduction in OPDP testosterone replacement therapy expenditure.

Based on historical data from Ontario and data from other provinces, moving topical forms of TRT under EAP would lead to the smallest amount saved – an overall reduction of 20.0% or savings of \$2.4 million respectively by 2016; a reduction of 16.5% for patients <65 years and a reduction of 22.5% for patients ≥65 years.

If topical and oral forms of TRT were moved to EAP, a greater reduction in TRT expenditure is expected – an overall reduction of 31.8% or savings of \$3.9 million respectively by 2016: a reduction of 28.0% for patients <65 years and a reduction of 34.7% for patients ≥65 years.

Moving all TRT formulations under EAP would lead to the greatest amount saved – an overall reduction of 42.9% or savings of \$5.2 million by 2016: a reduction of 36.3% for patients <65 years and a reduction of 47.9% for patients ≥65 years. Under this strategy, the forecasted average number of TRT users per quarter in 2016 would fall from 16,069 to 8,749.

Results were most sensitive to the relative rate of use of the different formulations under each of the alternative reimbursement strategies.

Refer to Appendix B – Reimbursement Based Economic Assessment for a detailed report of the reimbursement based economic assessment.

## Appendices

### Appendix A – A Systematic Review of Economic Evidence

#### Research Question

What is the current evidence for the cost-effectiveness of testosterone replacement therapy in all clinical areas where it is indicated?

#### Review of Published Literature

##### Search Strategy and Search Findings

###### *Search Strategy*

A search of published literature from 1946 to present (2014 April 28) in Ovid Medline (indexed, in-process and other non-indexed) and Embase Classic & Embase 1947 to 2014 April 25 was conducted in order to capture all relevant literature. Key words relating to testosterone replacement therapy were combined with a standardized search strategy for identifying economic analyses adopted by National Health Service Economic Evaluation Database (NHS EED). The complete search strategy can be found in Appendix A1: Search Strategy.

In addition, any citations included by manufacturers in their evidence submission packaged were screened. Reasons for inclusion/exclusion can be found in Appendix A2: List of Citations Included by Manufacturer. As well, the Tufts CEA registry and NHS EED were also searched for relevant articles. Any relevant grey literature was identified through the Canadian Agency for Drugs and Technologies in Health and National Institute for Health and Care Excellence websites. Moreover, the reference lists of relevant studies were hand searched for additional relevant studies.

###### *Search Findings*

In total 815 citations were identified: 814 citations from the original search and one additional citation from a manufacturer.

Two reviewers (KAS and KT) independently reviewed the literature searches in order to identify potential articles for critical appraisal. Any disagreements were resolved through consensus.

Of the 815 citations that were identified, a total of 57 citations were identified for potential inclusion within the report. 733 citations were excluded for the following reasons: not an economic analysis or not relevant intervention. An additional 25 citations were excluded because the reports were non-English, not available or not full text. Results of the search can be found in Appendix A3: Results of

Search.

The 57 potential studies identified from title and abstract screening were reviewed by two reviewers (KAS and KT). Of these, one publication which addressed the objective of the review was selected for inclusion. Those studies that were not included in the review along with the reasons for exclusion are detailed in Appendix A4: List of Excluded Studies.

### *Included Studies*

The comprehensive list of included studies can be found in Appendix A5: List of Included Studies.

## **Summary and Critical Appraisal of Included Studies: Testosterone Replacement Therapy**

### *Included Studies*

One study was selected for inclusion in this review. This report was a cost-utility analysis comparing testosterone undecanoate depot injection treatment to no treatment in patients with Klinefelter syndrome and in patients with late-onset hypogonadism, aged 20-88 years.<sup>1</sup>

No sponsorship was disclosed, however, the authors were employed by Bayer.<sup>1</sup>

This study used an individual patient model based analysis with a lifetime time frame and a one month cycle length. It considered both a Swedish health care payer and societal perspective.<sup>1</sup>

Efficacy data was based on assumption of 100% response. Utility values were derived from the EQ-5D.<sup>1</sup>

The analysis did not consider generic prices or adverse events. Deterministic sensitivity analysis was conducted – no probabilistic analysis was conducted.<sup>1</sup>

A table summarizing the included report is provided in Appendix A6: Characteristics of Reviewed Study.

Thus, given the above, the quality of this study was assessed in terms of: the source of effectiveness data; the costs associated the use of testosterone replacement therapy, the consideration of generic prices, the inclusion of adverse events, the consideration of utility values; and the adoption of sensitivity analysis.

The applicability of this study was assessed in terms of: sponsorship, perspective, relevance of comparators, and reporting of results.

### ***Testosterone Replacement Therapy Considerations***

#### Multiple indications

In Canada, testosterone replacement therapy in adult males is indicated for conditions associated with a deficiency or absence of endogenous testosterone (hypogonadism).<sup>4</sup> In other countries, testosterone replacement therapy may be indicated for delayed puberty, sarcopenia, female-to-male transsexualism, osteoporosis, and cardiometabolic disorders.<sup>5</sup> There is therefore a possible off-label use of testosterone

replacement therapy in Canada. As a result, the research question for this systematic review was not limited to a particular indication.

### Adverse events

Testosterone replacement therapy is associated with an increase in red blood cell production, and an increase in blood viscosity which may lead to increased risk of stroke.<sup>5</sup> Moreover, testosterone replacement therapy may be associated with liver dysfunction and may reduce high-density protein cholesterol, but increase triglyceride levels and low-density protein cholesterol.<sup>5</sup> As well, testosterone replacement therapy may be related to the development of prostate cancer and exacerbations of symptoms of obstructive apnoea.<sup>5</sup> Given the potential for adverse events associated with testosterone replacement therapy, neglecting costs associated with the management of adverse events limits the usefulness of these studies to the question at hand.

### Generic Pricing

Currently in Canada, there are 7 available treatments (1 oral, 2 injectable, 1 patch and 3 topical), with only oral and injectable formats available in generic form. Brand name treatment costs may affect the applicability of the reports to the decision at hand, given that generic prices may be available now or in the near future. Therefore, it is necessary that in the assessment of cost effectiveness generic pricing is incorporated to be reflective of the current or near future situation. Failure to do so will limit the usefulness of studies to the question at hand.

## *Concerns Relating to the Literature*

### Paucity of evidence

There is a paucity of evidence regarding the cost-effectiveness of testosterone replacement therapy. Only one study met the inclusion criteria for this report.

### Comparators

The study included in this report compared testosterone undecanoate depot injection to no treatment.<sup>1</sup> Testosterone undecanoate depot injections are not available as a treatment option in Canada. Therefore, there were no available comparisons of active treatments.

### Sponsorship

The study did not disclose sponsorship, however, its authors were employed by a manufacturer.<sup>1</sup>

### Canadian content

There were no relevant reports from a Canadian perspective. The one available study was from a Swedish perspective and included a product not available in Canada.

## Included Study

### Arver et al. (2014)

A recent cost-utility analysis was conducted using a Swedish health care payer perspective and societal perspective.<sup>1</sup> This analysis compared the cost effectiveness of testosterone undecanoate depot injection treatment to no treatment in patients with Klinefelter syndrome and in patients with late-onset hypogonadism, aged 20-88 years.

The study was conducted using an individual patient model with a lifetime time frame and a one month cycle length. Patients may transition from hypogonadism to a complication such as type 2 diabetes (T2D), cardiovascular events (CV) as a result of T2D, cerebrovascular events (CBV) as a result of T2D, major depression, fractures, and death. Estimates of relative treatment effectiveness were derived from a systematic review of clinical trials. Efficacy measures were risk of developing long term complications and risk of death. Utility values for health states were derived from the EQ-5D. Adverse events were not considered. Costs included within the model were direct treatment costs (drug acquisition cost, cost related to treatment administration and monitoring) and indirect costs (for societal perspective included production losses because of administration of treatment; incurred long term clinical complications and mortality until retirement of 65 years of age). Generic prices were not considered.

In patients with Klinefelter syndrome, the incremental cost utility ratios were €16,884 per QALY from a societal perspective and €13,265 per QALY from a health care payer perspective. In patients with late-onset hypogonadism, the incremental cost utility ratios were €19,720 per QALY from a societal perspective and €9,886 per QALY from a health care payer perspective. Sensitivity analyses suggest that results were insensitive to changes to risk of developing long term complications, costs, and age; as well as, scenarios including mortality from CV/CBV events only and diabetes related mortality only.

Strengths of this analysis were that costs and outcomes were modelled over a lifetime time frame and final outcomes (QALYs) were considered. Key limitations were that the analysis did not compare active treatments and that probabilistic sensitivity analysis was not considered. It is also important to note that although no financial support was disclosed, authors are employed by a manufacturer of testosterone undecanoate.

However, the major weakness of this study related to the modeling of effectiveness. The authors assumed that TRT leads to a 100% response with respect to increased testosterone levels and that this was maintained for lifetime without treatment waning. This was assumed to be immediate without any negative effects of prior low testosterone levels. Further, they assumed that the relationship between testosterone levels and diabetes risk was the same for treated patients as in untreated patients. Finally, the effect of diabetes on cardiovascular events was modelled without calibration despite the high incidence of type 2 diabetes in the population. All of these assumptions would inflate the modeled benefits from testosterone replacement therapy.

Applicability of this study is limited given that it is not from the Canadian perspective, a limited number of treatment alternatives were included, it only included testosterone undecanoate injections which are

not available in Canada and it may be subject to bias due to conflict of interest.

### Overall Conclusions

Overall, only one study was identified for inclusion in our review. It was a cost-utility analysis which compared testosterone undecanoate depot injection treatment to no treatment in patients with Klinefelter syndrome and in patients with late-onset hypogonadism, aged 20-88 years.<sup>1</sup> The study was linked to industry and concluded that testosterone replacement therapy was cost effective compared to no treatment. For the treatment of Klinefelter syndrome, the incremental cost utility ratios of testosterone undecanoate versus no treatment would be \$24,617 per QALY in \$CAN 2014 from a health care payer perspective and \$31,333 per QALY in \$CAN 2014 from a societal perspective.<sup>2,3</sup> For the treatment of late onset hypogonadism, the incremental cost utility ratios of testosterone undecanoate versus no treatment would be \$18,346 per QALY in \$CAN 2014 from a health care payer perspective and \$36,596 per QALY in \$CAN 2014 from a societal perspective.<sup>2,3</sup>

However, major limitations with this study with respect to the assumptions relating to treatment effectiveness were noted.

### Conclusions

In brief, this review highlights the paucity of current economic evidence for the cost-effectiveness of testosterone replacement therapy in all clinical areas where it is indicated. Given the lack of evidence and concerns with the methodological quality of the available study, no inferences over the cost effectiveness of testosterone replacement therapy can be made.

As a result, the reimbursement based economic assessment will focus solely on the budget impact of alternative reimbursement scenarios for testosterone replacement therapy.

## Appendix A - Appendices

### Appendix A1: Search Strategy

The following is the search strategy used in Medline (Ovid) and Embase.

#### **Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations (1947 to 2014 April 28), Embase Classic+Embase (1946 to present (2014 April 25))**

1. testosterone replacement therapy.mp. [mp=ti, ab, sh, hw, tn, ot, dm, mf, dv, kw, nm, kf, px, rx, ui]
2. testosterone replacement therapy.tw.
3. exp testosterone replacement/
4. 1 or 2 or 3
5. testosterone.tw,rn.
6. ANDRIOL.tw,rn.
7. ANDRODERM.tw,rn.
8. ANDROGEL.tw,rn.
9. AXIRON.tw,rn.
10. DELATESTRYL.tw,rn.
11. DEPO-TESTOSTERONE.tw,rn.
12. PMS-TESTOSTERONE.tw,rn.
13. PMS-TESTOSTERONE ENANTHATE.tw,rn.
14. TESTIM 1%.tw,rn.
15. TESTOSTERONE CYPIONATE.tw,rn.
16. TESTOSTERONE PROPIONATE.tw,rn.
17. 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16
18. 4 or 17
19. health economics/
20. exp economic evaluation/
21. exp "health care cost"/
22. exp pharmacoeconomics/
23. 19 or 20 or 21 or 22
24. Economics/
25. exp "Costs and Cost Analysis"/
26. Economics, Pharmaceutical/
27. 24 or 25 or 26
28. 23 or 27

- 29. 18 and 28
- 30. limit 29 to humans
- 31. (letter or editorial).pt.
- 32. 30 not 31



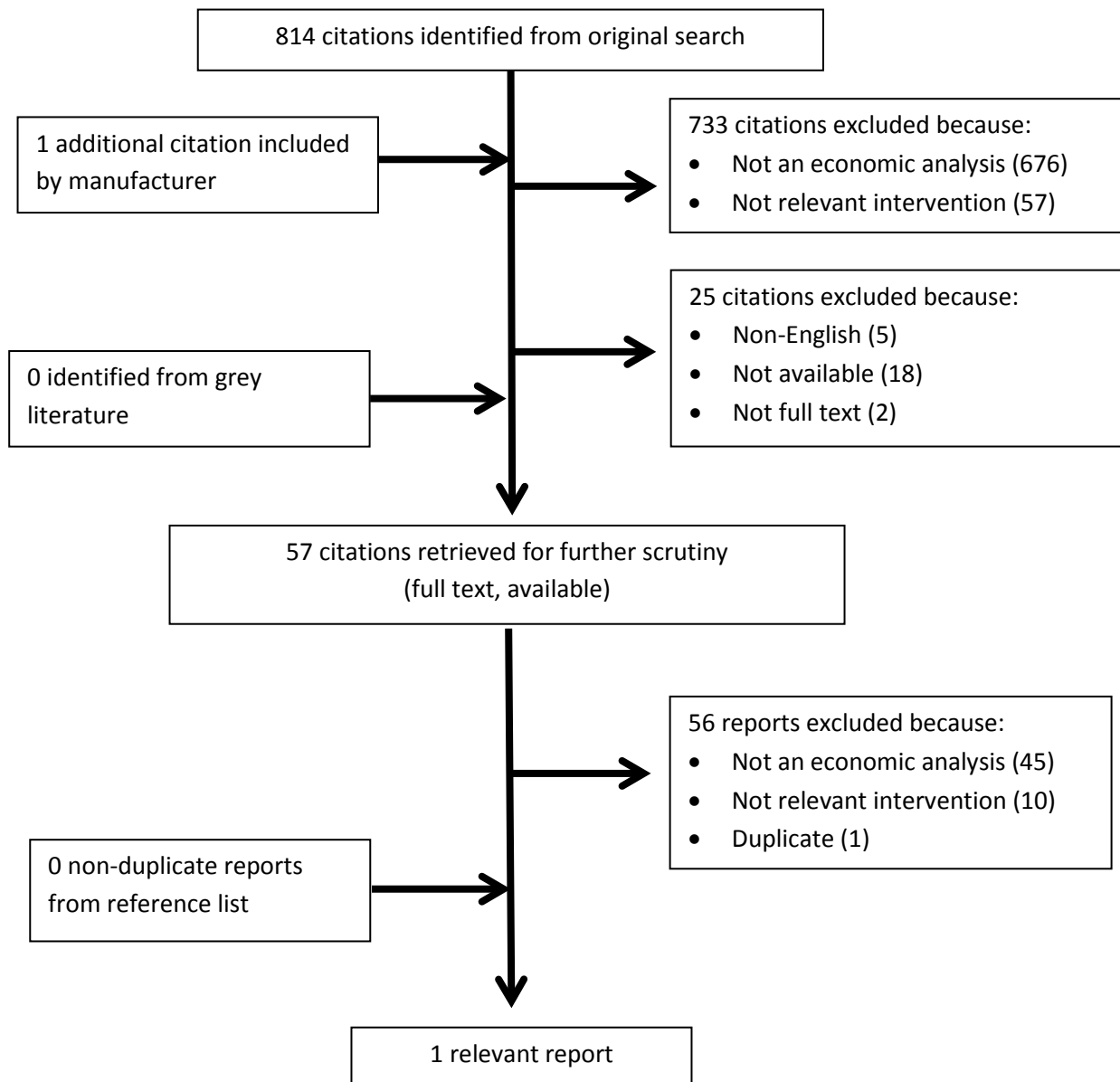
## Appendix A2: List of Citations Included by Manufacturer

The following table includes a study submitted by the manufacturer in their evidence submission package.

Study Reference	Additional Citation From Original Search	Relevant Citation	Reason For Inclusion/Exclusion
Lachaine J, Beauchemin C, Lapierre ME, Snow LA. Utilization trends of various formulations of testosterone: An analysis of the RAMQ database [abstract]. Value in Health. 2013;16(3):A175.	Yes	No	This report is not an economic analysis and is only available in abstract form; therefore, it is not considered a relevant report.

## Appendix A3: Results of Search

The following flow chart illustrates the results of the literature search.



## Appendix A4: List of Excluded Studies

The following table lists the citations retrieved for further scrutiny which were excluded from the review in addition to the rationale for their exclusion.

Reference #	Study Reference	Reason For Exclusion
6	Hickey M, Elliott J, Davison SL. Hormone replacement therapy. <i>BMJ (Online)</i> . 2012;344(7845):44-9.	Not an economic analysis
7	Kamerow D. Getting your "t" up big pharma creates a new disease: Low testosterone. <i>BMJ (Online)</i> . 2014;348.	Not an economic analysis
8	Roth MY. Male hormonal contraception. <i>The virtual mentor : VM</i> . 2012;14(2):126-32.	Not an economic analysis
9	Sigman M. Think before ordering that test. <i>Fertility and Sterility</i> . 2013;100(1):43-4.	Not an economic analysis
10	Taplin M-E. Secondary hormone therapy for castration-resistant prostate cancer. <i>ONCOLOGY (United States)</i> . 2013;27(5).	Not an economic analysis
11	Thomas BC, Neal DE. Androgen deprivation treatment in prostate cancer. <i>BMJ (Online)</i> . 2013;346(7893).	Not an economic analysis
12	Ioannidis JPA. Mega-trials for blockbusters. <i>JAMA - Journal of the American Medical Association</i> . 2013;309(3):239-40.	Not an economic analysis
13	Hickey M, Elliott J, Davison SL. Hormone replacement therapy. <i>BMJ (Online)</i> . 2012;344(7845):44-9.	Not an economic analysis
14	Kaltenboeck A, Foster S, Ivanova J, Diener M, Bergman R, Birnbaum H, et al. The Direct and Indirect Costs among U.S. Privately Insured Employees with Hypogonadism. <i>Journal of Sexual Medicine</i> . 2012;9(9):2438-47.	Not an economic analysis
15	Handelsman DJ. Pharmacoepidemiology of testosterone prescribing in Australia, 1992-2010. <i>The Medical journal of Australia</i> . 2012;196(10):642-5.	Not an economic analysis
16	Jorgensen AP, Bollerslev J. Bone: Growth hormone replacement-implications for bone health. <i>Nature Reviews Endocrinology</i> . 2012;8(6):325-6.	Not an economic analysis

17	Wyllie MG. 'New kids' in androgen(i) city. BJU International. 2012;109(7):E19-E20.	Not an economic analysis
18	Payton S. Prostate cancer: Dutasteride-a welcome addition to active surveillance? Nature Reviews Urology. 2012;9(3):119.	Not an economic analysis
19	Payton S. Prostate cancer: Hormone therapy dosing regimen affects development of castration resistance. Nature Reviews Urology. 2011;8(3):117.	Not an economic analysis
20	Spence D. Men behaving madly: testosterone replacement therapy. BMJ (Clinical research ed ). 2010;340:c1493.	Not an economic analysis
21	Inadvertent Castration. AORN Journal. 2010;91(3):422,325.	Not an economic analysis
22	Sexson E, Knezevich J. Male hypogonadism: A review of the disease and its treatment. U S. 2010;Pharmacist.(6):HS7-HS16.	Not an economic analysis
23	Wyllie MG. Green shoots: But will the sap rise? BJU International. 2010;105(1):129-30.	Not an economic analysis
24	Feneley MR. Is it worth the wait? BJU International. 2009;104(1):121-2.	Not an economic analysis
25	Martineau B. A look at fast-dissolving drug delivery systems. Drug Delivery Technology. 2009;9(4):36-7.	Not an economic analysis
26	Jones MC. Treatment options for androgenic alopecia. U S. 2008;Pharmacist.(8).	Not an economic analysis
27	Wyllie MG. X marks the spot for BPH therapy? BJU International. 2008;102(3):399-400.	Not an economic analysis
28	Movassaghi M, Turek PJ. The cost-effectiveness of treatments for male infertility. Expert Review of Pharmacoeconomics and Outcomes Research. 2008;8(2):197-206.	Not an economic analysis
29	Perls TT. DHEA and testosterone in the elderly. The New England journal of medicine. 2007;356(6):636.	Not an economic analysis
30	Wyllie MG. The female sexual dysfunction (FSD) revolution reverts to evolution. BJU International. 2007;100(3):697-8.	Not an economic analysis

31	Maggi M, Schulman C, Quinton R, Langham S, Uhl-hochgraeber K. The burden of testosterone deficiency syndrome in adult men: Economic and quality-of-Life impact. <i>Journal of Sexual Medicine</i> . 2007;4(4 I):1056-69.	Not an economic analysis
32	Martinez L. Testosterone for women's sexual health disorders: making our voices heard. <i>AWHONN lifelines / Association of Women's Health, Obstetric and Neonatal Nurses</i> . 2006;10(3):210-1.	Not an economic analysis
33	Verma P, Mahajan KK, Mittal S. Andropause - A debatable physiological process. <i>JK Science</i> . 2006;8(2):68-72.	Not an economic analysis
34	Davis SR. The use of androgens for female sexual dysfunction. <i>Nature Clinical Practice Urology</i> . 2006;3(4):176-7.	Not an economic analysis
35	Kingsberg SA. The testosterone patch for women. <i>International Journal of Impotence Research</i> . 2005;17(5):465-6.	Not an economic analysis
36	Sun P, Seftel A, Swindle R, Ye W, Pohl G. The costs of caring for erectile dysfunction in a managed care setting: Evidence from a large national claims database. <i>Journal of Urology</i> . 2005;174(5):1948-52.	Not an economic analysis
37	Spark RF. Intrinsic fails to impress FDA advisory panel. <i>International Journal of Impotence Research</i> . 2005;17(3):283-4.	Not an economic analysis
38	Moynihan R. The marketing of a disease: Female sexual dysfunction. <i>British Medical Journal</i> . 2005;330(7484):192-4.	Not an economic analysis
39	Female testosterone patch rejected by advisory committee. <i>Nature Reviews Drug Discovery</i> . 2005;4(1):7.	Not an economic analysis
40	Rinaldi A. Hormone therapy for the ageing. <i>EMBO Reports</i> . 2004;5(10):938-41.	Not an economic analysis
41	Hanna KE. No fountain of youth: FDA and NIH review off-label use of hormones. <i>The Hastings Center report</i> . 2003;33(4):8-9.	Not an economic analysis
42	Pc spes. <i>Medical Letter on Drugs and Therapeutics</i> . 2001;43(1098):15-6.	Not an economic analysis
43	AndroGel. <i>Medical Letter on Drugs and Therapeutics</i> . 2000;42(1080):49-51.	Not an economic analysis

44	Goktas S, Ziada A, Crawford ED. Combined androgen blockade for advanced prostatic carcinoma. <i>Prostate Cancer and Prostatic Diseases</i> . 1999;2(4):172-9.	Not an economic analysis
45	Patch available for testosterone deficiency. <i>AIDS Patient Care and STDs</i> . 1998;12(6):498.	Not an economic analysis
46	Kaltenboeck A, Foster S, Ivanova J, Diener M, Bergman R, Birnbaum H, et al. The direct and indirect costs among U.S. privately insured employees with hypogonadism. <i>J Sex Med</i> . 2012 Sep;9(9):2438-47.	Not an economic analysis
47	Maggi M, Schulman C, Quinton R, Langham S, Uhl-hochgraeber K. The burden of testosterone deficiency syndrome in adult men: economic and quality-of-life impact. <i>J Sex Med</i> . 2007 Jul;4(4 Pt 1):1056-69.	Not an economic analysis
48	Sun P, Seftel A, Swindle R, Ye W, Pohl G. The costs of caring for erectile dysfunction in a managed care setting: evidence from a large national claims database. <i>J Urol</i> . 2005 Nov;174(5):1948-52.	Not an economic analysis
49	AndroGel. <i>Med Lett Drugs Ther</i> . 2000 Jun 12;42(1080):49-51.	Not an economic analysis
50	Evens RP, Amerson AB. Androgens and erythropoiesis. <i>J Clin Pharmacol</i> . 1974 Feb;14(2):94-101.	Not an economic analysis
51	Organ M, Wood L, Wilke D, Skedgel C, Cheng T, North S, et al. Intermittent LHRH therapy in the management of castrate-resistant prostate cancer (CRPCa) : Results of a multi-institutional randomized prospective clinical trial. <i>American Journal of Clinical Oncology: Cancer Clinical Trials</i> . 2013;36(6):601-5.	Not relevant intervention
52	Taylor F, Levine L. Clomiphene citrate and testosterone gel replacement therapy for male hypogonadism: Efficacy and treatment cost. <i>Journal of Sexual Medicine</i> . 2010;7(1 PART 1):269-76.	Not relevant intervention
53	Clay PG. Program savings associated with switching testosterone intramuscular injections to topical gel in HIV infected males. <i>Current Medical Research and Opinion</i> . 2004;20(4):461-8.	Not relevant intervention
54	Bryant J, Loveman E, Chase D, Mihaylova B, Cave C, Gerard K, et al. Clinical effectiveness and cost-effectiveness of growth hormone in adults in relation to impact on quality of life: A systematic review and economic evaluation. <i>Health Technology Assessment</i> . 2002;6(19).	Not relevant intervention

55	Tan HL. Economic cost of male erectile dysfunction using a decision analytic model: For a hypothetical managed-care plan of 100 000 members. <i>Pharmacoeconomics</i> . 2000;17(1):77-107.	Not relevant intervention
56	Bowers SP, Pearlman NW, McIntyre J, Finlayson CA, Huerd S. Cost-effective management of gynecomastia. <i>American Journal of Surgery</i> . 1998;176(6):638-41.	Not relevant intervention
57	Taylor F, Levine L. Clomiphene citrate and testosterone gel replacement therapy for male hypogonadism: efficacy and treatment cost. <i>J Sex Med</i> . 2010 Jan;7(1 Pt 1):269-76.	Not relevant intervention
58	Clay PG. Program savings associated with switching testosterone intramuscular injections to topical gel in HIV infected males. <i>Curr Med Res Opin</i> . 2004 Apr;20(4):461-8.	Not relevant intervention
59	Tan HL. Economic cost of male erectile dysfunction using a decision analytic model: for a hypothetical managed-care plan of 100,000 members. <i>Pharmacoeconomics</i> . 2000 Jan;17(1):77-107.	Not relevant intervention
60	Taylor F, Levine L. Clomiphene citrate and testosterone gel replacement therapy for male hypogonadism: efficacy and treatment cost. <i>J Sex Med</i> . 2010 Jan;7(1 Pt 1):269-76.	Not relevant intervention
61	Arver S, Luong B, Fraschke A, Ghatnekar O, Stanisic S, Gultyev D, et al. Is testosterone replacement therapy in males with hypogonadism cost-effective? An analysis in Sweden. <i>J Sex Med</i> . 2014 Jan;11(1):262-72.	Duplicate

## Appendix A5: List of Included Studies

The following table includes the study reviewed in this report.

Reference #	Study Reference
1	Arver S, Luong B, Fraschke A, Ghatnekar O, Stanisic S, Gultyev D, et al. Is Testosterone Replacement Therapy in Males with Hypogonadism Cost-Effective? An Analysis in Sweden. <i>Journal of Sexual Medicine</i> . 2014;11(1):262-72.



## Appendix A6: Characteristics of Reviewed Study

The following table lists characteristics of the reviewed study.

Study	Arver et al., 2014
<b>Sponsorship</b>	None disclosed Authors are employed by Bayer, the manufacturer of a testosterone undecanoate
<b>Country</b>	Sweden
<b>Perspective</b>	Health care payer perspective Societal perspective
<b>Study type</b>	Cost-utility analysis
<b>Comparators</b>	testosterone undecanoate depot injection no treatment
<b>Populations</b>	Patients with Klinefelter syndrome and patients with late-hypogonadism Age ranging between 20-88 years
<b>Time horizon</b>	Lifetime
<b>Type of model</b>	Individual patient model
<b>Cycle length</b>	One month
<b>Efficacy inputs</b>	Risk of developing long term complications and death Quality of life
<b>Adverse events</b>	Not included
<b>Utilities</b>	EQ-5D
<b>Discounting</b>	Costs and outcomes at 3%
<b>Outcomes</b>	Incremental cost per QALY
<b>Results</b>	<p><u>Klinefelter syndrome</u> From a societal perspective, the incremental cost utility ratio for testosterone undecanoate versus placebo was €16,884 per QALY From a health care payer perspective, the incremental cost utility ratio for testosterone undecanoate versus placebo was €13,265 per QALY</p> <p><u>Late-onset hypogonadism</u> From a societal perspective, the incremental cost utility ratio for testosterone undecanoate versus placebo was €19,720 per QALY From a health care payer perspective, the incremental cost utility ratio for testosterone undecanoate versus placebo was €9,886 per QALY</p>
<b>Types of sensitivity analysis</b>	<p><u>Deterministic analysis (one-way)</u> Risk of developing long term complications Costs Age</p> <p><u>Deterministic analysis (scenario)</u> Mortality due to CV/CBV events only Diabetes related mortality only</p>

<b>Sensitivity analysis results</b>	<p><u>Deterministic analysis (one-way)</u> Results not sensitive to risk of developing long term complications, costs, and age</p> <p><u>Deterministic analysis (scenario)</u> Results not sensitive to scenarios including mortality due to CV/CBV events only and diabetes related mortality only</p>
<b>Points to consider</b>	<p>Costs €(2009) Generic prices not considered Efficacy data based on assumption of 100% response Impact of increased testosterone derived from data not specifically related to treatment response The analysis reports two separate populations: patients with Klinefelter syndrome and patients with late-onset hypogonadism Adverse events not considered Utilities derived from the EQ-5D PSA not considered Comparison of testosterone undecanoate to no treatment</p>

## Appendix B – Reimbursement Based Economic Assessment

### Research Question

What is the economic impact of alternative policies for reimbursing testosterone replacement therapies?

### Methods Reimbursement Based Economic Assessment

An applied, policy-oriented economic model focusing on financial impact was created to facilitate the consideration of alternative reimbursement scenarios for testosterone replacement therapy. The analysis used OPDP data on usage of testosterone replacement therapy (oral, patch, topical, injection) from 2000-2013. In addition data from other provinces were sourced from the accompanying pharmacoepidemiology report. Further Ontario administrative databases were used to identify patients who had laboratory tests prior to commencement of testosterone replacement therapy and/or a diagnosis of HIV.

The model was developed within Microsoft Excel. Expenditure for testosterone replacement therapy for the next three years, 2014-2016, was predicted using time series analysis. Expenditure was separated and analysed by age of patient (Patients <65 years and Patients ≥65 years).

Four models were considered for forecasting expenditure:

1. A linear model whereby expenditure was assumed to increase by the same amount each year and also increase with each new testosterone replacement therapy covered under OPDP and incorporated the number of generic treatment available.
2. An exponential model where an exponential relationship between expenditure and time and number of testosterone replacement therapy covered was assumed and incorporated the number of generic treatment available.
3. A power model whereby a non-linear relationship between time and expenditure was allowed – this model also incorporated the number of testosterone replacement therapy covered and incorporated the number of generic treatment available.
4. A constant growth model whereby a constant percentage increase in expenditure was assumed with the addition of a testosterone replacement therapy to coverage also leading to a percentage increase.

Within all models the following covariates were considered; quarter (i.e.: January-March 2000 was quarter 1, April-June 2000 was quarter 2, etc.), number of available TRT products, and the availability of a generic formulation. Quarter and number of products were continuous variables and generic formulations was a binary variable. In addition, each model was examined for seasonal effects based on an absolute and Winters seasonal effects. For each model, the best suitable combination of independent variables and inclusion of seasonal effects was selected based on the Akaike Information Criterion (AIC). Once the most appropriate functional form for each of the four models was chosen, the appropriate model for each age group was determined using the smallest AIC.

The exponential model with quarter and availability of generic formulation as independent variables and absolute seasonal effects was chosen for patients under 65 years of age and the power model with quarter, number of testosterone replacement therapy covered, and availability of generic formulation as independent variables and absolute seasonal effects was chosen for patients 65 and over (see Appendix B1: Model Details for model details). Once forecasts of expenditure for 2014-16 were obtained (Status Quo), expenditures under three alternative reimbursement strategies were estimated. The three strategies considered were:

All products to EAP: Under this strategy, all products were moved to the province's Exceptional Access Program (EAP) whereby they are available only to patients for whom a written request has been received OPDP from their physician outlining that they meet specified criteria for reimbursement. In this context, the criteria will be either HIV positive or had a positive lab test result for hypogonadism. For this strategy, the use of TRT products will be estimated based on the proportion of patients stratified by age and type of product who received TRT products in 2013 who were either HIV positive or had a lab test prior to commencement of therapy. Thus, analysis took the conservative approach (i.e. underestimating the number of ineligible patients and hence the budget saving from move to EAP) by assuming that all patients who had undergone a lab test would be eligible. This may be countered to, a small degree, by any lab tests conducted that were privately funded. Although analysis did not include the costs associated with any increase in the volume of testosterone tests, the low costs of tests compared with the costs of drug treatment would suggest that this would have little impact.

Oral and topical products to EAP: Under this strategy, all oral and topical products were moved to the EAP based on the same criteria above and use will be estimated as above. The overall rate of use of TRT products stratified by age will be estimated by assuming that the rate of use per beneficiary will be the lesser of the current rate in Ontario or the rate in Alberta where there is restricted access to oral and topical products. To estimate the rate of use of injection and patch products, it is assumed the ratio of current use of these products can be applied to the difference in the overall rate of use and the rate of use of oral and topical products under this strategy.

Topical products to EAP: Under this strategy, all topical products were moved to the EAP based on the same criteria above and use will be estimated as above. The overall rate of use of TRT products stratified by age will be estimated by assuming that the rate of use per beneficiary will be the lesser of the current rate in Ontario or the combined rate in Manitoba and Nova Scotia where there is restricted access to topical products. However, if this rate is less than the rate in Alberta then the same rate as the previous strategy will be adopted to avoid a counter intuitive result. To estimate the rate of use of oral, injection and patch products, it is assumed the ratio of current use of these products can be applied to the difference in the overall rate of use and the rate of use of topical products under this strategy.

Analysis is based on the following four assumptions:

1. All tests are positive, so if tested, then patients will be eligible under EAP. This assumption was required as data were not available on lab results just the conduct of tests.

2. There will be no extra testing with EAP. It is possible that by moving products to EAP, where a test will be required, more patients will be tested.
3. Overall rates for selective moving of products to EAP can be estimated based on provinces with similar listing status.
4. The relative use between products not moved to EAP will remain as is.

The following sensitivity analyses were conducted to address each of these scenarios:

1. It is assumed that 75% of lab results are positive.
2. It is assumed that 50% of patients who were not tested prior to initiation of therapy will now be tested.
3. There will be no switching of products. That is, for example, if a patient who would have had a topical product is not eligible for EAP, they will not move to another product not under EAP.
4. Under the Topical to EAP and Oral and Topical to EAP strategies, usage will be exactly as Alberta and Manitoba and Nova Scotia respectively.

## Findings

### Current Usage and Expenditure

**Table 1 Average Number of Testosterone Replacement Therapy Users per Quarter by Age**

AVERAGE NUMBER OF TESTOSTERONE REPLACEMENT THERAPY USERS PER QUARTER IN 2013			
	N(%)		
	OVERALL	PATIENTS <65 YEARS	PATIENTS ≥65 YEARS
Total TRT	10,862 (100%)	4,697 (100%)	6,165 (100%)
Oral	2,967 (27%)	973 (21%)	1,994 (32%)
Patch	95 (1%)	43 (1%)	52 (1%)
Topical	3,993 (37%)	1,261 (27%)	2,732 (44%)
Injection	3,807 (35%)	2,421 (52%)	1,387 (22%)

Total number of TRT users per quarter was 10,862, more than half (57%) were aged 65 years and over

### Summary of Average Number of Testosterone Replacement Therapy Users per Quarter by Age

- The total number of TRT users per quarter was 10,862, ranging from 4,697 users under age 65 to 6,165 users aged 65 and over.
- Overall, users of topical TRT accounted for more than a third of TRT users (37%), with patients under age 65 accounting for 27% of users and 44% of patients aged 65 and over.
- Similarly, users of injection TRT accounted for more than a third of TRT users (35%), with patients under age 65 accounting for 52% of users and 22% of patients aged 65 and over.
- TRT in the form of patches are less common, with only 1% of patients using TRT patches.

**Table 2 Testosterone Replacement Therapy Prescription by Age**

TESTOSTERONE REPLACEMENT THERAPY PRESCRIPTIONS IN 2013			
	N(%)*		
	OVERALL	PATIENTS <65 YEARS	PATIENTS ≥65 YEARS
Total TRT	77,384(100%)	39,885(100%)	37,499(100%)
Oral	29,371(38%)	15,440(39%)	13,931(37%)
Patch	882(1%)	561(1%)	321(1%)
Topical	28,104(36%)	11,289(28%)	16,815(45%)
Injection	19,027(25%)	12,595(32%)	6,432(17%)

\* Number of prescriptions for patients <65 years and patients ≥65 years may not total Overall Number of prescriptions due to removal of data when number of patients are ≤5

Oral testosterone replacement therapy was the most commonly prescribed formulation

### Summary of Testosterone Replacement Therapy Prescription by Age

- Oral testosterone replacement therapy was the most commonly prescribed formulation, followed by topical testosterone replacement therapy.
- A total of 77,384 prescriptions for testosterone replacement therapy were filled; 39,885 for patients under 65 and 37,499 for patients 65 and over.
- In patients under 65 years of age, more prescriptions for oral testosterone replacement therapy were given than prescriptions for topical testosterone replacement therapy.
- In contrast, more prescriptions for topical testosterone replacement therapy were given to patients aged 65 and older than prescriptions for oral testosterone replacement therapy.

**Table 3 OPDP Expenditure on Testosterone Replacement Therapy from 2000-2013 (Adjusted to 2013 \$CAN)**

TESTOSTERONE REPLACEMENT THERAPY EXPENDITURE			
§*			
YEAR	OVERALL	PATIENTS <65 YEARS	PATIENTS ≥65 YEARS
2000	\$2,300,330	\$576,169	\$1,722,391
2001	\$2,550,370	\$632,325	\$1,917,546
2002	\$3,055,103	\$786,296	\$2,268,709
2003	\$3,459,787	\$910,348	\$2,549,438
2004	\$3,575,057	\$974,752	\$2,589,975
2005	\$4,061,891	\$1,304,567	\$2,755,997
2006	\$3,767,857	\$1,396,338	\$2,371,520
2007	\$4,028,459	\$1,559,005	\$2,469,453
2008	\$4,512,579	\$1,762,974	\$2,749,606
2009	\$5,269,104	\$2,098,880	\$3,170,224
2010	\$5,770,621	\$2,299,345	\$3,471,276
2011	\$6,260,914	\$2,558,665	\$3,702,249
2012	\$7,353,701	\$3,065,987	\$4,287,713
2013	\$8,264,275	\$3,408,108	\$4,856,167

\* Expenditure for patients <65 years and patients ≥65 years may not total Overall Expenditure due to removal of data when number of patients are ≤ 5

Testosterone replacement therapy expenditure has increased significantly from \$2.3 million in 2000 to \$8.3 million in 2013

- Testosterone replacement therapy expenditure has risen significantly over the last 13 years.
- In 2000, testosterone replacement therapy expenditure by OPDP was \$2.3 million.
- By 2013, total testosterone replacement therapy expenditure by OPDP was \$8.3 million.
- Patients 65 years of age and older accounted for 59% of total costs (\$4.9 million), while patients under 65 years of age accounted for 41% of OPDP expenditure (\$3.4 million).

Table 4 OPDP Expenditure on Testosterone Replacement Therapy Expenditure by Formulation

TESTOSTERONE REPLACEMENT THERAPY EXPENDITURE IN 2013			
	N(%)*		
	OVERALL	PATIENTS <65 YEARS	PATIENTS ≥65 YEARS
Total TRT	\$8,264,275(100%)	\$3,408,108(100%)	\$4,856,167(100%)
Oral	\$1,804,526(22%)	\$515,063(15%)	\$1,289,463(27%)
Patch	\$90,030(1%)	\$57,264(2%)	\$32,766(1%)
Topical	\$5,339,719(65%)	\$2,146,844(63%)	\$3,192,875(66%)
Injection	\$1,029,999(12%)	\$688,936(20%)	\$341,063(7%)

\* Expenditure for patients <65 years and patients ≥65 years may not total Overall Expenditure due to removal of data when number of patients are ≤5

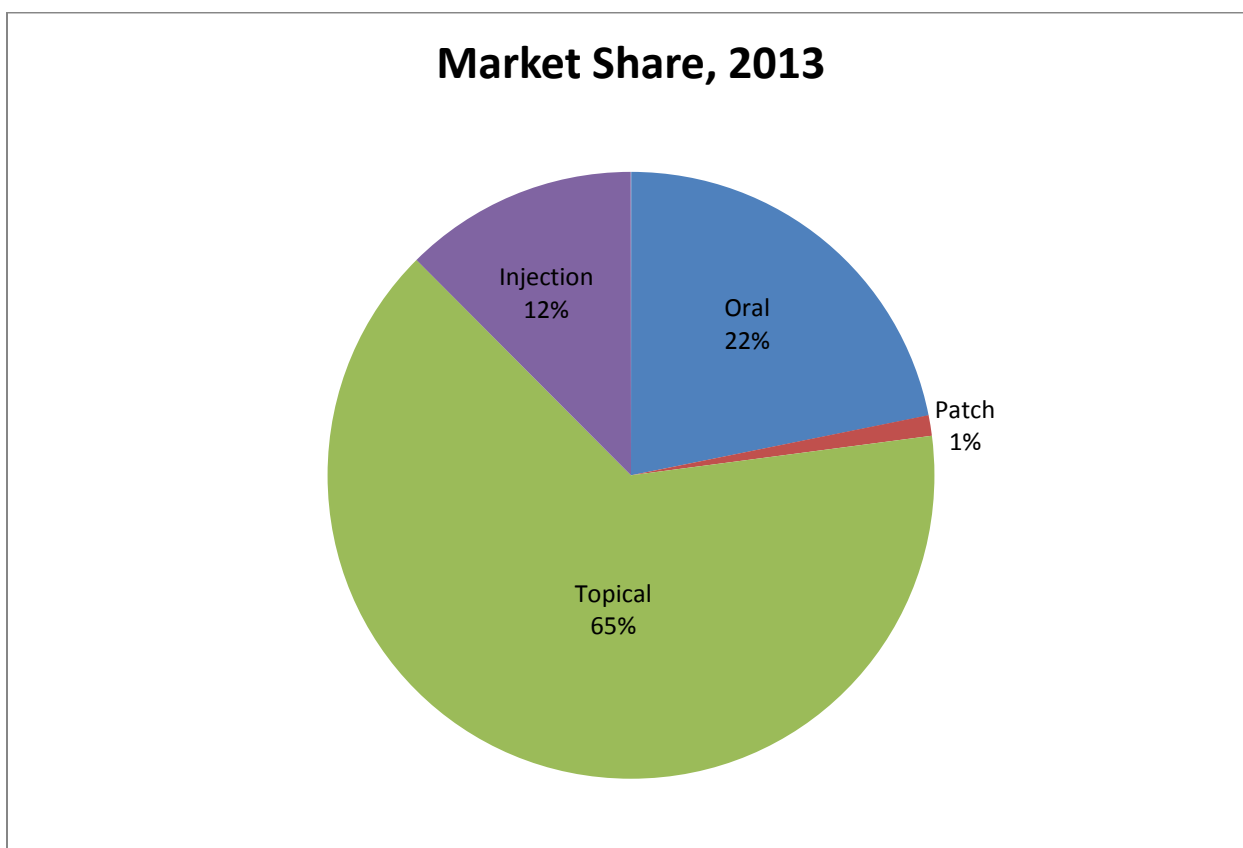
Overall, expenditure on topical testosterone replacement therapy expenditure was the greatest

#### Summary of OPDP Expenditure on Testosterone Replacement Therapy Expenditure by Formulation

- Overall, expenditure on topical testosterone replacement therapy expenditure was the greatest at \$5.3 million, while expenditure on testosterone replacement therapy patches was the least at \$0.1 million.
- For patients under 65 years, expenditure on topical testosterone replacement therapy expenditure was the greatest, followed by injection testosterone replacement therapy expenditure.
- In contrast, for patients 65 years and over, expenditure on topical testosterone replacement therapy expenditure was the greatest, followed by oral testosterone replacement therapy expenditure, then injection testosterone replacement therapy expenditure.



Figure 1 Testosterone Replacement Therapy Market Share in 2013



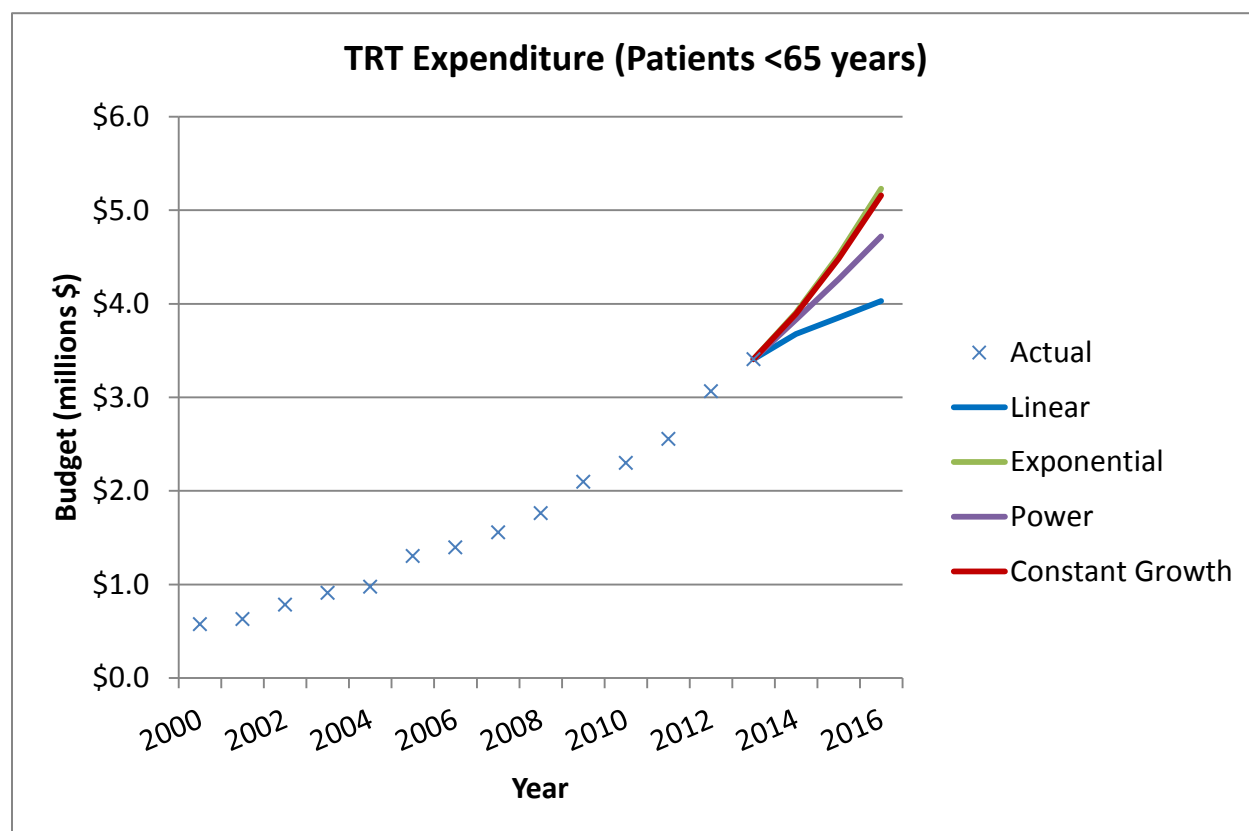
Based on expenditure in 2013, topical testosterone replacement therapy had the largest market share at 65%, whilst patch testosterone replacement therapy had the smallest market share at 1%

#### Summary of Testosterone Replacement Therapy Market Share in 2013

- In 2013, topical testosterone replacement therapy had the largest market share, followed by oral testosterone replacement therapy, and while patch testosterone replacement therapy had the smallest market share.

## Forecasting Expenditure

Figure 2 Testosterone Replacement Therapy Expenditure for Patients <65 years

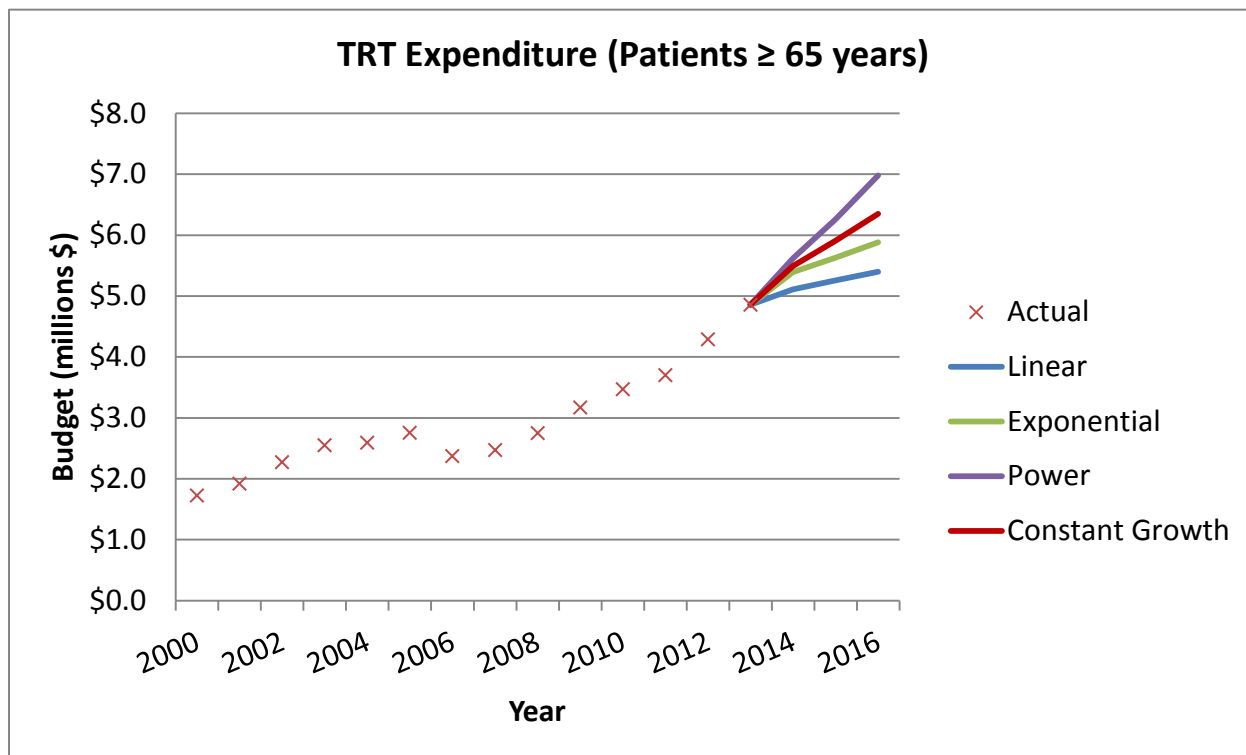


TRT expenditure for patients under 65 years has risen since 2000 and is expected to continue to rise

### Summary of Testosterone Replacement Therapy Expenditure for Patients <65 years

- TRT expenditure for patients under 65 years is expected to rise over the next three years.
- All four models follow an upward trend.
- The exponential model is the most suitable model for forecasting.

Figure 3 Testosterone Replacement Therapy Expenditure for Patients ≥65 years



TRT expenditure for patients 65 years and old has risen since 2006 and is expected to continue to rise

#### Summary of Testosterone Replacement Therapy Expenditure for Patients ≥65 years

- TRT expenditure for patients 65 years and older is expected to rise over the next three years.
- All four models follow an upward trend.
- The power model is the most suitable model for forecasting.

Table 5 Forecasted Testosterone Replacement Therapy Expenditure

YEAR	TRT EXPENDITURE		
	ACTUAL	PATIENTS <65 YEARS	PATIENTS ≥65 YEARS
2000		\$576,169	\$1,722,391
2001		\$632,325	\$1,917,546
2002		\$786,296	\$2,268,709
2003		\$910,348	\$2,549,438
2004		\$974,752	\$2,589,975
2005		\$1,304,567	\$2,755,997
2006		\$1,396,338	\$2,371,520
2007		\$1,559,005	\$2,469,453
2008		\$1,762,974	\$2,749,606
2009		\$2,098,880	\$3,170,224
2010		\$2,299,345	\$3,471,276
2011		\$2,558,665	\$3,702,249
2012		\$3,065,987	\$4,287,713
2013		\$3,408,108	\$4,856,167
<b>ESTIMATED</b>			
2014		\$3,905,533	\$5,620,231
2015		\$4,520,105	\$6,262,704
2016		\$5,230,554	\$6,979,470

Without any changes to current testosterone replacement therapy reimbursement, testosterone replacement therapy expenditure is expected to surpass \$9.5 million by 2014 (\$3.9 million for patients <65 years and \$5.6 million for patients ≥ 65 years) and \$12.2 million by 2016 (\$5.2 million for patients <65 years and \$7.0 million for patients ≥ 65 year)

## Impact of Alternative Approaches to Reimbursement

**Table 6 Rates of Use per 100,000 Eligible Beneficiaries in Ontario, Alberta, and Manitoba/Nova Scotia**

PATIENTS	PROVINCE	ORAL	INJ	TOPICAL	PATCH	TOTAL
<65 YEARS	Alberta	0.0005	0.0045	0.0000	0.0002	0.0052
	MB/NS	0.0025	0.0038	0.0001	0.0000	0.0064
	ON	0.0023	0.0013	0.0027	0.0001	0.0064
≥65 YEARS	Alberta	0.0010	0.0081	0.0000	0.0007	0.0098
	MB/NS	0.0023	0.0043	0.0000	0.0000	0.0066
	ON	0.0029	0.0047	0.0034	0.0001	0.0111

Overall, rates of use per 100,000 eligible beneficiaries was highest in Manitoba, Nova Scotia and Ontario for patients <65 years and highest in Ontario for patients ≥65 years

Table 7 Proportion of Current Recipients of TRT who are Estimated to Meet EAP Criteria

PATIENTS	ORAL	INJECTABLE	TOPICAL	PATCH	OVERALL
<65 YEARS	0.50	0.62	0.68	0.53	0.61
≥65 YEARS	0.36	0.48	0.59	0.57	0.49

Overall, 61% of current recipients of TRT <65 years and 49% of current recipients of TRT ≥65 years are estimated to meet EAP criteria

Table 8 Forecasted Rates of Use per 100,000 Eligible Beneficiaries under Each Reimbursement Strategy

PATIENTS	REIMBURSEMENT SCENARIO	ORAL	INJ	TOPICAL	PATCH	TOTAL
<65 YEARS	Status Quo	0.0023	0.0013	0.0027	0.0001	0.0064
	All to EAP	0.0012	0.0008	0.0018	0.0000	0.0039
	Oral/Topical to EAP	0.0012	0.0021	0.0018	0.0001	0.0052
	Topical to EAP	0.0028	0.0016	0.0018	0.0001	0.0064
≥65 YEARS	Status Quo	0.0029	0.0047	0.0034	0.0001	0.0111
	All to EAP	0.0010	0.0022	0.0020	0.0001	0.0053
	Oral/Topical to EAP	0.0010	0.0066	0.0020	0.0002	0.0098
	Topical to EAP	0.0029	0.0048	0.0020	0.0001	0.0098

For patients <65 years, forecasted rates of use per 100,000 eligible beneficiaries would decline negligibly, if topical forms of testosterone replacement therapy were available under EAP  
For patients ≥65 years, forecasted rates of use per 100,000 eligible beneficiaries would decline slightly, if topical or both oral and topical forms of testosterone replacement therapy were available under EAP

Table 9 Forecasted Average Number of Users per Quarter (2016) Under Each Reimbursement Strategy

REIMBURSEMENT SCENARIO	<65	≥65	TOTAL	CHANGE IN AVERAGE NUMBER OF USERS PER QUARTER
Status Quo	7,208	8,861	16,069	
All to EAP	4,399	4,350	8,749	-7,320 (-45.6%)
Oral/Topical to EAP	5,820	7,890	13,711	-2,358 (-14.7%)
Topical to EAP	7,125	7,890	15,016	-1,053 (-6.6%)

Overall, moving all testosterone replacement therapy products to EAP would lead to the greatest change in average number of users per quarter (a reduction of 7,320 users or reduction of 45.6% compared to Status Quo)

**Table 10 Forecasted Total Costs (2016) Under Each Reimbursement Strategy**

REIMBURSEMENT SCENARIO	<65	≥65	TOTAL	NET BUDGET IMPACT
Status Quo	\$5,230,554	\$6,979,470	\$12,210,024	
All to EAP	\$3,329,354	\$3,639,447	\$6,968,801	-\$5,241,223 (-42.9%)
Oral/Topical to EAP	\$3,765,913	\$4,556,654	\$8,322,567	-\$3,887,457 (-31.8%)
Topical to EAP	\$4,365,919	\$5,407,006	\$9,772,925	-\$2,437,099 (-20.0%)

If one (only topical forms), two (topical and oral forms) or all formulations of testosterone replacement therapy were available under EAP, there would be a reduction in OPDP testosterone replacement therapy expenditure

#### Summary of Forecasted Total Costs (2016) Under Each Reimbursement Strategy

- Without any changes to current testosterone replacement therapy reimbursement, testosterone replacement therapy expenditure is expected to surpass \$12.2 million by 2016.
- Moving topical forms of TRT under EAP would lead to the smallest amount saved (an overall reduction of 20.0% or savings of \$2.4 million respectively by 2016).
- If topical and oral forms of TRT were available under EAP, a greater reduction in TRT expenditure is expected (an overall reduction of 31.8% or savings of \$3.9 million respectively by 2016).
- Moving all TRT formulations under EAP would lead to the greatest amount saved (an overall reduction of 42.9% or savings of \$5.2 million by 2016).

**Table 11 Forecasted Total Costs (2016) Under Each Reimbursement Strategy: Sensitivity Analyses**

OVERALL REIMBURSEMENT SCENARIO	NET BUDGET IMPACT				
	BASE CASE	75% OF TESTS ARE +VE	50% OF NON-TESTED WILL BE TESTED	NO SWITCHING WITH EAP	USE AS PER OTHER PROVINCES*
Status Quo	-	-	-	-	-
All to EAP	-\$5,241,223 (-42.9%)	-\$6,837,672 (-56.0%)	-\$4,832,153 (-39.6%)	-\$4,832,153 (-39.6%)	-\$6,529,735 (-53.5%)
Oral/Topical to EAP	-\$3,887,457 (-31.8%)	-\$4,797,769 (-39.3%)	-\$4,058,749 (-33.2%)	-\$4,638,952 (-38.0%)	-\$9,018,936 (-73.9%)
Topical to EAP	-\$2,437,099 (-20.0%)	-\$3,207,962 (-26.3%)	-\$2,548,106 (-20.9%)	-\$2,974,195 (-24.4%)	-\$7,211,086 (-59.1%)

\* Manitoba/Nova Scotia, and Alberta

#### Summary of Forecasted Total Costs (2016) Under Each Reimbursement Strategy: Sensitivity Analyses

- Overall, results were most sensitive to the relative rates of use of different formulations under the alternative reimbursement strategies.

## Appendix B – Appendices

### Appendix B1: Model Details

The following tables provide details of each model used to forecast testosterone replacement therapy expenditure.

**Table 12 Model Details for Patients <65 Years**

	CONSTANT	QUARTER	AVAILABILITY OF GENERIC FORMULATION
<b>LINEAR MODEL</b>			
Coefficient	67027.97	43896.72	102484.12
Std. error	10892.64	1775.30	16089.99
R <sup>2</sup>	0.98		
AIC	4154.00		
	CONSTANT	QUARTER	AVAILABILITY OF GENERIC FORMULATION
<b>EXPONENTIAL MODEL</b>			
Coefficient	128716.44	1.16	0.92
Std. error	0.01	0.00	0.02
R <sup>2</sup>	1.00		
AIC	4058.16		
	CONSTANT	QUARTER	AVAILABILITY OF GENERIC FORMULATION
<b>POWER MODEL</b>			
Coefficient	155999.30	4920.38	-29470.33
Std. error	3512.48	87.70	9112.79
R <sup>2</sup>	1.00		
AIC	4075.34		
	CONSTANT	NEW TRT AVAILABLE	
<b>CONSTANT GROWTH MODEL</b>			
Coefficient	0.04	-0.02	
Std. error	0.00	0.02	
R <sup>2</sup>	0.03		
AIC	4065.93		

The Exponential model was the most suitable model for forecasting testosterone replacement therapy expenditure



Table 13 Model Details for Patients ≥65 Years

	CONSTANT	QUARTER	NO. OF TRT COVERED	
<b>LINEAR MODEL</b>				
Coefficient	-54134.68	36090.08	88591.24	
Std. error	56382.35	2318.47	10934.71	
R <sup>2</sup>	0.93			
AIC	4212.89			
	CONSTANT	QUARTER	NO. OF TRT COVERED	
<b>EXPONENTIAL MODEL</b>				
Coefficient	263024.90	1.05	1.11	
Std. error	0.06	0.00	0.01	
R <sup>2</sup>	0.95			
AIC	4197.87			
	CONSTANT	QUARTER	NO. OF TRT COVERED	AVAILABILITY OF GENERIC FORMULATION
<b>POWER MODEL</b>				
Coefficient	74227.57	569.32	84506.10	-169044.89
Std. error	71513.76	36.33	12831.83	40832.05
R <sup>2</sup>	0.96			
AIC	4183.65			
	CONSTANT	NEW TRT AVAILABLE		
<b>CONSTANT GROWTH MODEL</b>				
Coefficient	0.02	0.04		
Std. error	0.00	0.02		
R <sup>2</sup>	0.07			
AIC	4217.43			

The Power model was the most suitable model for forecasting testosterone replacement therapy expenditure

## Appendix B2: Alternative Approaches to Reimbursement - Disaggregated Results

The following tables present the forecasted expenditure for each alternative approach to reimbursement.

### Disaggregated Base Case Results – Budget Impact

Table 14 Disaggregated Base Case Results – Budget Impact for Patients <65 Years

PATIENTS <65 YEARS	YEAR		
	2014	2015	2016
<b>BASE CASE</b>			
<b>STATUS QUO</b>			
	\$3,905,533	\$4,520,105	\$5,230,554
<b>ALL TRT PRODUCTS MOVE TO EAP</b>			
Predicted Total	\$2,485,951	\$2,877,139	\$3,329,354
Budget Impact \$	-\$1,419,582	-\$1,642,966	-\$1,901,200
% Budget Impact	-36.3%	-36.3%	-36.3%
<b>BOTH TOPICAL AND ORAL FORMS WILL MOVE TO EAP</b>			
Predicted Total	\$2,811,920	\$3,254,402	\$3,765,913
Budget Impact \$	-\$1,093,613	-\$1,265,704	-\$1,464,641
% Budget Impact	-28.0%	-28.0%	-28.0%
<b>ONLY TOPICAL FORMS WILL MOVE TO EAP</b>			
Predicted Total	\$3,259,931	\$3,772,911	\$4,365,919
Budget Impact \$	-\$645,603	-\$747,194	-\$864,635
% Budget Impact	-16.5%	-16.5%	-16.5%

Table 15 Disaggregated Base Case Results – Budget Impact for Patients ≥65 Years

PATIENTS ≥65 YEARS	YEAR		
	2014	2015	2016
<b>BASE CASE</b>			
<b>STATUS QUO</b>			
	\$5,620,231	\$6,262,704	\$6,979,470
<b>ALL TRT PRODUCTS MOVE TO EAP</b>			
Predicted Total	\$2,930,671	\$3,265,689	\$3,639,447
Budget Impact \$	-\$2,689,560	-\$2,997,015	-\$3,340,023
% Budget Impact	-47.9%	-47.9%	-47.9%
<b>BOTH TOPICAL AND ORAL FORMS WILL MOVE TO EAP</b>			
Predicted Total	\$3,669,254	\$4,088,702	\$4,556,654
Budget Impact \$	-\$1,950,977	-\$2,174,002	-\$2,422,816
% Budget Impact	-34.7%	-34.7%	-34.7%
<b>ONLY TOPICAL FORMS WILL MOVE TO EAP</b>			
Predicted Total	\$4,354,001	\$4,851,726	\$5,407,006
Budget Impact \$	-\$1,266,230	-\$1,410,978	-\$1,572,464
% Budget Impact	-22.5%	-22.5%	-22.5%

#### Summary of Disaggregated Base Case Results –Budget Impact

- Moving topical forms of TRT under EAP would lead to the smallest amount saved (a reduction of 16.5% for patients <65 years and a reduction of 22.5% for patients ≥65 years or savings of \$0.9 million and \$1.6 million respectively by 2016).
- If topical and oral forms of TRT were available under EAP, a greater reduction in TRT expenditure is expected (a reduction of 28.0% for patients <65 years and a reduction of 34.7% for patients ≥65 years or savings of \$1.5 million and \$2.4 million respectively by 2016).
- Moving all TRT formulations under EAP would lead to the greatest amount saved (a reduction of 36.3% for patients <65 years and a reduction of 47.9% for patients ≥65 years or savings of \$1.9 million and \$3.3 million respectively by 2016).

### Disaggregated Base Case Results by Formulation

**Table 16 Disaggregated Base Case Results – No Changes to Current Reimbursement for Patients <65 Years**

NO CHANGES TO CURRENT REIMBURSEMENT OF TRT PATIENTS <65 YEARS					
YEAR	ORAL	INJECTION	TOPICAL	PATCH	TOTAL
<b>COSTS</b>					
2013	\$515,063	\$688,936	\$2,146,844	\$57,264	<b>\$3,408,108</b>
2014	\$590,238	\$789,489	\$2,460,184	\$65,622	<b>\$3,905,533</b>
2015	\$683,118	\$913,722	\$2,847,317	\$75,948	<b>\$4,520,105</b>
2016	\$790,487	\$1,057,337	\$3,294,844	\$87,886	<b>\$5,230,554</b>
<b>AVERAGE NUMBER OF USERS PER QUARTER</b>					
2013	973	2,421	1,261	43	<b>4,697</b>
2014	1,115	2,774	1,444	49	<b>5,382</b>
2015	1,290	3,210	1,672	57	<b>6,229</b>
2016	1,493	3,715	1,935	66	<b>7,208</b>

**Table 17 Disaggregated Base Case Results – No Changes to Current Reimbursement for Patients ≥65 Years**

NO CHANGES TO CURRENT REIMBURSEMENT OF TRT PATIENTS ≥65 YEARS					
YEAR	ORAL	INJECTION	TOPICAL	PATCH	TOTAL
<b>COSTS</b>					
2013	\$1,289,463	\$341,063	\$3,192,875	\$32,766	<b>\$4,856,167</b>
2014	\$1,492,346	\$394,725	\$3,695,238	\$37,922	<b>\$5,620,231</b>
2015	\$1,662,942	\$439,848	\$4,117,657	\$42,257	<b>\$6,262,704</b>
2016	\$1,853,266	\$490,189	\$4,588,923	\$47,093	<b>\$6,979,470</b>
<b>AVERAGE NUMBER OF USERS PER QUARTER</b>					
2013	1,994	1,387	2,732	52	<b>6,165</b>
2014	2,307	1,605	3,162	60	<b>7,135</b>
2015	2,571	1,789	3,524	67	<b>7,951</b>
2016	2,865	1,993	3,927	75	<b>8,861</b>

**Table 18 Disaggregated Base Case Results - All to EAP for Patients <65 Years**

ALL TRT PRODUCTS (ALL DOSAGE FORMS) MOVE TO EAP PATIENTS <65 YEARS					
YEAR	ORAL	INJECTION	TOPICAL	PATCH	TOTAL
<b>COSTS</b>					
2013	\$515,063	\$688,936	\$2,146,844	\$57,264	<b>\$3,408,108</b>

2014	\$293,541	\$491,152	\$1,666,260	\$34,999	<b>\$2,485,951</b>
2015	\$339,732	\$568,439	\$1,928,461	\$40,506	<b>\$2,877,139</b>
2016	\$393,130	\$657,784	\$2,231,568	\$46,872	<b>\$3,329,354</b>
<b>AVERAGE NUMBER OF USERS PER QUARTER</b>					
2013	973	2,421	1,261	43	<b>4,697</b>
2014	555	1,726	978	26	<b>3,285</b>
2015	642	1,997	1,132	30	<b>3,801</b>
2016	743	2,311	1,310	35	<b>4,399</b>

**Table 19 Disaggregated Base Case Results - All to EAP for Patients ≥65 Years**

<b>ALL TRT PRODUCTS (ALL DOSAGE FORMS) MOVE TO EAP PATIENTS ≥65 YEARS</b>					
<b>YEAR</b>	<b>ORAL</b>	<b>INJECTION</b>	<b>TOPICAL</b>	<b>PATCH</b>	<b>TOTAL</b>
<b>COSTS</b>					
2013	\$1,289,463	\$341,063	\$3,192,875	\$32,766	<b>\$4,856,167</b>
2014	\$541,857	\$188,378	\$2,178,829	\$21,606	<b>\$2,930,671</b>
2015	\$603,799	\$209,913	\$2,427,901	\$24,076	<b>\$3,265,689</b>
2016	\$672,904	\$233,937	\$2,705,774	\$26,832	<b>\$3,639,447</b>
<b>AVERAGE NUMBER OF USERS PER QUARTER</b>					
2013	1,994	1,387	2,732	52	6,165
2014	838	766	1,864	34	3,503
2015	934	854	2,078	38	3,903
2016	1,040	951	2,315	43	4,350

**Table 20 Disaggregated Base Case Results – Oral/Topical to EAP for Patients <65 Years**

<b>BOTH TOPICAL AND ORAL FORMS WILL MOVE TO EAP PATIENTS &lt;65 YEARS</b>					
<b>YEAR</b>	<b>ORAL</b>	<b>INJECTION</b>	<b>TOPICAL</b>	<b>PATCH</b>	<b>TOTAL</b>
<b>COSTS</b>					
2013	\$515,063	\$688,936	\$2,146,844	\$57,264	<b>\$3,408,108</b>
2014	\$293,541	\$786,726	\$1,666,260	\$65,393	<b>\$2,811,920</b>
2015	\$339,732	\$910,525	\$1,928,461	\$75,683	<b>\$3,254,402</b>
2016	\$393,130	\$1,053,637	\$2,231,568	\$87,578	<b>\$3,765,913</b>
<b>AVERAGE NUMBER OF USERS PER QUARTER</b>					
2013	973	2,421	1,261	43	4,697
2014	555	2,764	978	49	4,346
2015	642	3,199	1,132	57	5,030
2016	743	3,702	1,310	65	5,820

Table 21 Disaggregated Base Case Results - Oral/Topical to EAP for Patients ≥65 Years

BOTH TOPICAL AND ORAL FORMS WILL MOVE TO EAP					
PATIENTS ≥ 65 YEARS					
YEAR	ORAL	INJECTION	TOPICAL	PATCH	TOTAL
<b>COSTS</b>					
2013	\$1,289,463	\$341,063	\$3,192,875	\$32,766	<b>\$4,856,167</b>
2014	\$541,857	\$865,425	\$2,178,829	\$83,142	<b>\$3,669,254</b>
2015	\$603,799	\$964,356	\$2,427,901	\$92,646	<b>\$4,088,702</b>
2016	\$672,904	\$1,074,726	\$2,705,774	\$103,250	<b>\$4,556,654</b>
<b>AVERAGE NUMBER OF USERS PER QUARTER</b>					
2013	1,994	1,387	2,732	52	6,165
2014	838	3,519	1,864	132	6,354
2015	934	3,922	2,078	147	7,080
2016	1,040	4,371	2,315	164	7,890

Table 22 Disaggregated Base Case Results - Topical to EAP for Patients &lt;65 Years

ONLY TOPICAL FORMS WILL MOVE TO EAP					
PATIENTS <65 YEARS					
YEAR	ORAL	INJECTION	TOPICAL	PATCH	TOTAL
<b>COSTS</b>					
2013	\$515,063	\$688,936	\$2,146,844	\$57,264	<b>\$3,408,108</b>
2014	\$650,808	\$870,506	\$1,666,260	\$72,356	<b>\$3,259,931</b>
2015	\$753,219	\$1,007,488	\$1,928,461	\$83,742	<b>\$3,772,911</b>
2016	\$871,606	\$1,165,840	\$2,231,568	\$96,904	<b>\$4,365,919</b>
<b>AVERAGE NUMBER OF USERS PER QUARTER</b>					
2013	973	2,421	1,261	43	4,697
2014	1,229	3,058	978	54	5,320
2015	1,423	3,540	1,132	63	6,157
2016	1,647	4,096	1,310	72	7,125

Table 23 Disaggregated Base Case Results - Topical to EAP for Patients ≥65 Years

ONLY TOPICAL FORMS WILL MOVE TO EAP					
PATIENTS ≥65 YEARS					
YEAR	ORAL	INJECTION	TOPICAL	PATCH	TOTAL
<b>COSTS</b>					
2013	\$1,289,463	\$341,063	\$3,192,875	\$32,766	<b>\$4,856,167</b>
2014	\$1,686,297	\$446,025	\$2,178,829	\$42,850	<b>\$4,354,001</b>
2015	\$1,879,064	\$497,012	\$2,427,901	\$47,748	<b>\$4,851,726</b>

2016	\$2,094,123	\$553,895	\$2,705,774	\$53,213	<b>\$5,407,006</b>
<b>AVERAGE NUMBER OF USERS PER QUARTER</b>					
2013	1,994	1,387	2,732	52	6,165
2014	2,607	1,814	1,864	68	6,354
2015	2,905	2,021	2,078	76	7,080
2016	3,238	2,253	2,315	84	7,890

### Summary of Disaggregated Base Case Results – by Formulation

- Under all three reimbursement strategies (All to EAP, Oral/Topical to EAP, Topical to EAP), topical formulations will continue to account for the greatest expenditure in both age groups (patients <65 years and patients ≥65 years).

### Disaggregated Sensitivity Analysis Results

Table 24 Sensitivity Analysis - 75% of Lab Tests are Positive for Patients <65 Years

PATIENTS <65 YEARS 75% OF TESTS ARE +VE	YEAR		
	2014	2015	2016
<b>STATUS QUO</b>			
	\$3,905,533	\$4,520,105	\$5,230,554
<b>ALL TRT PRODUCTS MOVE TO EAP</b>			
Predicted Total	\$1,963,136	\$2,272,053	\$2,629,164
Budget Impact \$	-\$1,942,398	-\$2,248,052	-\$2,601,390
% Budget Impact	-49.7%	-49.7%	-49.7%
<b>BOTH TOPICAL AND ORAL FORMS WILL MOVE TO EAP</b>			
Predicted Total	\$2,658,019	\$3,076,283	\$3,559,799
Budget Impact \$	-\$1,247,514	-\$1,443,822	-\$1,670,755
% Budget Impact	-31.9%	-31.9%	-31.9%
<b>ONLY TOPICAL FORMS WILL MOVE TO EAP</b>			
Predicted Total	\$3,056,580	\$3,537,562	\$4,093,579
Budget Impact \$	-\$848,953	-\$982,543	-\$1,136,975
% Budget Impact	-21.7%	-21.7%	-21.7%

Table 25 Sensitivity Analysis - 75% of Lab Tests are Positive for Patients ≥65 Years

PATIENTS ≥65 YEARS 75% OF TESTS ARE +VE	YEAR		
	2014	2015	2016
<b>STATUS QUO</b>			
	\$5,620,231	\$6,262,704	\$6,979,470
<b>ALL TRT PRODUCTS MOVE TO EAP</b>			
Predicted Total	\$2,208,958	\$2,461,473	\$2,743,189
Budget Impact \$	-\$3,411,273	-\$3,801,231	-\$4,236,281
% Budget Impact	-60.7%	-60.7%	-60.7%
<b>BOTH TOPICAL AND ORAL FORMS WILL MOVE TO EAP</b>			
Predicted Total	\$3,102,197	\$3,456,822	\$3,852,456
Budget Impact \$	-\$2,518,034	-\$2,805,881	-\$3,127,014
% Budget Impact	-44.8%	-44.8%	-44.8%
<b>ONLY TOPICAL FORMS WILL MOVE TO EAP</b>			
Predicted Total	\$3,952,565	\$4,404,400	\$4,908,483
Budget Impact \$	-\$1,667,666	-\$1,858,304	-\$2,070,987
% Budget Impact	-29.7%	-29.7%	-29.7%

Table 26 Sensitivity Analysis - 50% of Untested Patients will be Tested for Patients &lt;65 Years

PATIENTS <65 YEARS 50% OF NON-TESTED WILL BE TESTED	YEAR		
	2014	2015	2016
<b>STATUS QUO</b>			
	\$3,905,533	\$4,520,105	\$5,230,554
<b>ALL TRT PRODUCTS MOVE TO EAP</b>			
Predicted Total	\$2,521,047	\$2,917,758	\$3,376,357
Budget Impact \$	-\$1,384,486	-\$1,602,348	-\$1,854,197
% Budget Impact	-35.4%	-35.4%	-35.4%
<b>BOTH TOPICAL AND ORAL FORMS WILL MOVE TO EAP</b>			
Predicted Total	\$2,576,366	\$2,981,781	\$3,450,443
Budget Impact \$	-\$1,329,168	-\$1,538,325	-\$1,780,111
% Budget Impact	-34.0%	-34.0%	-34.0%
<b>ONLY TOPICAL FORMS WILL MOVE TO EAP</b>			
Predicted Total	\$3,206,801	\$3,711,421	\$4,294,765
Budget Impact \$	-\$698,732	-\$808,684	-\$935,789
% Budget Impact	-17.9%	-17.9%	-17.9%



Table 27 Sensitivity Analysis - 50% of Untested Patients will be Tested for Patients ≥65 Years

PATIENTS ≥65 YEARS 50% OF NON-TESTED WILL BE TESTED	YEAR		
	2014	2015	2016
<b>STATUS QUO</b>			
	\$5,620,231	\$6,262,704	\$6,979,470
<b>ALL TRT PRODUCTS MOVE TO EAP</b>			
Predicted Total	\$3,222,227	\$3,590,573	\$4,001,514
Budget Impact \$	-\$2,398,004	-\$2,672,130	-\$2,977,956
% Budget Impact	-42.7%	-42.7%	-42.7%
<b>BOTH TOPICAL AND ORAL FORMS WILL MOVE TO EAP</b>			
Predicted Total	\$3,785,354	\$4,218,074	\$4,700,832
Budget Impact \$	-\$1,834,877	-\$2,044,630	-\$2,278,638
% Budget Impact	-32.6%	-32.6%	-32.6%
<b>ONLY TOPICAL FORMS WILL MOVE TO EAP</b>			
Predicted Total	\$4,321,910	\$4,815,966	\$5,367,154
Budget Impact \$	-\$1,298,321	-\$1,446,737	-\$1,612,316
% Budget Impact	-23.1%	-23.1%	-23.1%

Table 28 Sensitivity Analysis - No Switching with EAP for Patients &lt;65 Years

PATIENTS <65 YEARS NO SWITCHING WITH EAP	YEAR		
	2014	2015	2016
<b>STATUS QUO</b>			
	\$3,905,533	\$4,520,105	\$5,230,554
<b>ALL TRT PRODUCTS MOVE TO EAP</b>			
Predicted Total	\$2,521,047	\$2,917,758	\$3,376,357
Budget Impact \$	-\$1,384,486	-\$1,602,348	-\$1,854,197
% Budget Impact	-35.4%	-35.4%	-35.4%
<b>BOTH TOPICAL AND ORAL FORMS WILL MOVE TO EAP</b>			
Predicted Total	\$2,360,219	\$2,731,622	\$3,160,965
Budget Impact \$	-\$1,545,314	-\$1,788,484	-\$2,069,589
% Budget Impact	-39.6%	-39.6%	-39.6%
<b>ONLY TOPICAL FORMS WILL MOVE TO EAP</b>			
Predicted Total	\$2,930,149	\$3,391,235	\$3,924,253
Budget Impact \$	-\$975,384	-\$1,128,870	-\$1,306,301
% Budget Impact	-25.0%	-25.0%	-25.0%

Table 29 Sensitivity Analysis - No Switching with EAP for Patients ≥65 Years

PATIENTS ≥65 YEARS	YEAR		
	2014	2015	2016
<b>NO SWITCHING WITH EAP</b>			
<b>STATUS QUO</b>			
	\$5,620,231	\$6,262,704	\$6,979,470
<b>ALL TRT PRODUCTS MOVE TO EAP</b>			
Predicted Total	\$3,222,227	\$3,590,573	\$4,001,514
Budget Impact \$	-\$2,398,004	-\$2,672,130	-\$2,977,956
% Budget Impact	-42.7%	-42.7%	-42.7%
<b>BOTH TOPICAL AND ORAL FORMS WILL MOVE TO EAP</b>			
Predicted Total	\$3,551,247	\$3,957,205	\$4,410,107
Budget Impact \$	-\$2,068,984	-\$2,305,499	-\$2,569,363
% Budget Impact	-36.8%	-36.8%	-36.8%
<b>ONLY TOPICAL FORMS WILL MOVE TO EAP</b>			
Predicted Total	\$4,277,156	\$4,766,096	\$5,311,576
Budget Impact \$	-\$1,343,075	-\$1,496,608	-\$1,667,894
% Budget Impact	-23.9%	-23.9%	-23.9%

Table 30 Sensitivity Analysis - Use as Per Other Provinces for Patients &lt;65 Years

PATIENTS <65 YEARS	YEAR		
	2014	2015	2016
<b>USE AS PER OTHER PROVINCES*</b>			
<b>STATUS QUO</b>			
	\$3,905,533	\$4,520,105	\$5,230,554
<b>ALL TRT PRODUCTS MOVE TO EAP</b>			
Predicted Total	\$1,989,530	\$2,302,601	\$2,664,513
Budget Impact \$	-\$1,916,003	-\$2,217,504	-\$2,566,041
% Budget Impact	-49.1%	-49.1%	-49.1%
<b>BOTH TOPICAL AND ORAL FORMS WILL MOVE TO EAP</b>			
Predicted Total	\$944,597	\$1,093,238	\$1,265,068
Budget Impact \$	-\$2,960,936	-\$3,426,867	-\$3,965,486
% Budget Impact	-75.8%	-75.8%	-75.8%
<b>ONLY TOPICAL FORMS WILL MOVE TO EAP</b>			
Predicted Total	\$2,205,821	\$2,552,928	\$2,954,185
Budget Impact \$	-\$1,699,712	-\$1,967,177	-\$2,276,369
% Budget Impact	-43.5%	-43.5%	-43.5%

\* Manitoba, Nova Scotia, and Alberta

Table 31 Sensitivity Analysis - Use as Per Other Provinces for Patients ≥65 Years

PATIENTS ≥65 YEARS USE AS PER OTHER PROVINCES*	YEAR		
	2014	2015	2016
<b>STATUS QUO</b>			
	\$5,620,231	\$6,262,704	\$6,979,470
<b>ALL TRT PRODUCTS MOVE TO EAP</b>			
Predicted Total	\$2,428,459	\$2,706,066	\$3,015,776
Budget Impact \$	-\$3,191,772	-\$3,556,637	-\$3,963,694
% Budget Impact	-56.8%	-56.8%	-56.8%
<b>BOTH TOPICAL AND ORAL FORMS WILL MOVE TO EAP</b>			
Predicted Total	\$1,550,931	\$1,728,225	\$1,926,020
Budget Impact \$	-\$4,069,300	-\$4,534,479	-\$5,053,450
% Budget Impact	-72.4%	-72.4%	-72.4%
<b>ONLY TOPICAL FORMS WILL MOVE TO EAP</b>			
Predicted Total	\$1,646,541	\$1,834,764	\$2,044,753
Budget Impact \$	-\$3,973,690	-\$4,427,940	-\$4,934,717
% Budget Impact	-70.7%	-70.7%	-70.7%

\*Manitoba, Nova Scotia, and Alberta

#### Summary of Disaggregated Sensitivity Analysis Results

- Overall, results were most sensitive to the relative rates of use of different formulations under the alternative reimbursement strategies.

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