

This article is part of a CME certified activity. The complete activity is available at:
<http://cme.medscape.com/viewprogram/14665>

Options in Testosterone Replacement Therapy CME

Adrian S. Dobs, MD ; Diala El-Maouche, MD

Published: 06/27/2008

A number of testosterone replacement modalities are in use in the United States. Each has a unique profile that may determine its appropriateness for your patient.

A 76-year-old man with primary testicular failure secondary to war trauma sustained 40 years ago reports dissatisfaction with his testosterone replacement therapy (TRT). For many years, he has been using testosterone enanthate (TE) 200 mg IM every 2 weeks. He was doing relatively well with the treatment until recently, after his wife passed away. Now he is bothered by the mood swings and the lethargy that he feels shortly before his next injection is due. Although these symptoms are not new, he says he has recently been feeling low and is, therefore, more sensitive to them.

The patient recalls that, while using TE, he had a healthy libido despite some erectile dysfunction. He is, however, no longer interested in continuing the treatment for this goal.

He has no problem voiding, reports no excessive daytime sleepiness, and has no history of fractures or height loss, though he has never had a dual energy X-ray absorptiometry (DEXA) bone scan.

Past medical history includes dyslipidemia, for which he is currently taking simvastatin 20 mg daily. In addition, he takes aspirin 81 mg daily to lower his risk of clot-related events. A cardiac catheterization performed within the past few years showed some blockage.

Recent blood work reveals the following levels: hemoglobin (Hb), 16.2 g/dL (normal, 13.8 to 17.2); hematocrit (Hct), 49.2% (normal, 42% to 52%); low-density lipoprotein (LDL) cholesterol, 65 mg/dL (normal, less than 100 mg/dL); high-density lipoprotein (HDL) cholesterol, 52 mg/dL (normal, above 40 mg/dL); triglycerides, 104 mg/dL (normal, less than 150 mg/dL); prostate-specific antigen (PSA), 0.8 ng/mL (normal, below 4 ng/mL); total testosterone, 369 ng/dL (normal, 280 to 800 ng/dL); luteinizing hormone (LH) and follicle-stimulating hormone (FSH) levels, undetectable (normal, 2 to 12 mIU/mL and 1 to 12 mIU/mL, respectively). He also has been told he has elevated blood glucose levels and has, therefore, reduced his carbohydrate intake and lost some weight.

On physical exam, the patient appears to be healthy and in no distress. His vital signs are within the normal range. He has a nontender, Tanner stage II gynecomastia on the left side, which he says developed recently. Genitourinary examination reveals no palpable testis in the left scrotal sack, and an atrophic right testis measuring approximately 7 mL. Digital rectal exam (DRE) reveals a nonenlarged prostate with no nodules. Body hair, virilization, and all other aspects of his physical examination are normal.

How do we evaluate and manage this patient's treatment?

The ideal TRT would be one that mimics the normal physiologic state and is safe, efficient, and easy to use. A number of TRT modalities are in current use, many of which have been approved for use in the United States (Table 1).^[1] Each has a unique profile that may influence its acceptability to the specific patient.

Table 1. Testosterone Replacement Therapies Approved for Use in the U.S.¹

Delivery System (Drug)	Route of Delivery	Standard Dosage for Androgen Deficiency	Advantages	Disadvantages	Estimated Monthly Cost
Testosterone esters Testosterone enanthate Testosterone cypionate	IM	100 mg every week or 200 mg every 2 weeks	Inexpensive; administered every 2 weeks	Roller-coaster pharmacokinetics; requires injection	\$100
Testosterone pellets	SC	Two to six 75-mg pellets every 3 to 6 months	Convenient 6-month biological duration	Expensive; requires small incision; high rate of extrusion; available only through manufacturer	\$150
Buccal testosterone	Buccal	30 mg BID	Testosterone levels within physiologic range	Expensive; twice-daily dosing; possible oral irritation	\$250
Testosterone patch	Nonscrotal topical	5 mg/day	Mimics circadian rhythm	Expensive, daily administration; skin irritation	\$250
Testosterone gel	Topical	5 g/day	Testosterone levels within physiologic range	Expensive; daily administration; possible transference to intimate contacts	\$300

Adapted with permission from Edelstein D, Dobs A, Basaria S. Emerging drugs for hypogonadism. *Expert Opin Emerg Drugs*. 2006;11(4):685-707.¹

(Click to enlarge)

This article reviews existing TRT modalities, discusses their advantages and disadvantages, and describes the pharmacokinetics of each. It provides recommendations for pretreatment screening and post-treatment monitoring of TRT, while clarifying matters that require consideration by the treating clinician in the previous case scenario.

Intramuscular Injections

Intramuscular testosterone has been used for years due to its effectiveness and low cost. Whereas free testosterone has a half-life of only 10 minutes, the esterification process renders testosterone less polar and more lipid soluble, thereby prolonging its duration of action. Delivery of these esters through an oil-based depot injection allows their slow release.

TE and testosterone cypionate (TC) have similar pharmacokinetic profiles. Both produce peak, often supraphysiologic levels within 2 to 3 days of injection and decline slowly, often to subnormal levels in 1 to 2 weeks.^[1,2] Such roller-coaster pharmacokinetics cause swings in mood, energy level, sexual function, and libido.

Placebo-controlled data show that sexual functioning, which closely follows fluctuations in circulating testosterone levels, has a dose-related response to TE therapy.^[3] Although there is no placebo-controlled evidence that mood swings and energy levels vary more with injectable testosterone than with other modalities, the concept is widely held to be true. Higher dosing prolongs the interval between consecutive injections, but it also produces higher peaks and lower nadirs in circulating testosterone, thereby exacerbating symptom fluctuation.

The most commonly recommended dosing regimen for TE or TC is 100 to 200 mg IM every 2 weeks^[1] or, as the American Association of Clinical Endocrinologists recommends, when testosterone levels are just above the lower limit of normal, in the range of 250 to 300 ng/dL.^[4] The Endocrine Society recommends measuring levels midway between injections and adjusting dose or frequency to achieve levels in the midnormal range.^[5]

Testosterone propionate is rarely used in an injectable form because its pharmacokinetic profile requires administration every 2 to 3 days.

Intramuscular testosterone injections are deep and may produce pain, site reactions, or pruritis.^[6] As with all forms of testosterone that undergo aromatization to estradiol (all formulations mentioned in Table 1), administration may cause gynecomastia early in the treatment process, mild cases of which usually resolve within a few months. Some reports also have described short episodes of coughing following injections. Such episodes are thought to result from pulmonary microembolisms caused by the oily vehicle.^[7]

Implantable Testosterone

Developed in the 1940s, implantable testosterone is the oldest form of TRT. Pellets, each containing 75 mg of crystalline testosterone, are implanted subcutaneously to provide slow release over 4 to 6 months. Depending on the dose required, 2 to 6 pellets are implanted under the skin of the lower abdomen, upper thighs, deltoid, or gluteal muscles every 3 to 6 months.

Pellets tend to provide stable physiologic levels of testosterone. Although implantable testosterone, like the injectable forms, can cause levels to peak initially, the decline is gradual, over 6 months, so that mood swings and energy fluctuations are seldom recognized by the patient.^[8]

Because pellets require surgical implantation, their use can be painful. They also have a high rate of extrusion. Furthermore, since their duration of action is long and reversibility is difficult, testosterone pellets are unsuitable for treating elderly patients, in whom adverse effects are more common. Testosterone pellets are not often used in the United States.

Transbuccal System

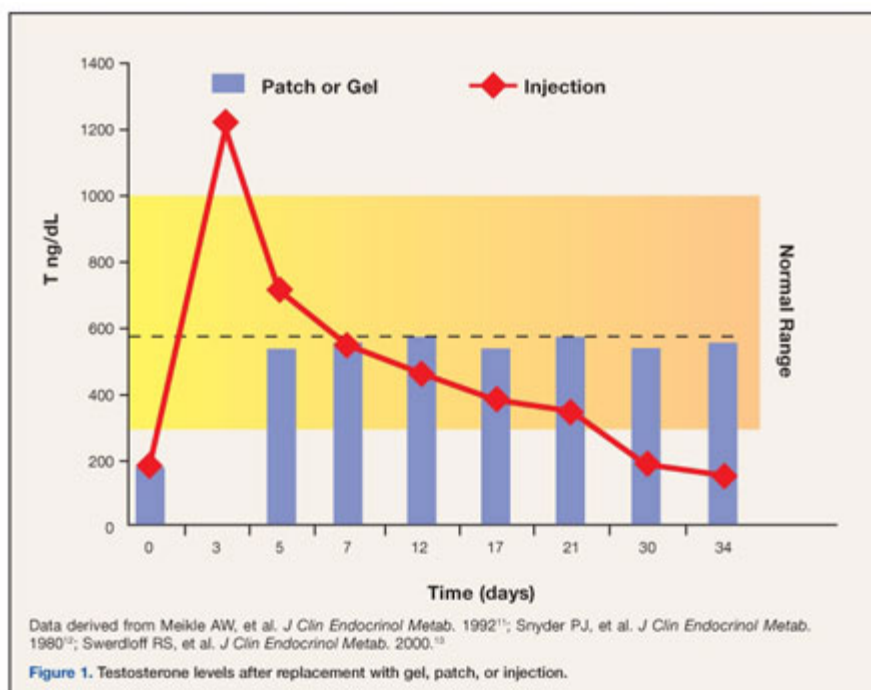
One of the newest TRT modalities is transbuccal testosterone. Administered through a small, convex, tablet-like system that adheres to the gum tissue above the incisors, transbuccal testosterone is absorbed slowly, as it is hydrated by the buccal mucosa. Since buccal testosterone is transported directly into the superior vena cava from the buccal venous system, it avoids the first-pass effect of hepatic metabolism.

Tablets contain 30 mg testosterone each and are applied twice daily. Levels peak within 30 minutes, attain steady state within 24 hours,^[9] and drop to below normal 2 to 4 hours after the tablet is removed. Transbuccal administration maintains testosterone at levels within the physiologic range, comparably to testosterone gel, or nearly so.^[10]

Associated adverse effects are mild to moderate and include gum or mouth irritation or tenderness and bitter taste. Other potential concerns include inadvertent swallowing of the tablet resulting in decreased blood levels of testosterone and transfer of salivary testosterone to the partner.

Transdermal Testosterone

Transdermal TRT is delivered in the form of a nonscrotal patch or gel. It requires daily administration and has the benefit of mimicking testosterone's normal circadian rhythm, peaking in the morning and declining slowly to its nadir at night (Figure 1).^[11-13] Another advantage to this modality is that, unlike injectable and oral testosterone formulations, which tend to lower HDL levels significantly, transdermal therapy does not disturb serum lipids. One caveat to consider when prescribing transdermal TRT is that testosterone absorption varies widely among individuals.^[14]



(Click to enlarge)Figure 1.

The TRT Patch

The first testosterone patch was developed for placement on scrotal skin to maximize the hormone's absorption. Scrotal patches should be applied to shaved skin; this inconvenience, plus the poor adherence of the patch to the scrotal skin area, are limitations which led to its demise. The nonscrotal transdermal patch was developed to overcome some of these problems.

Due to the limited ability of nonscrotal skin to absorb testosterone, nonscrotal patches contain permeation enhancers. Although both 2.5- and 5-mg patches are available, the usual dose is 5 mg daily, using one or two patches. At this dosage, the patient actually absorbs approximately 4.5 of the 5 mg applied daily.^[15] The patch is applied at nighttime to the abdomen, upper arms, back, or upper thighs.

The most common problem encountered with this system is the high incidence of skin irritation at the application site, which is caused by permeation enhancers and occurs in at least one third of users.^[16] Applying a glucocorticoid cream, such as 1% triamcinolone acetonide, under the patch generally reduces the contact dermatitis without interfering with testosterone absorption.^[16]

All transdermal preparations increase dihydrotestosterone (DHT) concentrations, due to the presence of type 1 5 α -reductase within the skin.^[17] Removal of the patch returns DHT levels to the hypogonadal range within 24 hours.

TRT Gel

TRT gel was designed to further improve transdermal delivery systems. Although it is the most expensive of the TRT modalities, transdermal gel is currently the most commonly used, followed by injections, patches, and, finally, oral tablets.^[18]

The gel, containing 1% testosterone, is available in 2.5-, 5-, or 10-g tubes or packets, and as a 75-g pump delivering doses of 1.25 g per compression. Generally, the gel is applied to dry skin on the shoulder, abdomen, or upper arm after bathing. It dries within 10 minutes. Patients are advised to cover the application site with clothing for at least 2 hours after application to prevent transferring the gel to others by contact and to avoid bathing or swimming for 2 to 6 hours after application, depending on the

brand.

Approximately 10% of the gel is absorbed into the stratum corneum of the skin, which serves as a reservoir for the testosterone, allowing its slow release over several hours.^[15] Testosterone levels peak in 16 to 22 hours, reaching steady state in 1 to 2 days,^[19-21] and tending to remain stable thereafter. Levels return to baseline within 4 days of discontinuation.

Compared with the patch, the gel rarely causes skin irritation. It also allows for greater flexibility of dosing than do other modalities, as it is available in variable doses and as a pump. Levels of DHT, however, seem to be significantly higher than those attained with patch use.^[13] This is likely due to the fact that the gel covers a greater skin surface area than the patch, causing more testosterone to convert to DHT. PSA levels are elevated with gel use but remain within the normal range.^[22,23]

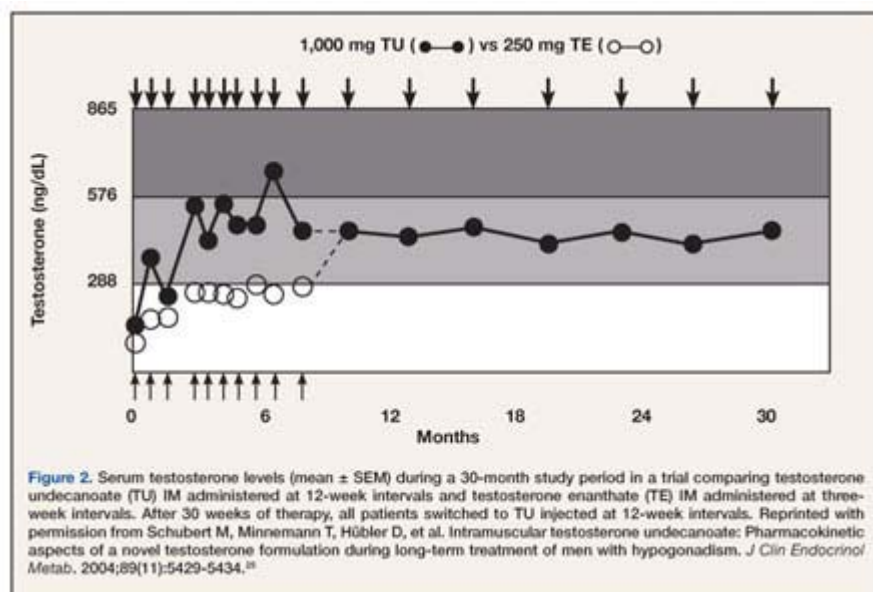
Oral Testosterone

Alkylation of testosterone allows its escape from significant hepatic metabolism but also imparts risk for cholestasis, lipid disturbances, and hepatic adenoma, as well as other hepatic complications. Oral forms of testosterone, such as 17--methyltestosterone and fluoxymesterone, have been associated with a few reports of hepatotoxicity and are therefore not recommended.

Mesterolone, an oral DHT derivative, is rarely used because of its weak androgenicity. Testosterone undecanoate (TU) is an oral testosterone ester delivered by an oily vehicle that escapes hepatic metabolism through absorption into the lymphatics. It has been used in Europe for decades but was never approved for use in the United States. Its advantages include convenience of administration and a relatively safe profile, but its short half-life causes testosterone levels to fluctuate, necessitating multiple daily dosing.

Novel Testosterone Therapy

A long-acting intramuscular injection of the testosterone ester TU is currently undergoing phase III trial for approval in the United States. It has been approved for use in Europe. TU is the first injectable testosterone to be taken every 3 months. It maintains stable physiologic levels for 12 weeks^[24] and appears to be well accepted.^[25] Compared with TE, TU produces a more stable rise, modest maximal concentration, and gradual decline of testosterone, thereby minimizing the mood and libido fluctuations seen with TE (Figure 2).^[1,25,26] As reviewed by Harle and colleagues,^[26] its safety and tolerability profile is also favorable: Incidence and severity of common adverse effects are not greater than those associated with TE, and no serious adverse events have been noted.



([\) Figure 2.](/webmd/professional_assets/medscape/images/content/slide/migrated/editorial/cmecircle/2008target=)

Although intramuscular TU is not yet approved in the United States, the recommended dose will probably be 1000 mg every 10 to 14 weeks, with an additional loading dose of 750 mg to be administered at 4 weeks. Because TU has a long half-life and its safety in older men is yet to be reported, it may have a greater role in treating younger patients. For older men, the switch to TU may be considered if transdermal agents have been used for 3 to 6 months, thus ensuring tolerability.

Choice and Evaluation of Treatment

TRT modalities are numerous, and all have advantages and disadvantages in terms of safety, convenience, efficacy, ability to mimic physiologic levels, and adverse effects. Choice of treatment must take into account the patient's age, existing medical conditions, previous and current response to treatment, and preference, as well as cost.

Since elderly patients experience more of the adverse effects associated with TRT, such as polycythemia,^[27] it would be preferable to treat them with modalities that have a shorter duration of action, so that such effects would be easily reversible upon discontinuation of treatment.

Safety issues of prostate enlargement, elevation of PSA levels, polycythemia, and sleep apnea are evaluated before and during therapy (Table 2).^[5] Before initiation of treatment, levels of PSA, Hb, Hct, and testosterone should be obtained; a DRE should be performed; voiding symptoms should be assessed; and a DEXA scan should be ordered to assess baseline bone status.

Table 2. Monitoring Guidelines for Testosterone Replacement Therapy⁵

Test	1-2 months	3-6 months	Annually	Goal/Comments
Symptom assessment	X	X	X	Evaluate whether symptoms have responded to treatment or if there are adverse effects
Testosterone level	X	X	X	Therapy should aim to raise serum testosterone levels into the midnormal range
PSA/DRE	X	X	X	Obtain urological consultation if: PSA >4 ng/mL or increases >1.4 ng/mL within any 12 month-period. Detection of a prostatic abnormality on DRE
Hematocrit	X	X	X	If hematocrit is >54%, stop therapy until hematocrit decreases to a safe level

PSA = prostate-specific antigen, DRE = digital rectal exam.
Reprinted with permission from The Endocrine Society.¹

([\)](/webmd/professional_assets/medscape/images/content/slide/migrated/editorial/cmecircle/2008target=)

One month after the initiation of treatment, PSA, Hct, testosterone levels, and treatment response should be assessed so that the dose may be modified if necessary. Ideally, a midnormal level of testosterone is the target of therapy, but testosterone levels should be correlated to the patient's signs and symptoms because dose-response levels vary among individuals.

The previous parameters should be assessed at 6 months and annually thereafter to evaluate the treatment. If the patient has osteopenia or osteoporosis at baseline, measurement of lumbar spine and/or femoral neck BMD every other year of testosterone replacement is indicated.

It is important to ask about voiding symptoms, especially in men with a history of benign prostatic hypertrophy. TRT is contraindicated in patients with severe BPH as it may increase prostate size to that of normal men,^[28] thereby exacerbating voiding symptoms. Such adverse effects of TRT as fluctuations in mood and libido, gynecomastia, acne, and treatment modality-specific symptoms should be assessed at each visit. As for choosing the TRT modality, patient preference is a major factor in determining the success of therapy. That, along with patient motivation, lifestyle, and adherence to the prescribed regimen determine how effective treatment is in restoring physiologic testosterone levels and achieving clinical improvement.

Case Discussion

In the case described previously, the patient presented with two symptoms commonly associated with TRT: (1) fluctuation in mood and libido, a frequent occurrence with injectable forms of TRT due to the fact that testosterone levels decline to baseline by the end of the second week when readministration is due; and (2) gynecomastia, which is common to patients using aromatizable forms of TRT, particularly older men in whom levels of sex hormone-binding globulin are elevated. Men with a genetic susceptibility to alopecia are particularly vulnerable to TRT-related gynecomastia.^[4]

The patient's sexual functioning and normal total testosterone level seem to suggest that his testosterone is adequately replaced. His undetectable gonadotropin levels, however, indicate that his testosterone has been over-replaced, a problem that is common with IM forms of TRT. To better assess the situation, it is advisable to measure serum testosterone levels midway between IM injections.

Although the rest of his blood work shows normal values, his Hct level is in the upper range of normal. Given his age and unclear history of cardiovascular disease, his Hct should be monitored routinely for polycythemia.

Liver safety is a concern mainly for patients using oral TRT, but it would be prudent to order liver function tests. Although he has no history of fractures or height loss, it is important to obtain a DEXA scan to evaluate the efficiency of his treatment. His nonenlarged prostate and normal virilization are signs that his therapy is safe and his response is good.

Next steps in treatment would include informing the patient that benefits of TRT are not limited to sexual effects and, depending on the results of his DEXA scan, advising him that it would be prudent to continue with TRT since his levels are in the low range of normal with treatment. If DEXA scanning reveals osteoporosis, other etiologies besides androgen deficiency need to be explored. Hypovitaminosis D, for example, is a factor that commonly contributes to osteoporosis in the elderly.

Since the patient is no longer tolerating the mood swings associated with injectable TRT, recommending a switch to transdermal therapy would be warranted. Transdermal therapy is more appropriate for hyperlipidemic patients since, in the recommended dose range, it does not affect serum lipid levels. In addition, its shorter duration of action makes it safer to use in a man of his age. Finally, the patient would likely find it more convenient to use a TRT that he could apply at home than to visit a physician's office every 2 weeks for an injection.

After therapeutic options are discussed with the patient, if he is willing to try another form of TRT, he should be provided with detailed instruction on how to use the new modality. His response to and tolerability of the new treatment should be reassessed in 1 month.

Dr. Dobs is professor of medicine and oncology in the School of Medicine, and Dr. El-Maouche is a postdoctoral fellow in the division of endocrinology and metabolism, both at Johns Hopkins University, Baltimore, MD.

References

References

1. Edelstein D, Dobs A, Basaria S. Emerging drugs for hypogonadism. *Expert Opin Emerg Drugs*. 2006;11(4):685-707.
2. Snyder PJ. Clinical use of androgens. *Annu Rev Med*. 1984;35:207-217.
3. Davidson JM, Camargo CA, Smith ER. Effects of androgen on sexual behavior in hypogonadal men. *J Clin Endocrinol Metab*. 1979;48(6):955-958.
4. American Association of Clinical Endocrinologists. American Association of Clinical Endocrinologists medical guidelines for clinical practice for the evaluation and treatment of hypogonadism in adult male patients—2002 update. *Endocr Pract*. 2002;8(6):440-456. www.aace.com/pub/pdf/guidelines/hypogonadism.pdf. Accessed April 4, 2008.
5. Bhasin S, Cunningham GR, Hayes FJ, et al. Testosterone therapy in adult men with androgen deficiency syndromes: An

- endocrine society clinical practice guideline. *J Clin Endocrinol Metab.* 2006;91(6):1995-2010.
6. Dobs AS, Meikle AW, Arver S, Sanders SW, Caramelli KE, Mazer NA. Pharmacokinetics, efficacy, and safety of a permeation-enhanced testosterone transdermal system in comparison with bi-weekly injections of testosterone enanthate for the treatment of hypogonadal men. *J Clin Endocrinol Metab.* 1999;84(10):3469-3478.
 7. Mackey MA, Conway AJ, Handelsman DJ. Tolerability of intramuscular injections of testosterone ester in oil vehicle. *Hum Reprod.* 1995;10(4):862-865.
 8. Zitzmann M, Nieschlag E. Hormone substitution in male hypogonadism. *Mol Cell Endocrinol.* 2000;161(1-2):73-88.
 9. Ross RJ, Jabbar A, Jones TH, et al. Pharmacokinetics and tolerability of a bioadhesive buccal testosterone tablet in hypogonadal men. *Eur J Endocrinol.* 2004;150(1):57-63.
 10. Dobs AS, Matsumoto AM, Wang C, Kipnes MS. Short-term pharmacokinetic comparison of a novel testosterone buccal system and a testosterone gel in testosterone deficient men. *Curr Med Res Opin.* 2004;20(5):729-738.
 11. Meikle AW, Mazer NA, Moellmer JF, et al. Enhanced transdermal delivery of testosterone across nonscrotal skin produces physiological concentrations of testosterone and its metabolites in hypogonadal men. *J Clin Endocrinol Metab.* 1992;74(3):623-628.
 12. Snyder PJ, Lawrence DA. Treatment of male hypogonadism with testosterone enanthate. *J Clin Endocrinol Metab.* 1980;Dec;51(6):1335-1339.
 13. Swerdloff RS, Wang C, Cunningham G, et al. Long-term pharmacokinetics of transdermal testosterone gel in hypogonadal men. *J Clin Endocrinol Metab.* 2000;85(12):4500-4510.
 14. Tenover JL. The androgen-deficient aging male: Current treatment options. *Rev Urol.* 2003;5(suppl 1):S22-S28.
 15. Basaria S, Dobs AS. New modalities of transdermal testosterone replacement. *Treat Endocrinol.* 2003;2(1):1-9.
 16. Androderm [package insert]. Corona, CA: Watson Pharma, Inc.; 2005. http://pi.watsonpharm.com/data_stream.asp?product_group=1200&p=pi&language=E. Accessed April 4, 2008.
 17. Russell DW, Wilson JD. Steroid 5 alpha-reductase: Two genes/two enzymes. *Annu Rev Biochem.* 1994;63:25-61.
 18. The extent and nature of testosterone use. IMS web site. www.imshealth.com/portal/front/articleC/0,2777,6599_5266_43871355,00.html. Accessed February 29, 2008.
 19. Meikle AW, Arver S, Dobs AS, Sanders SW, Rajaram L, Mazer NA. Pharmacokinetics and metabolism of a permeation-enhanced testosterone transdermal system in hypogonadal men: Influence of application site—a clinical research center study. *J Clin Endocrinol Metab.* 1996;81(5):1832-1840.
 20. Wang C, Berman N, Longstreth JA, et al. Pharmacokinetics of transdermal testosterone gel in hypogonadal men: Application of gel at one site versus four sites: A General Clinical Research Center study. *J Clin Endocrinol Metab.* 2000;85(3):964-969.
 21. Darby E, Anawalt BD. Male hypogonadism : An update on diagnosis and treatment. *Treat Endocrinol.* 2005;4(5):293-309.
 22. Androderm [package insert]. www.androderm.com/prescribing_info.html. Accessed February 29, 2008.
 23. Swerdloff RS, Wang C. Three-year follow-up of androgen treatment in hypogonadal men: preliminary report with testosterone gel. *Aging Male.* 2003;6(3):207-211.
 24. von Eckardstein S, Nieschlag E. Treatment of male hypogonadism with testosterone undecanoate injected at extended intervals of 12 weeks: A phase II study. *J Androl.* 2002;23(3):419-425.
 25. Schubert M, Minnemann T, Hübler D, et al. Intramuscular testosterone undecanoate: Pharmacokinetic aspects of a novel testosterone formulation during long-term treatment of men with hypogonadism. *J Clin Endocrinol Metab.* 2004;89(11):5429-5434.
 26. Harle L, Basaria S, Dobs AS. Nebido: A long-acting injectable testosterone for the treatment of male hypogonadism. *Expert Opin Pharmacother.* 2005;6(10):1751-1759.
 27. Calof OM, Singh AB, Lee ML, et al. Adverse events associated with testosterone replacement in middle-aged and older men: A meta-analysis of randomized, placebo-controlled trials. *J Gerontol A Biol Sci Med Sci.* 2005;60(11):1451-1457.
 28. Meikle AW, Arver S, Dobs AS, et al. Prostate size in hypogonadal men treated with a nonscrotal permeation-enhanced testosterone transdermal system. *Urology.* 1997;49(2):191-196.

**This article is part of a CME certified activity. The complete activity is available at:
<http://cme.medscape.com/viewprogram/14665>**

Contents of *Men's Sexual Health Consult Collection: Testosterone Replacement Therapy in the VA Setting*
[<http://cme.medscape.com/viewprogram/14665>]

All sections of this activity are required for credit.

1. Introduction
[<http://cme.medscape.com/viewarticle/575490>]
2. Diagnosis and Evaluation of Male Hypogonadism
[<http://cme.medscape.com/viewarticle/575491>]
3. Options in Testosterone Replacement Therapy
[<http://cme.medscape.com/viewarticle/575492>]
4. Potential Adverse Effects of TRT
[<http://cme.medscape.com/viewarticle/575495>]

This article is part of a CME certified activity. The complete activity is available at:
<http://cme.medscape.com/viewprogram/14665>

CME Information

CME Released: 06/27/2008; Valid for credit through 06/27/2009

Target Audience

This activity has been designed to meet the educational needs of physicians, nurse practitioners, and physician assistants who work in the Department of Veterans Affairs.

Goal

Male hypogonadism has been found to be more common than was previously recognized and more likely to be prevalent among VA patients than among the general population. As testosterone replacement therapy (TRT) is commonly used to treat this

condition, VA practitioners should have a comprehensive understanding of the diagnosis and treatment of older men with adult-onset hypogonadism, and the benefits and risks associated with TRT.

Learning Objectives

Upon completion of this activity, participants will be able to:

1. Recall at least three conditions common among VA patients that are closely associated with adult-onset hypogonadism
2. Identify five adverse symptoms associated with adult-onset hypogonadism that testosterone replacement therapy (TRT) has been shown to ameliorate
3. Describe four clear indications for TRT in adult males
4. Discuss current recommendations regarding pretreatment screening and post-treatment monitoring of TRT

Credits Available

Physicians - maximum of 1.25 *AMA PRA Category 1 Credit(s)*TM

All other healthcare professionals completing continuing education credit for this activity will be issued a certificate of participation.

Physicians should only claim credit commensurate with the extent of their participation in the activity.

Accreditation Statements

For Physicians



This activity has been planned and implemented in accordance with the Essential Areas and Policies of the Accreditation Council for Continuing Medical Education (ACCME). The Postgraduate Institute for Medicine is accredited by the Accreditation Council for Continuing Medical Education (ACCME) to provide continuing medical education for physicians.

Postgraduate Institute for Medicine designates this educational activity for a maximum of 1.25 *AMA PRA Category 1 Credit(s)*TM. Physicians should only claim credit commensurate with the extent of their participation in the activity.

Contact This Provider

For questions regarding the content of this activity, contact the accredited provider for this CME/CE activity noted above. For technical assistance, contact CME@medscape.net

Instructions for Participation and Credit

There are no fees for participating in or receiving credit for this online educational activity. For information on applicability and acceptance of continuing education credit for this activity, please consult your professional licensing board.

This activity is designed to be completed within the time designated on the title page; physicians should claim only those credits that reflect the time actually spent in the activity. To successfully earn credit, participants must complete the activity online during the valid credit period that is noted on the title page.

Follow these steps to earn CME/CE credit*:

1. Read the target audience, learning objectives, and author disclosures.
2. Study the educational content online or printed out.
3. Online, choose the best answer to each test question. To receive a certificate, you must receive a passing score as designated at the top of the test. Medscape encourages you to complete the Activity Evaluation to provide feedback for future programming.

You may now view or print the certificate from your CME/CE Tracker. You may print the certificate but you cannot alter it. Credits will be tallied in your CME/CE Tracker and archived for 6 years; at any point within this time period you can print out the tally as well as the certificates by accessing "Edit Your Profile" at the top of your Medscape homepage.

*The credit that you receive is based on your user profile.

Hardware/Software Requirements

Medscape requires version 4.x browsers or higher from Microsoft or Netscape. Certain educational activities may require additional software to view multimedia, presentation or printable versions of their content. These activities will be marked as such and will provide links to the required software. That software may be: [Macromedia Flash](#), [Apple Quicktime](#), [Adobe Acrobat](#), [Microsoft Powerpoint](#), [Windows Media Player](#), and [Real Networks Real One Player](#).

**Supported by an unrestricted
educational grant from:**

