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Trends in Androgen Prescribing in the United States, 2001 to 2011

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Although commercial sales of androgen replacement therapy (ART) have increased substantially in recent years,^{1,2} to our knowledge, no national population-based studies of this treatment have been reported. In view of the conflicting evidence on the risks and benefits of ART,³⁻⁷ understanding androgen prescribing patterns in the United States is important from both a clinical and a public health perspective. We used data from Clinformatics DataMart (CDM), one of the nation's largest commercial health insurance populations, to examine androgen prescribing patterns in the United States over the past decade.

Methods

During the study period (2001-2011), a total of 10 739 815 men 40 years or older were included in the overall study population, with a minimum of 1 270 812 men in any year. We calculated prevalence of use as all men who received a prescription for ART in a year over all men covered in that year. Incident users were men who received a prescription and had not received a prescription in the 12 prior months. We examined total days of ART in the 12 months following the first prescription for androgens using an incidence cohort from 2010. Total days represented all filled prescriptions and the number of days covered by each prescription. For intramuscular formulations, each 100 mg (as indicated by the Health-care Common Procedure Coding System code) was considered equal to 1 week of exposure. For

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Author Contributions: Dr Baillargeon had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis. *Study concept and design:* Baillargeon, Urban, Ottenbacher, and Goodwin. *Acquisition of data:* Baillargeon. *Analysis and interpretation of data:* All authors. *Drafting of the manuscript:* Baillargeon, Urban, and Goodwin. *Critical revision of the manuscript for important intellectual content:* Baillargeon, Urban, Ottenbacher, Pierson, and Goodwin. *Statistical analysis:* Baillargeon and Pierson. *Obtained funding:* Goodwin. *Administrative, technical, and material support:* Urban, Ottenbacher, and Goodwin. *Study supervision:* Baillargeon, Urban, and Goodwin.

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Online-Only Material:

The eFigures and eTable are available at <http://www.jamainternalmed.com>.

incident users in 2001 to 2011, we searched for a laboratory test for free or total testosterone and for any diagnoses that might be related to hypogonadism in the prior 12 months, including hypogonadism, fatigue, erectile dysfunction, and psychosexual dysfunction. This study was exempted from full review by the University of Texas Medical Branch institutional review board.

Results

The **Table** shows that from 2001 through 2011, androgen use among men 40 years or older increased more than 3-fold, from 0.81% in 2001 to 2.91% in 2011. The increase was seen in all age groups. By 2011, 2.29% of men in their 40s and 3.75% of men in their 60s were taking some form of ART. Of the 4 formulations examined, topical gel demonstrated the highest rate of overall use and the highest rate of increase—more than 5-fold (eFigure 1; <http://www.jamainternalmed.com>). Geographic analysis based on US Census Bureau region showed the highest prevalence of androgen use was in the South (3.77% in 2010 for all men 40 years), followed by the West (2.61%), the Midwest (1.78%), and the Northeast (1.60%). The median number of days covered by androgen prescriptions in the 12 months following initiation of treatment in 2010 was 150 (eFigure 2). Approximately 18.63% of these incident users filled only 1 prescription and received a maximum of 30 days of coverage. Among all new androgen users (2001-2011), only 74.72% had had their testosterone level measured in the prior 12 months. Common diagnoses in the year prior to ART initiation were hypogonadism (50.58%), fatigue (34.49%), erectile dysfunction (31.88%), and psychosexual dysfunction (11.75%).

Discussion

Our findings must be interpreted in view of several limitations. First, our cohort (male enrollees 40 years in an employment-based commercial insurance plan) may not be representative of the general US population who are 40 years or older. In particular, the group of men 65 years or older may be very different from most older men who are retired and rely on Medicare as their primary source of health care. Second, prescription claims cannot confirm the extent to which patients adhered to their prescribed regimen. We estimated the maximum number of days covered by ART, but the actual duration could have been shorter. Third, while 74.72% of men had undergone testing of testosterone levels, we do not know what proportion of those men had low levels. Fourth, data on race/ethnicity and socioeconomic status were unavailable.

Our findings that almost 20% of all new users received treatment for 30 days or less and that most men did not have clear evidence of a potential indication for ART suggests that the clinical reasons for initiating therapy are complex. More research is needed to determine the extent to which men with normal testosterone levels and ambiguous symptoms seek and are prescribed ART, particularly given the concerns about cardiovascular and other toxic effects from such treatment.^{3,4} Studies that engage patient and provider stakeholders may offer particular insight into the reasons for initiating and discontinuing treatment.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table
 Percentage of Men Given Androgen Replacement Therapy (ART) by Age Group and Year^a

| Age Range, y | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|-------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| 40-49 | | | | | | | | | | | |
| % Given ART | 0.54 | 0.66 | 0.76 | 0.75 | 0.81 | 0.90 | 1.05 | 1.22 | 1.66 | 1.99 | 2.29 |
| Eligible men, No. | 624 080 | 670 126 | 703 738 | 698 074 | 724 518 | 715 546 | 720 046 | 761 088 | 729 965 | 698 380 | 698 343 |
| 50-59 | | | | | | | | | | | |
| % Given ART | 1.02 | 1.19 | 1.39 | 1.36 | 1.37 | 1.52 | 1.69 | 1.88 | 2.54 | 2.98 | 3.26 |
| Eligible men, No. | 424 534 | 457 417 | 490 381 | 501 335 | 562 482 | 578 941 | 605 057 | 675 508 | 639 073 | 625 709 | 643 106 |
| 60-69 | | | | | | | | | | | |
| % Given ART | 1.32 | 1.53 | 1.72 | 1.68 | 1.69 | 1.87 | 2.06 | 2.28 | 3.03 | 3.51 | 3.75 |
| Eligible men, No. | 161 273 | 182 399 | 197 578 | 204 055 | 234 902 | 250 808 | 280 662 | 331 150 | 309 766 | 300 312 | 317 143 |
| 70 | | | | | | | | | | | |
| % Given ART | 0.77 | 0.79 | 0.99 | 0.99 | 1.00 | 1.13 | 1.20 | 0.96 | 1.92 | 2.10 | 2.22 |
| Eligible men, No. | 60 925 | 69 210 | 71 445 | 73 181 | 93 855 | 95 678 | 104 750 | 113 813 | 103 342 | 82 203 | 84 875 |
| All ages | | | | | | | | | | | |
| % Given ART | 0.81 | 0.96 | 1.11 | 1.10 | 1.14 | 1.20 | 1.45 | 1.66 | 2.23 | 2.63 | 2.91 |
| Eligible men, No. | 1 270 812 | 1 379 062 | 1 463 142 | 1 476 645 | 1 615 757 | 1 640 973 | 1 710 515 | 1 881 559 | 1 782 146 | 1 706 604 | 1 743 467 |

^aWe included all doses and formulations of ART in our analyses. Androgen treatment was identified using National Drug Code codes for topical gel, transdermal patch, and oral formulations (eTable) and Healthcare Common Procedure Coding System codes for injectable formulations (eTable). Separate study cohorts were identified for each calendar year from 2001 to 2011. Men who were 40 years or older at the start of each calendar year with continuous pharmacy benefits during the entire 12-month period were included in the study population for that year. Prevalence was defined as the percentage of men in a given year's cohort who were prescribed any amount or duration of ART during that year. We used a combination of outpatient, inpatient, and pharmacy claims data. The pharmacy database contains eligibility and pharmacy claims information for medications from retail pharmacies through a member's pharmacy benefit. For each medication, the database contains medication name, date of fill, formulation (eg, oral, transdermal, injectable), dose, quantity, and days of supply. We used the outpatient claims file to identify androgen injections given in a physician's office. Enrollees were from all states, with a range of 523 to 180 680 in each state in 2010.