ORIGINAL ARTICLE

Androgen Therapy and Rehospitalization in Older Men With Testosterone Deficiency

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Abstract

Objective: To assess whether the receipt of androgen therapy is associated with a reduced 30-day rehospitalization rate among older men with testosterone deficiency.

Patients and Methods: We conducted a retrospective cohort study using a 5% national sample of Medicare beneficiaries. We identified 6372 nonsurgical hospitalizations between January 1, 2007, and December 31, 2012, for male patients aged 66 years and older with a previous diagnosis of testosterone deficiency. Patients who died or lost Medicare coverage in the 30 days after hospital discharge or who were discharged to another inpatient setting were excluded from the analysis. Logistic regression was used to calculate odds ratios (ORs) and 95% CIs for the risk of 30-day hospital readmissions associated with receipt of androgen therapy.

Results: In older men with testosterone deficiency, receipt of androgen therapy was associated with a reduced risk of rehospitalization (91 of 929 androgen users [9.8%] vs 708 of 5443 non-androgen users [13.0%]; OR, 0.73; 95% CI, 0.58-0.92) in the 30 days after hospital discharge. In a logistic regression analysis adjusting for multiple demographic, clinical, and health service variables, the OR was similar (OR, 0.75; 95% CI, 0.59-0.95). The adjusted OR for unplanned 30-day hospital readmissions was 0.62 (95% CI, 0.47-0.83). Each of these findings persisted across a range of propensity score analyses—including adjustment, stratification, and inverse probability treatment weighting—and several sensitivity analyses.

Conclusion: Androgen therapy may reduce the risk of rehospitalization in older men with testosterone deficiency. Given the high rates of early hospital readmission among older adults, further exploration of this intervention holds broad clinical and public health relevance.

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Hospitalization often causes substantial declines in physical function, and the inability to regain physical function after a hospital stay strongly predicts the risk of rehospitalization and mortality in older adults.[1-4] Such hospital-related functional decline represents a growing health care concern, particularly as our aging population continues to expand.[1-3] Hospitalized older adults frequently experience inactivity,[5-7] malnutrition,[8-10] and disease burden, which collectively contribute to the acceleration of sarcopenia.[11,12] Older men with low testosterone levels are particularly susceptible to these adverse events, given that testosterone deficiency is independently associated with sarcopenia and overall functional health decline.[13-15] Because testosterone deficiency occurs in a high percentage of older men with chronic disease—including heart failure, chronic obstructive pulmonary disease, diabetes, and chronic kidney disease[16,17]—examining the outcomes of hospitalization in this population is important. It is possible that androgen therapy, which is reported to improve physical strength, exercise capacity, and functional health, will help reduce such adverse hospital outcomes.[18-21] To date, no large-scale studies have examined the effectiveness of this treatment in hospital settings. We therefore conducted a cohort study using a 5% national sample of Medicare beneficiaries to examine whether androgen therapy was associated with a reduced risk of 30-day hospital readmissions in older men with testosterone deficiency.

PATIENTS AND METHODS

Study Design and Data Source

We conducted a retrospective cohort study using enrollment and claims data for a 5% national sample of Medicare beneficiaries. The Centers for Medicare and Medicaid

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Services selected these beneficiaries based on the eighth and ninth digits (05, 20, 45, 70, 95) of their health insurance claim number. Data files were constructed to include the patient's demographic and enrollment information (denominator file), claims for hospital stays (Medicare Provider Analysis and Review file), outpatient visits (Outpatient Standard Analytical file), Prescription Drug Event records, and physician services (Medicare carrier claim file). The methodology used in this analysis was consistent with those used in previous studies of hospital readmission using national Medicare claims data.[22-24] This study was reviewed and approved by the University of Texas Medical Branch Institutional Review Board.

Study Cohort
We identified male Medicare beneficiaries who were hospitalized at least once between January 1, 2007, and December 31, 2012. To be included in the study, patients were required to have met each of the following criteria: age 66 years or older at hospital admission, a nonsurgical diagnosis, a diagnosis of hypogonadism (*International Classification of Diseases, Ninth Revision, Clinical Modification*, code 257.xx) in the 12 months before admission, continuous enrollment in Medicare parts A, B, and D in the 12 months before hospital admission, and no health care maintenance organization enrollment in the previous 12 months.

To be classified as an androgen user, the patient was required to have filled a prescription for androgen therapy or received an androgen injection that extended at least until the patient's index hospitalization date. We included in this definition pharmacy fill dates of 30, 60, or 90 days before the index hospital admission date. For each of these fill dates, the drug supply duration was required to match the look-back period. All injections of androgen therapy were treated as the equivalent of a 30-day supply of a prescription androgen. We included all doses and formulations of androgen therapy in our analyses, using National Drug Code numbers for topical gel, transdermal patch, subcutaneous pellets, and oral formulations (see Supplemental Table, available online at http://www.mayoclinicproceedings.org) and Healthcare

Common Procedure Coding System codes for injectable formulations (see Supplemental Table).

Covariates
Sociodemographic characteristics, including age at index hospitalization and race/ethnicity (white, black, Hispanic, or other) were obtained from the Medicare database. Two zip code level variables, median income of neighborhood and proportion of persons aged 25 years or older in the neighborhood with at least a high school education, were obtained from Medicare data linked to 2011 American Community Survey estimates from the United States Census Bureau. Additionally, we examined and adjusted for all conditions included in the Elixhauser comorbidity index.[25]

Outcome Assessment
We examined all readmissions to an acute care hospital that occurred within 30 days after discharge for the patient's index hospitalization. We also assessed unplanned readmissions, defined as an admission type code of "emergency" or "urgent." For the primary analyses, we excluded patients who were discharged to another inpatient care setting, including a rehabilitation facility, a skilled nursing facility, or a psychiatric hospital. For patients hospitalized multiple times during the study period, we randomly selected one hospitalization per calendar year to include in the analysis.

Statistical Analyses
We used logistic regression models to estimate the association of androgen therapy with all 30-day hospital readmissions and unplanned 30-day hospital readmissions. Multivariate analyses were adjusted for all demographic, clinical, and health services variables listed in Table 1. We also used 3 types of propensity score analyses: adjustment, stratification, and inverse probability treatment weighting (IPTW).[26-28] We estimated the propensity score using a logistic regression model with receipt of androgen therapy as the binary outcome variable in the 6372 hospitalizations of men with testosterone deficiency. The propensity score model included all demographic, clinical, and health services variables listed in Table 1 with the exception of the duration of the index hospital visit and the