
Polycystic Ovary Syndrome in the United States: Clinical Visit Rates, Characteristics, and Associated Health Care Costs

In 1935, Stein and Leventhal¹ described 7 women with amenorrhea, infertility, hirsutism, and enlarged, polycystic ovaries. Variations of this disorder, now referred to as polycystic ovary syndrome (PCOS), are now thought to be the most frequent cause of oligo-ovulatory infertility^{2,3}; however, there are no national data on PCOS. To address this deficit, the latest available data on PCOS-related visits to US medical facilities were compared with medical visits by similarly aged women seen for other problems (non-PCOS-related visits).

Methods. Data were obtained from the 2003-2008 National Hospital Medical Care and National Ambulatory

Table. Estimated Annual Medical Costs Associated With Polycystic Ovary Syndrome (PCOS) Medical Visits in the United States (2005-2008)^a

| Calculation | Cost, \$ |
|--|----------------------|
| Initial evaluations 25% ^b × 516 000 × \$752 ^c | 97 008 000 |
| Ultrasonographic evaluation 37% ^d × 516 000 × \$120 | 22 910 000 |
| Health care provider costs 24% ^e × 516 000 × \$150 | 18 576 000 |
| 37% ^f × 516 000 × \$100 | 19 092 000 |
| 39% ^g × 516 000 × \$40 | 8 050 000 |
| Medical costs associated with obesity ^h 231 470 × \$9.91 + 277 793 × \$54.98 + 523 624 × \$81.99 + 5822 × \$131.54 | 61 265 000 |
| Treatment for diabetes mellitus 17% ⁱ × 516 000 × \$8160 ^j | 715 795 000 |
| Metformin in nondiabetic patients 13% ⁱ × 516 000 × \$70 ^k | 4 696 000 |
| Oral contraceptives 34% ⁱ × 516 000 × \$700 ^k | 122 808 000 |
| Spirolonolactone 5% ⁱ × 516 000 × \$300 ^k | 7 740 000 |
| Eflornithine cream 4% ⁱ × 516 000 × \$570 ^k | 11 765 000 |
| Thiazolidinediones 3% ⁱ × 516 000 × \$1320 ^k | 20 434 000 |
| Infertility evaluation and treatment 19% ⁱ × 516 000 × \$538 ^l | 52 745 000 |
| Total | 1 162 884 000 |

^aMean annual number of medical visits to US emergency departments, outpatient departments, and physicians' offices that were associated with PCOS between 2005 and 2008, were based on the National Hospital Medical Care and National Ambulatory Medical Care Surveys, and the calculated costs were rounded to the nearest thousand.

^bProportion of PCOS medical visits that were for newly diagnosed disease.

^cThe specific evaluations, therapies, and medications included in each category include a testosterone panel, thyrotropin, prolactin, basal 17-hydroxyprogesterone, sex hormone-binding globulin, insulin, C-peptide, lipid profile, oral glucose tolerance test, and blood draw fee in all new patients; dehydroepiandrosterone sulfate in 25% of new patients; endometrial biopsy in 30% of patients; and a corticotropin stimulation test in 6% of new patients. Costs are based on 2010 laboratory fees. Costs for transvaginal sonograms were not included as part of this evaluation, since that cost is listed herein as a separate line item.

^dThe proportions of PCOS medical visits in which a sonogram was obtained. Cost is based on 2010 *Current Procedural Terminology (CPT)* fee schedule.

^eThe 2010 *CPT* fee for a new patient, 45- to 60-minute visit, with 24% of PCOS visits being by a patient new to the clinic.

^fThe 2010 *CPT* fee for an established patient, 45- to 60-minute visit, for visits involving a sonogram.

^gThe 2010 *CPT* fee for an established patient, 15- to 30-minute visit, for all remaining PCOS medical visits.

^hThe annual additional medical costs associated with obesity, by sex and age group, was obtained from Long et al⁷, adjusted for the age distribution of women being seen for PCOS herein, and adjusted to 2010 dollars, using consumer price index (CPI) changes for medical care (<http://www.bls.gov/cpi/>). These costs were applied to the number of obese women in each age group.

ⁱThe proportion of PCOS medical visits listing this disorder or prescription.

^jThe cost of a year of therapy for type 2 diabetes mellitus, as cited by Azziz et al⁸ and adjusted to 2010 dollars, using CPI changes for medical care (<http://www.bls.gov/cpi/>).

^kApproximate cost to purchase a year supply of the generic product at a US pharmacy in 2010. For eflornithine cream, the mean number of 30-g tubes used in a year was taken from *Drug Ther Bull*.⁹

^lThe mean cost of evaluating and treating infertility in 1 attempt to produce a viable offspring, as cited and described by Azziz et al³ and adjusted to 2010 dollars, would be \$13 450, using CPI changes for medical care (<http://www.bls.gov/cpi/>). Azziz et al³ assume that 50% of women with PCOS will seek infertility care within their reproductive lifespan. The calculations in the Table assume that the 17% of PCOS-related visits associated with infertility represent individuals who will receive infertility evaluation and treatment some time in a 25-year period, including the year in question ($\$13\,450/25 = \538).

Medical Care Surveys (NHAMCS and NAMCS),^{4,6} which together provide a representative sample of all medical visits to nonfederal US emergency departments, outpatient departments, and physician offices. For each visit sampled, up to 3 physician-determined diagnoses can be recorded using *International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM)* coding. Visits were considered PCOS related if any diagnoses was coded as *ICD-9-CM* 256.4, a defined medical code for PCOS (n = 172 records). Three additional records, with *ICD-9-CM* codes consistent with PCOS were also included.

Between 2003 and 2008, all PCOS-related visits were by 11- to 60-year-old women, so for these analyses, PCOS-related visits were compared with non-PCOS-related visits by 10- to 60-year-old women (n = 207 662 records).

For the comparison group, the estimated national numbers of medical visits for the entire period was 2 430 931 000.

In 2005, both surveys added dichotomous variables concerning the presence or absence of obesity and diabetes mellitus and began to record height, weight, and body mass index (BMI; calculated as weight in kilograms divided by height in meters squared). Weight was available for 79% of PCOS-related visits and 41% of non-PCOS-related visits; and BMI, for 63% of PCOS-related visits and 22% of non-PCOS-related visits. "Obesity" was defined as having a BMI of 30 or greater (<http://www.nhlbisupport.com/bmi/>), the obesity variable recorded in the affirmative, and/or a diagnostic field coded as 278.00 ("obesity") or 278.01 ("morbid obesity"). Diabetes melli-

tus was defined as an affirmative response to the diabetes variable, a code between 250 and 250.93 (“diabetes mellitus”) in a diagnostic field, and/or any of 3 NCHS-defined “reason for visit” variables coded as 2205.0 (“diabetes mellitus”).

All statistical analyses took into account the NHAMCS and NAMCS designs and sampling plans, by retaining all records and the weighting, strata, and primary sampling unit design variables, and used SAS/STAT version 9.2 survey module (SAS Institute Inc, Cary, North Carolina). These surveys’ sampling designs permit statistically reliable estimation when the estimate is based on at least 30 records and the associated relative standard error is 30% or lower. The diabetes data do not meet these criteria. Visit rates were calculated using US Census Bureau data.

Results. Between 2003 and 2008 there were 175 records associated with PCOS, representing 2 328 000 medical visits (eTable; <http://www.archinternmed.com>). Between 2005 and 2008, the mean yearly number of PCOS-related visits was 516 000 (95% confidence interval, 301 000-730 000) and the mean yearly rate of PCOS-related visits was 493 per 100 000 women aged 10 to-60 years (eTable). For 25% of PCOS-related visits, the symptoms began within 3 months of that visit.

Compared with 10- to 60-year-old women seen at non-PCOS-related visits, those at PCOS-related visits were significantly younger (mean age, 27 years vs 38 years). They also weighed more (mean weight, 87.45 kg vs 76.66 kg) and were more often obese (50% vs 18%; $P < .001$). A contraceptive prescription was provided at 34% of PCOS-related visits and metformin at 30%. Diet and nutrition counseling was provided at 40% of PCOS-related visits by obese women, compared with 24% of non-PCOS-related visits by obese women ($P = .045$).

The estimated annual national health care cost associated with PCOS was \$1.16 billion, in 2010 dollars, with the greatest contributors being diabetes, obesity, contraceptives, initial evaluation, and infertility treatment (**Table**).

Comment. Interpreting these national data on PCOS-related visits requires several caveats: (1) They do not include cases of unrecognized disease. (2) Diagnostic accuracy cannot be confirmed. (3) Although the number of PCOS-related visits over this period is adequate for analysis, the sample size is small, and associated 95% confidence intervals are large. (4) These data represent clinical visits, not patients, and thus cannot be used to calculate PCOS incidence or prevalence.

To my knowledge, this study provides the first estimate of the annual rate of PCOS-related visits in the United States: 5 visits per 1000 women aged 10 to 60 years. A quarter of these visits were for recent-onset disease. As expected, most women seen for PCOS were of childbearing age. Half were obese; 40% of these women received some form of diet and nutrition counseling. Given the current economic environment, this study’s greatest contribution may be in providing a conservative estimate of the annual national cost of PCOS-associated medical care: \$1.16 billion. Because diabetes and obesity contribute greatly to this cost, it would be useful for health care providers to intensify their nutritional, diet, weight loss, and

exercise counseling and education efforts, examine the specific content of these activities, and compare the relative cost-effectiveness of various educational and counseling interventions for patients with PCOS.

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analyzed 41 specialties with at least 20 respondents, as well as 4 broad-specialty categories: primary care, surgery, internal medicine, and pediatric subspecialties, and other specialties.¹ Control variables were age, sex, race, whether board certified, whether graduated from foreign medical school, residence in areas with less than 200 000 population, region of residence, practice ownership, academic employment, and revenue from managed care.