Pharmacotherapy Adherence and Costs Versus Nonpharmacologic Management in Overactive Bladder

Elise M. Pelletier, MS; Vasudha Vats, MPH; and J. Quentin Clemens, MD, MSCI

Abstract

Objective: To evaluate adherence with overactive bladder (OAB) pharmacotherapy and compare costs between patients receiving pharmacotherapy versus nonpharmacologic management.

Study Design: Retrospective cohort study using anonymous, patient-level data from administrative claims from the PharMetrics database.

Methods: Patients 18 years of age or older who received an OAB diagnosis or OAB medication prescription from January 1, 2005, through December 31, 2006, were identified. Eligible patients had continuous health plan enrollment from 6 months before to 12 months after the index date (date of first OAB prescription or first OAB diagnosis); exclusion criteria included prior OAB therapy use. Study cohorts were stratified as OAB therapy or nonpharmacologically managed based on evidence of treatment and matched using propensity score methodology. Outcomes included adherence rates with OAB therapy (defined as proportion of days covered [PDC]) and comparative costs of OAB pharmacotherapy versus nonpharmacologic management from a healthcare payer perspective.

Results: Adherence among OAB therapy patients was low, with 14% of patients achieving PDC of 80% or higher and an average PDC of 32%. Unadjusted total costs were approximately 3% higher for OAB therapy versus nonpharmacologically managed patients due to higher pharmacy costs. Conversely, outpatient service and inpatient hospitalization costs were higher for nonpharmacologically managed patients. Results did not change after adjusting for patient characteristics.

Conclusion: Results confirm low adherence to OAB pharmacotherapy, with few patients achieving PDC of 80% or higher. Total costs were higher among OAB therapy patients due to higher pharmacy costs, but outpatient and inpatient costs were higher among nonpharmacologically managed patients. Additional research into optimizing pharmacotherapeutic regimens may provide insight into improving treatment adherence.

(Am J Manag Care. 2009;15:S108-S114)

For author information and disclosures, see end of text.

Overactive bladder (OAB) affects more than 33 million American adults.[1,2] In 2000, total annual costs (direct and indirect) associated with OAB in the United States were estimated at $12 billion, with approximately $9 billion incurred in the community and almost $3 billion in institutions.[2] Associated comorbidities contributing to the costs of OAB include skin infections, urinary tract infections (UTIs), depression, and injuries associated with falls.[1,3] European data indicate that OAB affected 20.2 million people in the European Union (EU) older than age 40 in the year 2000 and will affect approximately 25.5 million EU adults by 2020.[4] Total direct costs for OAB management were approximately €4 billion in 2000 and could rise to more than €5 billion (26%) by 2020.[4,5] In the United States, annual total costs for OAB are estimated to range from $16 billion to as high as $26 billion each year, costs that are on par with those for such diseases as depression and Alzheimer's disease.[6] Importantly, prevalence and costs probably are much higher than these estimates, as evidence suggests that OAB is often underdiagnosed and undertreated.[5-10]

It is widely acknowledged that optimizing pharmacologic treatment can reduce long-term healthcare costs of chronic conditions. Poor medication adherence is a well-documented barrier to optimal treatment and the most common cause of treatment failure in these patients. Discontinuation rates of 70% to 90% within the first year of therapy have been reported for various OAB medications.[11-15] Medication discontinuation in chronic conditions has multiple contributors, including low educational levels, cultural factors, side effects, and costs.[16] Although many of these same factors contribute to the high discontinuation rates observed in OAB, unmet treatment expectations are a primary cause.[17]

The purposes of this study were to evaluate OAB pharmacotherapy adherence and to compare costs among OAB patients receiving pharmacotherapy versus patients being managed nonpharmacologically. By contributing to the knowledge base regarding therapeutic adherence and costs in OAB, we aim to raise awareness of the healthcare burden this condition presents and to encourage rapid diagnosis and optimal treatment to reduce it.

METHODS

We obtained anonymous, patient-level data from the PharMetrics

Patient-Centric Database (Watertown, MA), which contains adjudicated medical and pharmaceutical claims for more than 90 US managed care health plans across the United States. Data include inpatient and outpatient diagnoses by *International Classification of Diseases, Ninth Revision, Clinical Modification* (*ICD-9-CM*) code; procedures by *Current Procedural Terminology, 4th Edition* (*CPT-4*), and *Healthcare Common Procedure Coding System* (HCPCS) code; prescription records by National Drug Code (NDC); demographic variables; insurance product and payer types; provider specialties; charged, allowed, and paid amounts; and dates of plan enrollment. Records in the PharMetrics database are representative of the national, commercially insured population on demographic measures including age, sex, and health plan type. In compliance with the Health Insurance Portability and Accountability Act,[18] patient data for this analysis were deidentified, exempting this study from institutional review board review.

We identified patients aged 18 years or older having at least 1 OAB diagnosis code (**Appendix**) or at least 1 prescription for an antimuscarinic OAB medication (tolterodine extended release, branded and generic oxybutynin, solifenacin, darifenacin, trospium) during a 24-month index window from January 1, 2005, through December 31, 2006. The index date for patients receiving OAB pharmacotherapy was the date of the first prescription in the index window; the index date for patients with no OAB prescription was the date of the first OAB diagnosis. Subjects were required to have continuous health plan enrollment for a minimum of 6 months before and 12 months after the index date; during periods of continuous enrollment, all medical (inpatient and outpatient) and pharmacy (retail and mail order) claims are captured. Patients were excluded if there was evidence of OAB pharmacotherapy at any time during the 6-month preindex period or if they were aged 65 years or older and not enrolled in a Medicare risk plan (complete claims histories may not be available for patients aged 65 years or older without Medicare risk coverage because of benefit coordination issues with other payers).

Subjects were stratified into 2 cohorts: OAB therapy (at least 1 of the 6 OAB study medications) or nonpharmacologically managed (at least 1 OAB diagnosis *and* no evidence of any OAB medication); it was assumed that patients classified as nonpharmacologically managed received some type of medical treatment (eg, education, behavioral therapy, surgery) or pharmacotherapy (eg, urinary medications other than the OAB medications listed) following diagnosis. OAB therapy subjects were randomly matched to nonpharmacologically managed subjects (1:1) using propensity score methodology.[19,20] Propensity scores represent the probability that a subject will receive a particular treatment as determined by summing coefficient values for a list of potential confounding variables. These scores provide 2 advantages: (1) a single estimate can be used to adjust for confounding in all multivariate analyses; (2) subjects can be matched effectively on multiple variables simultaneously. The dependent variable in the multiple logistic regression models for propensity scoring was the use of OAB therapy (yes/no). Independent variables (established both at the index date and during the preindex period) included age; sex; geographic region; health plan type; comorbidity presence (Alzheimer's disease, multi-infarct dementia, Parkinson's disease, chronic obstructive pulmonary disease, congestive heart failure, diabetes, hypertension, ischemic heart disease, stroke, multiple sclerosis, prostate hyperplasia, urinary retention, urticaria); and the log of total preindex healthcare costs. Subjects were matched using a "nearest neighbor" approach (ie, the minimal difference in the fitted probability of OAB therapy use). All unsuccessfully matched subjects were excluded.

Outcomes of interest included adherence to index OAB pharmacotherapy over 12 months following the index date in the overall sample of OAB therapy subjects; and 12-month direct medical costs in the matched sample of OAB therapy versus nonpharmacologically managed subjects. Demographic characteristics (age, sex, geographic region, health plan type) and clinical characteristics (preindex healthcare costs, prior clinical conditions, history of comorbidities) were analyzed using data from the preindex period through the index date. Comorbidity burden was estimated using the Dartmouth-Manitoba adaptation of the Charlson Comorbidity Index (CCI).[21] This is the recommended approach for longitudinal claims database analyses where diagnosis-related group and *ICD-9-*

CM codes are not consistently available; use of this adaptation to risk models containing age also results in a better model fit and greater predictive ability.

Adherence for the overall sample of OAB therapy subjects was measured by proportion of days covered (PDC) over the 12-month postindex period. The numerator was the total number of days for which the index therapy was supplied; the denominator was the total number of follow-up days (360). Claims extending beyond day 359 were prorated to include only the portion of days' supply captured within the 12-month timeframe. Subjects were considered adherent if the PDC was 80% or higher.[22-24]

Direct medical costs, including medications (eg, OAB pharmacotherapies, anti-infectives, antide-

Table 1. Demographic and Clinical Characteristics of Patients With OAB

	OAB Therapy (N = 43,367)		Nonpharmacologically Managed (N = 43,367)	
Age, y: mean, SD	51.1	12.4	50.8	12.3
Sex, male: N, %	9675	22.3	9400	21.7
Geographic region: N, %				
Northeast	10,550	24.3	10,671	24.6
South	11,323	26.1	11,138	25.7
Midwest	18,360	42.3	18,309	42.2
West	3134	7.2	3249	7.5
Health plan type: N, %				
Health maintenance organization	14,362	33.1	14,435	33.3
Preferred provider organization	19,944	46.0	19,812	45.7
Point of service	5769	13.3	5876	13.5
Indemnity	2012	4.6	1954	4.5
Other/unknown	1280	3.0	1290	3.0
Preindex healthcare costs: mean, SD, $	5376	16,058	5152	16,221
Clinical events: N, %				
Fracture	1121	2.6	1026	2.4
Urinary tract infection	8719	20.1	10,851	25.0
Constipation/fecal impaction	1939	4.5	2193	5.1
Comorbid conditions: N, %				
Alzheimer's disease	95	0.2	90	0.2
Multi-infarct dementia	116	0.3	111	0.3
Parkinson's disease	138	0.3	124	0.3
Chronic obstructive pulmonary disease	1335	3.1	1290	3.0
Congestive heart failure	580	1.3	549	1.3
Diabetes mellitus	4637	10.7	4586	10.6
Hypertension	11,920	27.5	11,811	27.2
Ischemic heart disease	2266	5.2	2291	5.3
Stroke	343	0.8	312	0.7
Prostate hyperplasia	2561	5.9	2511	5.8
Urinary retention	1612	3.7	1483	3.4
Urticaria	249	0.6	235	0.5
Charlson Comorbidity Index: mean, SD	0.75	1.36	0.71	1.34

OAB indicates overactive bladder; SD, standard deviation.

pressants, all other pharmacy claims), outpatient care (emergency department visits, physician office visits, laboratory tests, all other outpatient services), and inpatient hospitalizations, were calculated over 12 months postindex. Outpatient and inpatient services were stratified as "OAB-related" and "other" based on the presence of OAB diagnosis codes on the claim. Costs were defined from a healthcare payer perspective, and paid claims were used as a proxy for costs; the "paid" variable did not include copayments, coinsurance, or deductibles. Costs were expressed in 2007 US dollars and adjusted as necessary using the medical care component of the Consumer Price Index.[25]

Adherence was assessed using logistic regression controlling for subject demographics, comorbidities, CCI, and log transformation of total preindex healthcare costs, with collinearity among variables evaluated during model development. The dependent variable in the model was "OAB therapy adherence" expressed as a dichotomous variable (PDC <80% vs PDC ≥80%).

Comparisons of costs between OAB therapy and nonpharmacologically managed subjects were conducted by nonparametric (Wilcoxon signed-rank) analyses, with significance assigned at P <.05. A multivariate analysis of total 12-month direct costs was performed using a generalized linear model with a gamma distribution and a log-link function. Candidate variables in the model were those used in the adherence logistic regression models. All data management and analyses were conducted using Statistical Analysis Software (SAS®) versions 8.2 and 9.1.

RESULTS

A total of 498,968 patients with an OAB diagnosis or a claim for 1 of 6 OAB therapies from January 1, 2005, through December 31, 2006, were identified. After applying exclusion criteria, 43,576 subjects remained who had received at least 1 OAB pharmacotherapy. Propensity scoring matched (1:1) 43,367 OAB therapy subjects with nonpharmacologically managed subjects.

Demographic and clinical characteristics of matched subjects are presented in **Table 1**. In both cohorts, the median age was 52 years and 22% were male. Hypertension and diabetes were the most common comorbidities, and approximately 25% of patients had a prior UTI. The CCI was similar between cohorts, averaging 0.75 for OAB therapy and 0.71 for nonpharmacologically managed.

Adherence rates over 12 months were obtained for the total sample of OAB therapy subjects (N = 43,576). Overall, patients receiving medication had low adherence. Only 14.4% of the aggregate OAB therapy cohort reached a PDC of 80% or higher, with an average PDC of 32.4%. Adjusting for patient characteristics revealed that female and older subjects were more likely to adhere to pharmacotherapy over 12 months. Subjects with a history of hypertension, diabetes, or multiple sclerosis also were more adherent, whereas those with chronic obstructive pulmonary disease were less adherent over the study period.

Twelve-month postindex healthcare costs are presented in **Table 2**. Following pharmacotherapy initiation, OAB therapy subjects had significantly higher mean (median) total costs compared with nonpharmacologically managed subjects ($9917 [$4598] vs $9657 [$4299]; P <.001). As expected, this was due primarily to significantly higher average total pharmacy costs, which were 30% greater among OAB therapy subjects ($2796 [$1251] vs $2150 [$681]; P <.001). Conversely, nonpharmacologically managed subjects had higher OAB-related and non–OAB-related outpatient services and inpatient hospitalization costs. Nonpharmacologically managed subjects averaged $277 for OAB-related outpatient services compared with $176 for OAB therapy subjects (P <.001), with 69% more OAB-related physician office visits and more than double the number of OAB-related laboratory tests among nonpharmacologically managed subjects contributing to this difference; average non–OAB-related outpatient services costs for nonpharmacologically managed versus OAB therapy subjects were $4812 and $4734 ($P$ <.001), respectively.

Multivariate analysis of total 12-month costs revealed that OAB therapy subjects continued to incur higher total costs compared with nonpharmacologically managed subjects (P <.001) after controlling for other subject characteristics. Being female and in the youngest age group (18-34 years) predicted 2% and 6% lower costs, respectively (P <.05); conversely, older age, higher preindex total healthcare costs, and

Table 2. 12-Month Direct Medical Costs for OAB Therapy Versus Nonpharmacologically Managed Patients

	OAB Therapy, $ (N = 43,367)		Nonpharmacologically Managed, $ (N = 43,367)		
	Mean (SD)	Median	Mean (SD)	Median	*P*
Total Costs	9917 (23,659)	4598	9657 (21,566)	4299	<.001
Total pharmacy	2796 (6479)	1251	2150 (6856)	681	<.001
OAB therapies	315 (421)	130	0	0	<.001
Anti-infectives	9 (185)	0	7 (170)	0	.005
Antidepressants	201 (525)	0	151 (451)	0	<.001
All other pharmacy services	2271 (6277)	793	1992 (6781)	567	<.001
OAB-Related					
Total outpatient	176 (1162)	0	277 (1287)	80	<.001
Emergency department visits	1 (49)	0	9 (132)	0	<.001
Physician office visits	42 (396)	0	70 (221)	42	<.001
Laboratory diagnostic tests	5 (124)	0	19 (57)	4	<.001
All other outpatient services	127 (1003)	0	179 (1229)	0	<.001
Total inpatient	47 (874)	0	93 (1409)	0	<.001
All Other					
Total outpatient	4734 (9377)	2038	4812 (10,375)	2189	<.001
Emergency department visits	240 (1072)	0	235 (1423)	0	.524
Physician office visits	803 (1914)	417	892 (2237)	483	<.001
Laboratory diagnostic tests	212 (652)	70	254 (551)	106	<.001
All other outpatient services	3480 (8190)	1116	3431 (9132)	1173	.998
Total inpatient	2164 (17,500)	0	2325 (13,468)	0	<.001

OAB indicates overactive bladder; SD, standard deviation.

multiple comorbidities predicted higher total costs ($P < .05$).

DISCUSSION

Our results confirm prior studies finding that medication discontinuation is very high among patients prescribed OAB pharmacotherapy on a national level. Other studies have explored persistence at both the state level as well as in specific populations (ie, Medicaid) and have found similar results.[11,14,15] This study reflects previous research findings that OAB syndrome is costly regardless of whether it is nonpharmacologically or pharmacologically managed. As expected, we found pharmaceutical costs were higher among those managed with medication, whereas costs for inpatient and outpatient services were higher among nonpharmacologically managed patients.

Although this study considered only direct healthcare costs, indirect costs also are high in OAB and include decreased health-related quality of life (HRQOL), lost productivity, and increased psychological distress.[8,26-29] Although nonpharmacologic management may be less expensive in the short term, it may not reduce the long-term healthcare burden presented by OAB. Advantages of nonpharmacologic management must be weighed against potential drawbacks, such as surgical failure, partial successes, and complications.[30-33]

The current study has several limitations. We assumed nonpharmacologically managed subjects received some form of medical intervention, such as behavioral therapy, education, or other urinary pharmacotherapy. Because subject selection relied on NDC, HCPCS, and *ICD-9-CM* codes, miscoding may have caused mistaken patient exclusion or miscategorization. Specifically, the choice of codes

to identify OAB patients, including those for stress or mixed incontinence, may have resulted in the inappropriate inclusion of study patients; however, because there can be errors in coding, particularly at the fourth and fifth digit levels, we chose to broaden our inclusion criteria. The eligibility requirement that subjects be continuously enrolled in their health plans may have biased sample selection, resulting in lower healthcare costs, as severely ill patients were more likely to be excluded due to death or healthcare coverage loss (because of inability to work). In addition, the database did not include uninsured patients, which may cause under- or overestimation of true OAB costs. We did not account for differences in disease duration among subjects or for OAB therapies used prior to the 6-month preindex period. Thus, our results may be biased by unknown factors, such as whether disease duration differed between cohorts, which could affect treatment regimens or complication rates, and the impact of pharmacotherapy use prior to the 6-month preindex period. Controlling for patient characteristics in the multivariate analyses helped to account for some—but not necessarily all—of the intercohort differences associated with variations in OAB duration and severity. Finally, the database did not contain information on systemic factors affecting care, such as plan limits on medication use, but these factors probably did not greatly influence our results because of the number and diversity of plans in the database.

CONCLUSION

A great deal of work remains to be done before we arrive at an optimal therapeutic regimen that will help reduce the economic burden of OAB syndrome. Recent research is beginning to provide some concrete guidance about how to improve therapeutic adherence in OAB.[34,35] Physicians should adjust dosages carefully and work with patients to develop realistic expectations of treatment and to provide education to avoid medication-defeating behaviors.

There is a need to improve our understanding of all factors that influence medication adherence. Without this effort, lifestyle preferences, health plan parameters, and patient psychological factors will continue to prevent us from reaping the long-term benefits of existing OAB pharmacotherapies.[28,29,36] Databases such as the one used in this study contain a wealth of information but cannot account for many influences on pharmacotherapeutic adherence and cost. Future research should link these data with other sources of information, such as patient HRQOL, medication preference surveys, and patients' long-term clinical histories.

Acknowledgments

Editorial assistance was provided by IMS Health, Inc. and funded by Pfizer Inc. The authors would like to thank Andrew Hostetter and Daniel Smith for their assistance with the statistical programming and analysis of this study. Coordination support and management of this supplement were provided by Complete Healthcare Communications, Inc.

Author Affiliations: From Health Economics and Outcomes Research, IMS Health, Inc., Watertown, MA (EMP); Global Outcomes Research, Pfizer Inc, New York, NY (VV); and Division of Neurourology and Pelvic Reconstructive Surgery, University of Michigan, Ann Arbor (JQC).

Funding Source: Financial support for this work was provided by Pfizer Inc.

Author Disclosure: The authors report paid consultancy (EMP), employment with (VV), and paid lecturer (JQC) for Pfizer Inc.

Authorship Information: Concept and design (EMP, VV, JQC); acquisition of data (EMP, VV); analysis and interpretation of data (EMP, VV, JQC); drafting of the manuscript (EMP, VV); critical revision of the manuscript for important intellectual content (EMP, VV, JQC); statistical analysis (EMP, VV); provision of study materials or patients (VV); obtaining funding (EMP, VV); administrative, technical, or logistic support (VV); and supervision (EMP, VV).

Address correspondence to: Elise M. Pelletier, MS, Director, Health Economics and Outcomes Research, IMS Health, Inc., 311 Arsenal St, The Arsenal on the Charles, Watertown, MA 02472. E-mail: epelletier@us.imshealth.com.

REFERENCES

1. Sussman DO. Overactive bladder: treatment options in primary care medicine [review]. *J Am Osteopath Assoc.* 2007;107(9):379-385.

2. Hu TW, Wagner TH, Bentkover JD, et al. Estimated economic costs of overactive bladder in the United States. *Urology.* 2003;61(6):1123-1128.

3. Darkow T, Fontes CL, Williamson TE. Costs associated with the management of overactive bladder and related comorbidities. *Pharmacotherapy.* 2005;25(4):511-519.

4. Reeves P, Irwin D, Kelleher C, et al. The current and future burden and cost of overactive bladder in five European countries. *Eur Urol.* 2006;50(5):1050-1057.

5. Klotz T, Bruggenjurgen B, Burkart M, Resch A. The economic costs of overactive bladder in Germany. *Eur Urol.* 2007;51(6):1654-1663.

6. Debruyne FMJ, Heesakkers JPFA. Clinical and socioeconomic relevance of overactive bladder. *Urology.* 2004;63(3A):42-44.

7. Odeyemi IA, Dakin HA, O'Donnell RA, Warner J, Jacobs A, Dasgupta P. Epidemiology, prescribing patterns and resource use associated with overactive bladder in UK primary care. *Int J Clin Pract.* 2006;60(8):949-958.

8. Kirby M, Artibani W, Cardozo L, et al. Overactive bladder: the importance of new guidance. *Int J Clin Pract.* 2006;60(10):1263-1271.

9. Tyagi S, Thomas CA, Hayashi Y, Chancellor MB. The overactive bladder: epidemiology and morbidity. *Urol Clin North Am.* 2006;33(4):433-438, vii.

10. Goepel M, Hoffman JA, Piro M, Rubben H, Michel MC. Prevalence and physician awareness of symptoms of urinary bladder dysfunction. *Eur Urol.* 2002;41(3):234-239.

11. D'Souza AO, Smith MJ, Miller LA, Doyle J, Ariely R. Persistence, adherence, and switch rates among extended-release and immediate-release overactive bladder medications in a regional managed care plan. *J Manag Care Pharm.* 2008;14(3):291-301.

12. Juzba M, White TJ, Chang EY. Prevalence and cost analysis of overactive bladder in a managed care organization [poster abstract]. *J Manag Care Pharm.* 2001;7(5):365. http://www.amcp.org/data/jmcp/Abstracts-355-373.pdf.

13. Desgagné A, LeLorier J. Incontinence drug utilization patterns in Québec, Canada. *Value Health.* 1999;2(6):452-458.

14. Yu YF, Nichol MB, Yu AP, Ahn J. Persistence and adherence of medications for chronic overactive bladder/urinary incontinence in the California Medicaid program. *Value Health.* 2005;8(4):495-505.

15. Shaya FT, Blume S, Gu A, Zyczynski T, Jumadilova Z. Persistence with overactive bladder pharmacotherapy in a Medicaid population. *Am J Manag Care.* 2005;11(4 suppl):S121-S129.

16. Krueger KP, Felkey BG, Berger BA. Improving adherence and persistence: a review and assessment of interventions and description of steps toward a national adherence initiative. *J Am Pharm Assoc.* 2003;43(6):668-678.

17. Brubaker L, Nichol M, Fanning K, Becker R, Jumadilova Z, Benner J. Patient-reported reasons for discontinuing overactive bladder (OAB) medications [poster abstract]. Presented at: 36th Annual Meeting of the International Continence Society. Christchurch, New Zealand; November 27-December 1, 2006. https://www.icsoffice.org/publications/2006/PDF/0086.PDF.

18. Health Insurance Portability and Accountability Act (HIPAA) of 1996, Pub. L. No. 104-191, 110 Stat. 1936, 2006.

19. Rubin DB. Estimating causal effects from large data sets using propensity scores. *Ann Intern Med.* 1997;127(8 pt 2):757-763.

20. Weitzen S, Lapane KL, Toledano AY, Hume AL, Mor V. Principles for modeling propensity scores in medical research: a systematic literature review. *Pharmacoepidemiol Drug Saf.* 2004;13(12):841-853.

21. Romano PS, Roos LL, Jollis JG. Adapting a clinical comorbidity index for use with *ICD-9-CM* administrative data: differing perspectives. *J Clin Epidemiol.* 1993;46(10):1075-1079.

22. Benner JS, Glynn RJ, Mogun H, Neumann PJ, Weinstein MC, Avorn J. Long-term persistence in use of statin therapy in elderly patients. *JAMA.* 2002;288(4):455-461.

23. Chapman RH, Benner JS, Petrilla AA, et al. Predictors of adherence with antihypertensive and lipid-lowering therapy. *Arch Intern Med.* 2005;165(10):1147-1152.

24. Ho PM, Rumsfeld JS, Masoudi FA, et al. Effect of medication nonadherence on hospitalization and mortality among patients with diabetes mellitus. *Arch Intern Med.* 2006;166(17):1836-1841.

25. US Department of Labor, Bureau of Labor Statistics. Consumer Price Index for the healthcare sector. Washington, DC: Bureau of Labor Statistics, Division of Consumer Prices and Price Indexes. http://www.bls.gov/CPI/.

26. Szeinbach SL, Jackson M. Here is the case for the urge in administrative claims database research about overactive bladder therapies. *J Manag Care Pharm.* 2008;14(3):309-311.

27. Michel MC, Oelke M, Goepel M, Beck E, Burkart M. Relationships among symptoms, bother, and treatment satisfaction in overactive bladder patients. *Neurourol Urodyn.* 2007;26(2):190-195.

28. Harpe SE, Szeinbach SL, Caswell RJ, Corey R, McAuley JW. The relative importance of health related quality of life and prescription insurance coverage in the decision to pharmacologically manage symptoms of overactive bladder. *J Urol.* 2007;178(6):2532-2536.

29. Dwyer P, Kelleher C, Young J, et al. Long-term benefits of darifenacin treatment for patient quality of life: results from a 2-year extension study. *Neurourol Urodyn.* 2008;27(6):540-547.

30. Srikrishna S, Robinson D, Cardozo L, Vella M. Management of overactive bladder syndrome. *Postgrad Med J.* 2007;83(981):481-486.

31. Sutherland SE, Lavers A, Carlson A, Holtz C, Kesha J, Siegel SW. Sacral nerve stimulation for voiding dysfunction: one institution's 11-year experience. *Neurourol Urodyn.* 2007;26(1):19-28.

32. Kulsend-Hanssen S, Husby H, Schiotz HA. The tension free vaginal tape operation for women with mixed incontinence: do preoperative variables predict the outcome? *Neurourol Urodyn.* 2007;26(1):115-121.

33. Botros SM, Miller JJ, Goldberg RP, et al. Detrusor overactivity and urge urinary incontinence following trans obturator versus midurethral slings. *Neurourol Urodyn.* 2007;26(1):42-45.

34. Tiwari A, Naruganahalli KS. Current and emerging investigational medical therapies for the treatment of overactive bladder. *Expert Opin Investig Drugs.* 2006;15(9):1017-1037.

35. Vella M, Robinson D, Cardozo L, Cartwright R. New developments in the treatment of urinary incontinence. *Minerva Urol Nefrol.* 2006;58(4):299-310.

36. Bolge SC, McDonnell DD, Chen A, Wan GJ. Patient satisfaction with extended release tolterodine or oxybutynin in overactive bladder. *Curr Med Res Opin.* 2007;23(8):1903-1912.

Appendix. *ICD-9-CM* Diagnosis Codes for Identifying Overactive Bladder

ICD-9-CM Code	*ICD-9-CM* Code Description
596.5x (excluding 596.53, 596.54)	Other functional disorders of bladder (excluding paralysis of bladder, neurogenic bladder NOS)
788.3x	Urinary incontinence
788.41	Urinary frequency
788.43	Nocturia

ICD-9-CM indicates *International Classification of Diseases, Ninth Revision, Clinical Modification*; NOS, not otherwise specified.