Original Article

BURDEN OF ILLNESS, ANNUAL HEALTHCARE UTILIZATION, AND COSTS ASSOCIATED WITH COMMERCIALLY INSURED PATIENTS WITH CUSHING DISEASE IN THE UNITED STATES

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ABSTRACT

Objective: To describe the burden of illness, healthcare utilization, and costs associated with Cushing disease (CD), a rare disorder resulting from adrenocorticotropic hormone–secreting pituitary tumors, in commercially insured patients in the U.S.

Methods: Patients with CD were identified in 2010 in the IMS Health PharMetrics and Truven Health Analytics MarketScan claims databases. Because there is no diagnosis code for CD, patients were identified with a claim for Cushing syndrome and either benign pituitary adenoma or hypophysectomy. We estimated total and CD-related utilization and costs using pharmacy and medical claims.

Results: We identified 685 CD patients (81% female; mean age, 41.7 years; mean Charlson comorbidity index, 1.6; mean number of chronic conditions, 4.2); 30.5% of the patients had diabetes, 22.5% had psychiatric disturbances, 21% had infections, 8.6% had osteoporosis, 8% had cardiovascular disease/stroke, 5.5% had kidney stones, and 0.7% had compression fracture of a vertebra. Patients had a mean of 19.8 office visits per year; 38.4% had inpatient hospitalizations and 34.2% visited the emergency department (ED). Patients had a mean of 3.2 CD-related office visits per year; 26.9% had CD-related hospitalizations, 0.9% had CD-related ED visits, and 36.8% had CD treatments. Mean annual total costs were $34,992 (pharmacy, $3,597; medical costs, $31,395). CD-related costs accounted for $14,310 of total costs (CD treatment costs, $9,353; other CD-related costs, $4,957).

Conclusion: CD patients have a high burden of illness. Among CD patients in this study, 30.5% had diabetes, 22.5% had psychiatric disturbances, 21% had infections, 8.6% had osteoporosis, 8% had cardiovascular disease/stroke, and 5.5% had kidney stones. Patients had 19.8 office visits per year, and >34% of patients were hospitalized. Mean total cost of care was approximately $35,000 per year. **(Endocr Pract. 2015;21:77-86)**

Abbreviations:
CD = Cushing disease; **CPT** = current procedural terminology; **ICD-9-CM** = International Classification of Diseases, 9th Revision, Clinical Modification

INTRODUCTION

Cushing syndrome is a rare disorder characterized by the diverse manifestations of disease of excess glucocorticoid exposure. The causes of endogenous Cushing syndrome are usually grouped into cortiotropin-dependent and -independent causes, with corticotropin-dependent causes making up the majority (1,2). Cushing disease (CD) is diagnosed when a corticotropin-producing pituitary adenoma is responsible for Cushing syndrome (1,3). CD has an estimated incidence range of 1.2 to 2.4 per million population per year (3-6) in Europe and nearly 8 cases per million population in the United States in individuals <65 years old (7); exogenous Cushing syndrome is far more common.

Incompletely controlled Cushing syndrome carries an elevated mortality risk, making adequate treatment crucial (5). Once a diagnosis of CD is made, the primary treatment is removal of the adenoma, usually via transsphenoidal surgery, with short-term remission rates as high as 90% (3,8). Disease may recur, at times many years after the initial

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diagnosis, requiring repeat surgery, radioablation, or pharmacologic treatment. The impact of elevated cortisol levels can be seen in every organ system, with obesity, diabetes, depression, and osteoporosis among the more common manifestations.

Although uncontrolled CD may result in significant morbidity and mortality (9), the only prior study to assess the cost consequences of the disease in a U.S. population used data from 2004-2008 (10). Given the lack of up-to-date population-based data on the economic impact of CD in the U.S., we examined 2 recent health insurance claims databases to gain a clearer understanding of the burden of illness, healthcare utilization, and healthcare costs associated with the disease.

METHODS

Study Design and Data Sources

We conducted a cross-sectional descriptive study among patients with CD using 2010 data from 2 major U.S. commercial administrative claims databases, IMS Health PharMetrics and Truven Health Analytics MarketScan®. Each database represents claims for over 10 million covered lives per year from all regions of the U.S.

Both administrative claims databases are compliant with the Health Insurance Portability and Accountability Act and contain deidentified adjudicated pharmacy claims (e.g., outpatient prescriptions) and medical claims (e.g., inpatient and outpatient services) submitted for payment by providers, healthcare facilities, and pharmacies. Claims in these databases include information on each physician visit, medical procedure, hospitalization, drug dispensed, date of service/prescription, number of days of medication supplied, and tests performed. Drug-related claims are only recorded for the outpatient setting. Also available are member enrollment and benefit information, as well as limited patient, provider, and hospital demographic information. Healthcare costs (claims paid) are recorded in both databases.

Study Sample Selection

There is no International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM) code or validated algorithm for identifying patients with CD using claims data. We identified patients with CD in the PharMetrics and MarketScan databases in the 2010 calendar year using a strategy previously published by Swearingen (10), requiring patients to have at least one medical claim with an ICD-9-CM diagnosis of Cushing syndrome (ICD-9-CM, 255.0) as the primary diagnosis and either a diagnosis of benign pituitary adenoma (ICD-9-CM, 227.3) or a hypophysectomy (ICD-9-CM, 07.6x, current procedural terminology [CPT], 61546, 61548, 62165). We excluded patients who were not continuously enrolled in an eligible health plan during the entire 2010 calendar year.

To avoid including the same patient in the study twice, once from each database, we randomly excluded possible duplicates from one of the databases. We considered a patient identified in one database a possible duplicate if he or she had the same age, gender, U.S. census region, treatment, and date of first Cushing syndrome diagnosis in 2010 as a patient in the second database.

Study Measures

All enrollment files, medical claims, and pharmacy claims submitted during the 2010 calendar year were used to determine the study measures. Every claim for an individual's period of enrollment is included in the databases, and there are presumed to be no missing data because a claim must exist in order for payment to be processed. Patient characteristics—age, gender, U.S. census region—were identified in enrollment records. "Usual physician specialty," a validated concept that assigns a specialty to each patient based on data from claims, refers to the physician specialty with the largest number of patient office visits coded with evaluation and management services and a diagnosis of Cushing syndrome (11).

Overall burden of illness was assessed with 2 variables. The widely validated Healthcare Cost and Utilization Project Chronic Condition Indicator (CCI) was used to calculate the number of chronic conditions experienced by each patient (12,13). The CCI defines a chronic condition as one that generally lasts ≥12 months and either places limitations on self-care, independent living, and social interactions or results in the need for ongoing intervention with medical products, services, and special equipment. Second, we included the Charlson comorbidity index (14,15). The Charlson comorbidity index, initially developed as a predictor of in-hospital mortality, has been widely adapted as a measure of the overall burden of illness in the general population.

To assess the burden of comorbidities, we used expert endocrinologist input (W.H.L.) and literature review to develop an a priori list of conditions associated with CD for which specific ICD-9-CM codes exist (Appendix). These comorbidities included infection, diabetes, osteoporosis, compression fracture of a vertebra, psychiatric disturbances (i.e., depression, anxiety), kidney stone, and cardiovascular disease/stroke. We also determined the number of CD patients who had used any antidiabetic drugs.

We measured the use of healthcare services, CD treatments, and biochemical tests in 2010. Healthcare service use included inpatient hospitalizations, emergency department (ED) visits, and physician office visits. Total health service use was determined using data from all claims. We estimated direct CD-related healthcare service by examining claims with either (*1*) a primary diagnosis of Cushing syndrome or benign pituitary adenoma, or (*2*) claims associated with CD treatment. CD treatments were identified using CPT codes for tests and procedures, national drug

codes for orally administered medications, and Healthcare Common Procedure Coding System codes for injected medications (Appendix).

We described the frequency of use of pharmacologic treatments—ketoconazole, dopamine agonists (bromocriptine and cabergoline), metyrapone, and mitotane—surgery (pituitary surgery and adrenalectomy), and radiotherapy. Number of days receiving pharmacologic therapy was also reported. Frequency of use of biochemical tests was reported for free cortisol tests (CPT, 82530), total cortisol tests (CPT, 82533), and inferior petrosal sinus sampling (CPT, 36500 [insertion of catheter vein]) and 75893 [X-ray for venous sample by catheter] at the same day).

Total annual healthcare costs were determined using all pharmacy and medical claims. Direct CD-related costs included costs for the pharmacologic treatments, surgeries, and radiotherapies defined earlier ("treatment costs") and costs associated with either (*1*) a primary diagnosis of Cushing syndrome or benign pituitary adenoma, or (*2*) claims associated with CD treatment. Total healthcare costs were reported as pharmacy costs and as medical costs. Direct CD-related healthcare costs were reported as CD treatment costs and as other CD-related costs.

The attribution of direct CD-related costs was complicated by the diversity of conditions associated with CD and by the lack of ICD-9-CM code specifically associated with the disease. As sensitivity analyses, we calculated CD-related cost in two other ways. First, we repeated the cost calculation, allowing Cushing syndrome to be identified in any diagnosis field (rather than only the primary diagnosis field, as in the main analysis). Second, we included the cost of claims that carried a primary ICD-9-CM diagnosis of any CD-associated comorbidity defined earlier (in addition to those claims with a primary diagnosis of Cushing syndrome or benign pituitary adenoma, as in the main analysis).

Analyses

We reported descriptive statistics, including means, medians, and standard deviations for continuous variables as well as patient counts and percentages for categorical variables, for all study measures where applicable. All data transformations and statistical analyses were performed using SAS© version 9.3 (SAS Institute, Cary, NC).

RESULTS

We initially identified 837 patients with a diagnosis of CD in 2010 from the PharMetrics and MarketScan databases (Fig. 1). Of these 837 patients, 687 were continuously enrolled for a 12-month calendar year in 2010. Using an algorithm based on age, gender, region, treatment, and the date of the first Cushing syndrome diagnosis, we identified 2 probable duplicate patients (i.e., the same

Table 1
Demographics and Usual Physician Specialty and Comorbidity Measures in Cushing Disease Patients During the 2010 Calendar Year

	N = 685
Age, years, mean (SD)	41.7 (13.4)
Age group (years), n (%)	
≤17	29 (4.2)
18-24	65 (9.5)
25-34	108 (15.8)
35-44	175 (25.5)
45-54	186 (27.2)
55-64	114 (16.6)
65+	8 (1.2)
Female, n (%)	555 (81.0)
Region, n (%)	
Midwest	151 (22.0)
Northeast	155 (22.6)
South	263 (38.4)
West	116 (16.9)
Usual physician specialty,[a] n (%)	
Endocrinology	215 (31.4)
Primary care	99 (14.5)
Other[b]/unknown[c]	371 (54.2)
No. of chronic conditions, mean (SD)	4.2 (2.1)
Charlson comorbidity index, mean (SD)	1.6 (2.3)
CD-related comorbidities, n (%)	
Diabetes	209 (30.5)
Psychiatric disturbances (depression, anxiety)	154 (22.5)
Infection	144 (21.0)
Osteoporosis	59 (8.6)
Cardiovascular disease/stroke	55 (8.0)
Kidney stone	38 (5.5)
Compression fracture of vertebra	5 (0.7)

Abbreviation: CD = Cushing disease.
[a] Assigned as the specialty with the largest plurality of office visits coded as evaluation and management services and having a Cushing syndrome diagnosis.
[b] All individual specialties in "other" are <2%.
[c] Specialty was reported as "unknown" if it could not be identified with evaluation and management service claims or if it was recorded as "unknown" on the claim (44%).

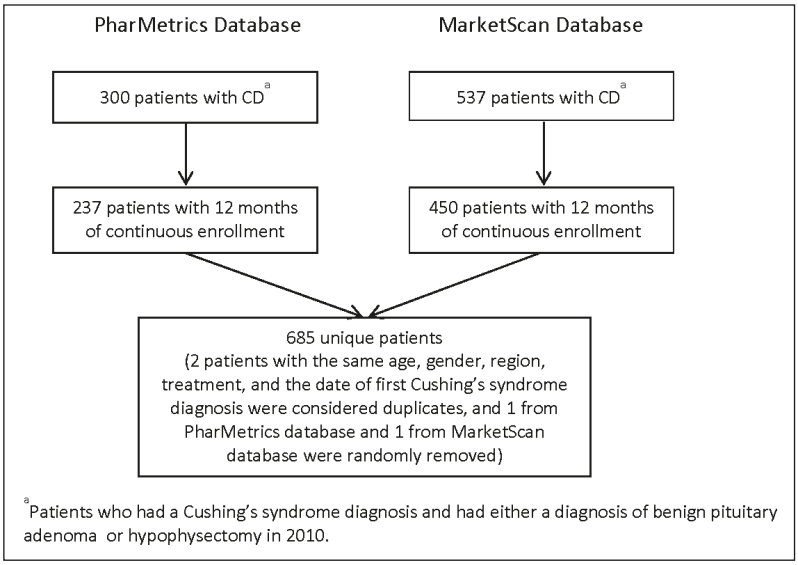

Fig. 1. [a]Patients who had a Cushing's syndrome diagnosis and had either a diagnosis of benign petuitary adenoma or hypophysectomy in 2010.

patient appearing in both databases). These 2 patients were randomly removed from one of the databases, leaving a final analytic sample of 685 unique continuously enrolled patients with probable CD.

The mean (SD) age was 41.7 (13.4) years, and 81% were female (Table 1). Most patients were from the South (38.4%), followed by 22.6% from the Northeast, 22.0% from the Midwest, and 16.9% from the West U.S. census regions. The usual physician specialty was endocrinology for 215 (31.4%) of the patients, primary care for 99 (14.5%), and other or unknown specialty for 371 (54.2%) of the patients. The mean Charlson comorbidity index was 1.6, and the mean number of chronic conditions was 4.2. Of the 685 patients, 30.5% had diabetes (and 171 [25%] used antidiabetic drugs), 22.5% had psychiatric disturbances, 21% had infections, 8.6% had osteoporosis, 8% had cardiovascular disease or stroke, 5.5% had kidney stones, and 0.7% had compression fracture of a vertebra.

With regard to healthcare utilization, patients had a mean of 19.8 physician office visits per year and a mean of 3.2 CD-related physician office visits per year (Table 2). More than one-third of patients had at least one inpatient hospitalization (38.4%) and any ED visits (34.2%), whereas 26.9% had a CD-related inpatient hospitalization. During the year of observation, 252 patients (36.8%) had at least one treatment for CD (pharmacologic, surgery, or radiotherapy), with the remainder presumably having had treatment in prior years. Surgery was observed in 179 patients (26.1%), with 167 having pituitary operations and 13 adrenalectomy. Of the 179 who had surgery, 141 patients had no other treatment during the year. Nine patients had more than one surgery during the calendar year. Pharmacologic treatment was used by 92 (13.4%) patients, with 48 (7%) receiving dopamine agonists, 48 (7%) ketoconazole, 1 (0.1%) mitotane, and none receiving metyrapone. Only 5 (0.7%) patients used more than one pharmacologic treatment, and pharmacologically treated patients had average treatment duration of 138.4 days. Of 685 CD patients, 24 (3.5%) received radiotherapy. Free cortisol, total cortisol, and inferior petrosal sinus sampling was performed in 353 (51.4%), 508 (73.9%), and 48 (7.0%) patients, respectively.

Mean annual total healthcare costs were $34,992 (SD, $45,811; median, $18,031), of which $3,597 (SD, $6,323) of these costs were from prescriptions (all outpatient pharmacy claims), and $31,395 (SD, $44,082) of these costs were from medical claims (Table 3). Direct CD-related costs, assessed using medical claims with primary diagnosis of Cushing syndrome or benign pituitary adenoma or claims associated with CD treatment, accounted for $14,310 (SD, $25,161; median, $2,079) of the mean total healthcare costs, of which $9,353 (SD, $19,259) were from CD treatment costs (pharmacologic, surgery, or radiotherapy) and $4,957 (SD, $11,805) from other CD-related costs. In the first sensitivity analysis, annual direct CD-related costs were $16,750; in the second, they were $15,815.

DISCUSSION

This study confirms the high cost of CD, as previously reported (10), and did so using a dataset which combined 2 major commercial health insurance claims databases. Using this large dataset, we described healthcare utilization and healthcare costs among a large, broadly representative sample of CD patients, addressing a significant knowledge gap for this rare but burdensome condition. Our data reflect care delivered throughout the U.S. in both inpatient and outpatient settings, and we report the costs of treating both chronic CD and related comorbidities.

Table 2
Use of Healthcare Services, CD Treatments, and Biochemical Tests in CD Patients During the 2010 Calendar Year

	N = 685
Annual Healthcare Service Utilization	
No. of inpatient hospitalizations, n (%)	
0	422 (61.6)
1	180 (26.3)
2	44 (6.4)
≥3	39 (5.7)
No. of ED visits, n (%)	
0	451 (65.8)
1	128 (18.7)
2	54 (7.9)
≥3	52 (7.6)
No. of physician office visits, mean (SD) [median]	19.8 (16.1) [16]
Annual Direct CD-Related Healthcare Service Utilization	
No. of CD-related[a] inpatient hospitalizations, n (%)	
0	501 (73.1)
1	172 (25.1)
≥2	12 (1.8)
No. of CD-related[a] ED visits, n (%)	
0	679 (99.1)
≥1	6 (0.9)
No. of CD-related[a] physician office visits, mean (SD) [median]	3.2 (3.9) [2]
CD Treatment	
Any CD treatment (surgery, pharmacologic, or radiotherapy), n (%)	252 (36.8)
Surgery (pituitary surgery or adrenalectomy), n (%)	179 (26.1)
Pituitary surgery, n (%)	167 (24.4)
Adrenalectomy, n (%)	13 (1.9)
No. of surgeries, n (%)	
0	506 (73.9)
1	170 (24.8)
2	7 (1.0)
3	2 (0.3)
Treated with surgery only[b], n (%)	141 (20.6)
Pharmacologic[c] (dopamine agonists, ketoconazole, metyrapone, or mitotane), n (%)	92 (13.4)
Dopamine agonists[d], n (%)	48 (7.0)
Ketoconazole, n (%)	48 (7.0)
Metyrapone, n (%)	0 (0)
Mitotane, n (%)	1 (0.1)
Used more than one pharmacologic treatment, n (%)	5 (0.7)
Days of any pharmacologic treatment (among treated patients), mean (SD)	138.4 (97.3)
Radiotherapy, n (%)	24 (3.5)
Biochemical Tests	
Free cortisol[e], n (%)	353 (51.4)
Total cortisol[e], n (%)	508 (73.9)
Inferior petrosal sinus sampling[f], n (%)	48 (7.0)

Abbreviations: CD = Cushing disease; ED = emergency department.
[a] Medical claims with primary diagnosis of Cushing syndrome or benign pituitary adenoma or claims associated with CD treatment.
[b] No other observed treatments in study period.
[c] At least one medication fill.
[d] Bromocriptine, cabergoline.
[e] Not site- or source-specific.
[f] Current procedural terminology: 36500 [insertion of catheter vein] and 75893 [X-ray for venous sample by catheter] at the same day.

Table 3
Annual Total and CD-Related Healthcare Costs in CD Patients During the 2010 Calendar Year

	N = 685 Mean (SD) [Median]
Annual Total and CD-Related Healthcare Costs	
Total healthcare costs	$34,992 (45,811) [18,031]
All outpatient pharmacy claims	$3,597 (6,323) [1,277]
All medical claims	$31,395 (44,082) [14,365]
Direct CD-related healthcare costs[a]	$14,310 (25,161) [2,079]
CD treatment (including pharmacologic treatment, surgery, and radiotherapy)	$9,353 (19,259) [0]
Other CD-related costs	$4,957 (11,805) [1,543]
Sensitivity Analysis I	
Direct CD-related healthcare costs[b]	$16,750 (28,271) [3,018]
Other CD-related costs	$7,396 (15,558) [2,265]
Sensitivity Analysis II	
Direct CD-related healthcare costs[c]	$15,815 (26,595) [2,849]
Other CD-related costs	$6,462 (14,440) [2,160]

Abbreviation: CD = Cushing disease.
[a] Medical claims with primary diagnosis of Cushing syndrome or benign pituitary adenoma or claims associated with CD treatment.
[b] Medical claims with a diagnosis of Cushing syndrome or benign pituitary adenoma in any diagnosis field or claims associated with CD treatment.
[c] Medical claims with primary diagnosis of Cushing syndrome, benign pituitary adenoma, or any comorbidity condition or claims associated with CD treatment.

In this cross-sectional study, 37% of patients were observed to have some treatment for CD. Among treated patients, 66% had pituitary surgery and 36% pharmacologic therapy, consistent with prior studies. The majority of patients (63%) were untreated during the observation year, suggesting that they may have been in remission or cured. Despite this remission rate, the overall direct healthcare cost was $35,000. Almost one-fourth of the total ($9,353) was spent on treatments, including surgery (in 26% of patients overall), pharmacotherapy (13%), and radioablation (3%), with an additional $4,957 annually for visits with a primary diagnosis of CD and CD-related tests. We combined these 2 costs to estimate direct CD-related costs at $14,310.

Comorbidities were common, with the most frequently observed being diabetes (30.5%), psychiatric conditions (22%), osteoporosis (9%), cardiovascular disease/stroke (8%), and kidney stones (5%). Costs of these comorbidities were not included in the calculation of CD-related costs, as they could not be directly attributed to the disease. However, their known association with glucocorticoid excess makes it plausible that some proportion of these conditions may have resulted from undertreated CD.

Using a different methodology, Swearingen et al (10) reported mean total annual direct healthcare costs of $26,440 for CD patients in 2008. The use of different populations and techniques makes direct comparisons to the current study impossible, but in that study, 77% of costs were CD-related. Applied to our data, this suggests that the CD patients in our study had $26,944 in costs attributable to the disease. The prior study found rates of comorbidities similar to our study. These 2 studies suggest that, although rare, CD is quite burdensome, both in human and economic terms.

Prior research has demonstrated a reduction in some costs associated with successful treatment (10). Our study design did not allow us to confirm this finding, but we are undertaking a study using primary data collection from medical records to further explore this and other questions that cannot be answered using insurance claims.

Strengths and Limitations

A strength of this study is the large sample of CD patients, obtained by combining 2 major claims databases to increase generalizability of our study results. The current study contributes valuable up-to-date population-based

data on the economic impact and burden of illness of CD in the U.S., supplementing limited prior literature on the burden of this condition.

Research use of insurance claims data presents unique challenges (16), and our study had limitations. Most importantly, to our knowledge, an algorithm for identifying patients with CD using claims has never been validated. Our strategy was to require a confirmatory ICD-9-CM diagnosis of Cushing syndrome as the primary diagnosis and either a diagnosis of benign pituitary adenoma or evidence of hypophysectomy, but it is possible that some patients in our sample did not actually have CD and that others with the disease were missed. However, the age distribution, treatment received, healthcare utilization, and healthcare costs observed in our study are consistent with the existing literature and what may be seen in clinical practice. Future research should use patients' medical charts to validate the CD patient claims-based identification algorithm used in this study.

Second, we only examined patients with commercial insurance plans that are captured in the 2 claims databases analyzed in this study, so the geographic distribution of CD patients seen in this study reflects the distribution of plans providing data. Hence, our results may not be representative of patients insured by other commercial health plans, uninsured patients, or those with Medicare coverage or other government plans. Third, healthcare claims are collected for billing purposes rather than research; these claims therefore lack detail about clinical factors such as disease severity, which limited their accuracy and our ability to examine the severity of illness for any of the observed complications. Fourth, claims do not provide historical information, and thus we were unable to determine how long patients had CD, determine the specific stage in their disease, or assess any long-term outcomes. For example, future research may consider assessing the occurrence of glucocorticoid replacement and development of hypopituitarism during the first year following surgery or irradiation. Future studies should also implement longitudinal study designs and primary data collection to examine the lifelong illness and economic burdens of CD. Fifth, biochemical laboratory test results are not reported in these insurance claims databases, so we were unable to identify patients whose disease was controlled and those in whom it was not. Future research should examine burden of illness, utilization, and costs in patients with active CD compared to those in remission. We are currently conducting such a study using data from patients' medical charts. Sixth, this study included only patients with CD, so we could not compare healthcare costs or healthcare utilization for CD patients with costs or utilization for patients without CD. A planned future study will estimate the cost of CD by comparing economic outcomes between patients with CD versus those with a common, chronic endocrine condition and general population controls.

CD-related costs are likely underestimated in our study for a variety of reasons. CD does not have its own ICD-9-CM code, and therefore some cases may have been missed entirely. The use of a detailed case-finding algorithm for CD may have helped to limit this to some extent. Also, claims linked to a comorbid condition were not included in the cost calculation, and some comorbidities were excluded as they lack codes specific enough to allow evaluation. Sequelae of untreated comorbidities or undertreated CD may take many years to develop (e.g., fracture from osteoporosis, myocardial infarction from hypertension) and were captured incompletely or not at all. This limitation is particularly important in light of the multisystem nature of CD. Future research is planned to further examine the long-term costs of treating CD-related morbidities, the impact of persistent comorbidities on patients with CD that may lead to long-term adverse effects and additional healthcare costs, and the cost for delay in diagnosis and/or misdiagnosis of CD.

CONCLUSION

Patients with CD have a high burden of illness. Thirty percent of patients suffer from diabetes, 22.5% have psychiatric disturbances, 21% have infections, 8.6% have osteoporosis, 8% have cardiovascular disease, 5.5% have kidney stones, and 0.7% have compression fracture of a vertebra. The economic impact is also high. Hospitalizations occur in >34% of patients, and mean annual costs are approximately $35,000. Future research is planned to further evaluate long-term treatment costs, the cost of delay in diagnoses and/or misdiagnosis, and costs associated with patient burden.

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DISCLOSURE

Maureen P. Neary and William H. Ludlam are employees of Novartis Pharmaceuticals Corporation. Michael S. Broder, Eunice Chang, and Dasha Cherepanov are employees of the Partnership for Health Analytic Research, LLC, a health services research company paid by Novartis to conduct this research.

Appendix 1

ICD-9-CM and CPT Codes for Comorbid Conditions, Cushing Disease Treatments, Office Visits, and Evaluation and Management Services	
Comorbid Conditions	
Condition	**ICD-9-CM Codes[a]**
Infection	001.xx – 139.xx
Diabetes	249.xx, 250.xx, 357.2, 362.0x, 366.41, 648.0x, 648.8x, 790.2x, 996.57, V45.85, V53.91, V58.67
Osteoporosis	733.0x
Compression fracture of vertebra	733.10, 733.13, 733.19
Psychiatric disturbances	Depression: 296.2x, 296.3x, 298.0, 300.4, 311 Anxiety disorder: 300.00, 300.01, 300.02, 300.21, 300.22, 300.23, 300.29, 300.3, 308.3, 309.81, 293.84
Kidney stone	592.x, 594.x
Cardiovascular disease/stroke	430-438.xx, 997.02
Pharmacologic Treatment	
Class	**Drug name**
Antifungal	Ketoconazole
Dopamine agonists	Parlodel, bromocriptine, cabergoline
Inhibitor of glucocorticoid synthesis	Metyrapone
Antineoplastic	Lysodren, mitotane
Pituitary Surgery	
Procedure Code	**Description**
61546[b]	Craniotomy for hypophysectomy or excision of pituitary tumor, intracranial approach
61548[b]	Hypophysectomy or excision of pituitary tumor, transnasal or transseptal approach, nonstereotactic
62165[b]	Neuroendoscopy, intracranial; with excision of pituitary tumor, transnasal or transsphenoidal approach
0713[c]	Biopsy of pituitary gland, transfrontal approach
0714[c]	Biopsy of pituitary gland, transsphenoidal approach
0715[c]	Biopsy of pituitary gland, unspecified approach
0761[c]	Partial excision of pituitary gland, transfrontal approach
0762[c]	Partial excision of pituitary gland, transsphenoidal approach
0763[c]	Partial excision of pituitary gland, unspecified approach
0764[c]	Total excision of pituitary gland, transfrontal approach
0765[c]	Total excision of pituitary gland, transsphenoidal approach
0768[c]	Total excision of pituitary gland, other specified approach
0769[c]	Total excision of pituitary gland, unspecified approach
0771[c]	Exploration of pituitary fossa
0772[c]	Incision of pituitary gland
0779[c]	Other operations on hypophysis

(Continued next page)

Appendix 1 *(Continued)*

Adrenalectomy	
Procedure Code	**Description**
60540[b]	Adrenalectomy, partial or complete, or exploration of adrenal gland with or without biopsy, transabdominal, lumbar or dorsal
60545[b]	Adrenalectomy, partial or complete, or exploration of adrenal gland with or without biopsy, transabdominal, lumbar or dorsal; with excision of adjacent retroperitoneal tumor
60650[b]	Laparoscopy, surgical, with adrenalectomy, partial or complete, or exploration of adrenal gland with or without biopsy, transabdominal, lumbar or dorsal
07.22[c]	Unilateral adrenalectomy
07.29[c]	Other partial adrenalectomy
07.3[c]	Bilateral adrenalectomy
Radiation Treatment	
Procedure Code	**Description**
61796[b]	Stereotactic radiosurgery (particle beam, gamma ray, or linear accelerator); 1 simple cranial lesion
61797[b]	Each additional cranial lesion, simple
61798[b]	1 complex cranial lesion
61799[b]	Each additional cranial lesion, complex
61800[b]	Application of stereotactic headframe for stereotactic radiosurgery
77371[b]	Radiation treatment delivery, stereotactic radiosurgery (SRS), complete course of treatment of cranial lesion(s) consisting of 1 session; multi-source Cobalt 60 based
77372[b]	Radiation treatment delivery, stereotactic radiosurgery (SRS), complete course of treatment of cranial lesion(s) consisting of 1 session; linear accelerator based
77373[b]	Stereotactic body radiation therapy (SBRT) delivery
77432[b]	Radiation therapy management
77435[b]	Stereotactic body radiation therapy (SBRT) management
77520-77525[b]	Proton therapy
92.2x[c]	Therapeutic radiology and nuclear medicine
92.32[c]	Multi-source photon radiosurgery (includes Gamma knife)
92.3 [c]	Single source photon radiosurgery [High energy X-rays and Linear accelerator (LINAC)]
92.41[c]	Intra-operative electron radiation therapy
Office Visits and Evaluation and Management Services	
Category	**Current Procedural Terminology Code**
Office or other outpatient services	99201-99205, 99211-99215
Office consultations	99241-99245
Preventive medicine services	99381-99387, 99391-99397, 99401-99404, 99411-99412, 99420-99429, 99431-99440

[a] ICD-9-CM (International Classification of Diseases, 9th Revision, Clinical Modification) diagnosis codes.
[b] CPT (Current Procedural Terminology) code.
[c] ICD-9-CM (International Classification of Diseases, 9th Revision, Clinical Modification) procedure code.

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