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ANNUAL ECONOMIC BURDEN ASSOCIATED WITH CUSHING'S DISEASE IN THE UNITED STATES

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BACKGROUND

- Cushing's disease (CD) is a rare disorder that results from excessive exposure to glucocorticoids caused by an adrenocorticotropic hormone (ACTH) secreting pituitary tumor.[1]
- Uncontrolled CD may result in significant morbidity and mortality[2] and increased healthcare costs even after surgical treatment, [3] although published data on CD are sparse.
- Recent reports describing comorbidities, healthcare utilization, and costs in patients with CD in the Unites States are lacking.

OBJECTIVE

- To evaluate healthcare costs and utilization associated with CD.

METHODS

Study Design and Data Source

This was a cross-sectional descriptive study combining 2 commercial, HIPAA-compliant US claims databases, IMS Health PharMetrics and Truven Health Analytics MarketScan.

Study Population and Study Timeframe

Timeframe: Data included the calendar year of 2010.

Inclusion Criteria: CD has no ICD-9-CM code. Patients were eligible if in 2010, they had:

- 1 medical claim with Cushing's syndrome diagnosis (ICD-9-CM: 255.0) as primary diagnosis, and
  - a benign pituitary adenoma diagnosis (ICD-9-CM: 227.3), or
  - a hypophysectomy procedure (ICD-9-CM: 07.6x, CPT: 61546, 61548, 62165).

Exclusion Criteria: Patients who were not continuously enrolled in the calendar year were excluded.

Measures

- All pharmacy and medical claims in the calendar period were used to determine the study measures.
- Direct CD-related costs and utilization from claims specifically coded as CD-related, by inclusion criteria, were estimated using medical claims for identified CD patients. Treatment for common chronic comorbidities for CD will likely not to have codes suggesting CD-related and therefore will not be included in this initial calculation of direct CD-related cost. Other costs to health systems not currently included are potential costs for delay in diagnoses and/or misdiagnoses and patient burden.

Outcomes:

- Overall and direct CD-related healthcare utilization included number of physician office visits, number of emergency department (ED) visits, number of inpatient hospitalizations, and use of CD treatments.
- Overall and direct CD-related healthcare costs included pharmacy cost and non-pharmacy costs.

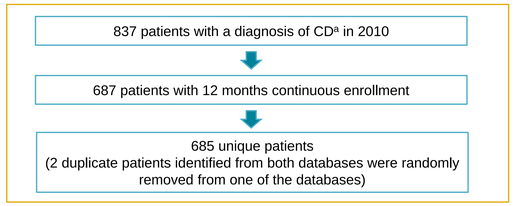
Other Measures: patient demographics (age, gender, region), usual care physician specialty,[4] number of chronic conditions, Charlson comorbidity index,[5] and comorbid conditions (infection, diabetes, osteoporosis, compression fracture of vertebra, psychiatric disturbances [i.e., major depression, psychosis anxiety], kidney stone, and cardiovascular disease/stroke).

Statistical Analyses

- Descriptive statistics, including mean, median, standard deviation (SD), and percentage, were reported for all study measures, as applicable.
- Data transformations and statistical analyses were performed with SAS® version 9.3.

RESULTS

Cohort Identification



[a] Patients who had a Cushing's syndrome diagnosis and had either benign pituitary adenoma diagnosis or hypophysectomy.

- 837 patients met the inclusion criteria in 2010, of which 685 unique patients were continuously enrolled in the calendar year.

Patient Characteristics

- Mean age was 41.7 years (SD: 13.4), and 81% were female.
- 22.0% were from the Midwest, 22.6% were from the Northeast, 38.4% were from the South, and 16.9% were from the West.
- Usual care was most frequently received their from endocrinologists (31.4%) and primary care physicians (14.5%) while 54.2% received their care most frequently from other specialists.

Comorbidities

	N=685
No. of chronic conditions, mean (SD)	4.2 (2.1)
Charlson comorbidity index, mean (SD)	1.6 (2.3)
CD-related comorbidities, No. (%)	
Diabetes	209 (30.5)
Psychiatric disturbances	154 (22.5)
Infection	144 (21.0)
Osteoporosis	59 (8.6)
Cardiovascular disease	55 (8.0)
Kidney stone	38 (5.5)
Compression fracture of vertebra	5 (0.7)

SD, standard deviation.

- Patients had a mean of 4.2 chronic conditions and mean Charlson comorbidity index of 1.6.
- 30.5% had diabetes, 22.5% had psychiatric disturbances, 8.6% had osteoporosis, 8.0% had cardiovascular disease, 5.5% had kidney stones, and 0.7% had compression fracture of vertebra.

Annual Healthcare Utilization

	N=685
Overall Healthcare Utilization	
No. of inpatient hospitalizations, no. (%)	
0	422 (61.6)
1	180 (26.3)
2	44 (6.4)
3+	39 (5.7)
No. of ED visits, no. (%)	
0	451 (65.8)
1	128 (18.7)
2	54 (7.9)
3+	52 (7.6)
No. of office visits, mean (SD) [median]	19.8 (16.1) [16]
Direct CD-Related[b] Healthcare Utilization	
No. of inpatient hospitalizations, no. (%)	
0	501 (73.1)
1	172 (25.1)
2+	12 (1.8)
No. of ED visits, no. (%)	
0	679 (99.1)
1+	6 (0.9)
Any CD treatment (pharmacologic, surgery, or radiotherapy), no. (%)	252 (36.8)
No. of office visits, mean (SD) [median]	3.2 (3.9) [2]

ED, emergency department; SD, standard deviation; [b] Medical claims with primary diagnosis of Cushing's syndrome or benign pituitary adenoma or claims associated with CD treatment.

- For overall healthcare utilization,
  - 38.4% of patients had inpatient hospitalizations and 34.2% had ED visits; and
  - Patients had a mean of 19.8 physician office visits.
- For direct CD-related healthcare utilization,
  - Hospitalizations were observed in 26.9% of patients, ED visits in 0.9% of patients, and treatment in 36.8% of patients; and
  - Patients had a mean of 3.2 physician office visits.

Annual Healthcare Costs

	N=685, Mean (SD) [Median]
Overall healthcare costs, $	34,992 (45,811) [18,031]
All outpatient drug claims, $	3,597 (6,323) [1,277]
All medical claims[c], $	31,395 (44,082) [14,365]
Direct CD-related[d] healthcare costs, $	14,310 (25,161) [2,079]
CD treatment (including pharmacologic treatment, surgery, and radiotherapy), $	9,353 (19,259) [0]
Non-treatment, $	4,957 (11,805) [1,543]

SD, standard deviation; [c] Include drugs billed through medical claims, such as injectable drugs; [d] Medical claims with primary diagnosis of Cushing's syndrome or benign pituitary adenoma or claims associated with CD treatment.

- Mean overall costs were $34,992, of which $31,395 were for medical claims and $3,597 were for all outpatient drug claims.
- Direct CD-related costs were estimated at $14,310: $9,353 from treatment and $4,957 from non-treatment costs.
- Estimated by 10 year age groups in adults (≥18 years old), annual mean overall costs were highest in older ages ($44,932 in 55-64 year olds, $46,996 in ≥65 year olds), consistent with the time that may be required for cost implications of chronic comorbidities to become fully apparent.
- In sensitivity analyses, defining costs by requiring the presence of any CD diagnosis, rather than a primary CD diagnosis only, resulted in the estimate for mean CD-related cost increasing to $16,750.

LIMITATIONS

- "Direct CD-related costs" represent the lower bound of costs because: 1) CD does not have its own ICD-9 code, and therefore some cases may have been missed; and 2) complications of CD were not included in cost unless linked to a primary CD diagnosis. This limitation is particularly important given the multi-system nature of CD.
- In sensitivity analyses defining direct CD-related costs by including claims with any CD diagnosis increased the lower bound estimate but still excluded claims not coded specifically with a CD diagnosis, even if treatment was provided for complications of CD (e.g., diabetes, hypertension).
- Costs reported also represent annual spending, and if extended over a patient's lifetime the economic burden would be dramatically higher.
- Claims are made to obtain payments for services and not for research purposes, thus claims databases are limited in clinical detail.
- This study included commercially insured patients and may not be generalizable to other populations.

CONCLUSIONS

- **Economic burden of CD is substantial, with hospitalizations or ED visits observed in >34% patients, 19.8 office visits per patient, and up to $35,000 in annual total costs, of which $31,395 is for medical costs.**
- **In a prior matched study[3], 77% of total healthcare costs for CD patients were attributed to CD. Applied to our data, this suggests for CD-related cost, $26,944 in annual overall treatment costs, with $24,174 in medical costs. Future research is planned to further evaluate long term treatment cost, cost for delay in diagnoses and/or misdiagnosis, and cost associated with patient burden.**

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