The Cost Impact of Non-Infectious Diarrhea in Patients with Carcinoid Syndrome

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BACKGROUND

- Carcinoid syndrome (CS) describes the hormonal effects of carcinoid tumors, including the secretion of serotonin into the systemic circulation causing episodic flushing and diarrhea.[1]
- CS patients with non-infectious diarrhea (NID), one of the most common symptoms of CS, experience profoundly poor sense of well-being.[2]
- Despite the frequent occurrence of this burdensome CS-related symptom, the healthcare costs and utilization associated with NID has not been elucidated.

OBJECTIVE

- To compare adjusted annual overall healthcare utilization and costs among CS patients with non-infectious diarrhea versus CS patients without non-infectious diarrhea.

METHODS

Study Design and Data Source

- Retrospective cross-sectional study using the HIPAA-compliant Truven Health Analytics MarketScan® Database from 1/1/2002 to 12/31/2012.

Patient Population

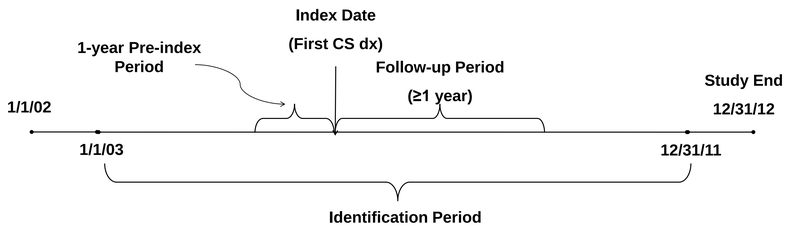
- Patients newly diagnosed with CS were identified between 1/1/2003 – 12/31/2011 (ID period) based on the following criteria:

Inclusion Criteria:

- 1) had ≥1 claim for CS (ICD-9-CM code 259.2), and 2) ≥1 claim for either CS or carcinoid tumors (209.x).

Exclusion Criteria:

- 1) had CS in the pre-index period, or 2) were not continuously-enrolled one year before and one year after the index date.



Stratifications: CS patients were stratified into those with NID vs. those without NID.

- NID patients had ICD-9-CM code 564.5 or 787.91 within 1 year after CS diagnosis.

Data

- All claims in the 1 year pre-index were used to determine patient demographics, number of chronic conditions,[3] and Charlson comorbidity index (CCI).[4]
- All claims occurring in the 1 year post-index were used to determine the outcome measures of healthcare resource utilization (HRU) and costs.

Statistical Analysis

- Multivariable models were used to adjust outcomes for age, gender, region, number of chronic conditions, and Charlson comorbidity index using SAS® version 9.4 .

RESULTS

- Of 2,822 newly-diagnosed CS patients the mean age was 51.5 year, 56.9% were women, and the mean Charlson Comorbidity Index was 3.6.

Table 1. Patient Characteristics

Characteristic	With NID n=534 (18.9%)	Without NID n=2,288 (81.1%)	*P* Value
Age, mean (SD)	51.3 (9.9)	51.6 (10.1)	0.639
Female, no. (%)	333 (62.4)	1,273 (55.6)	0.005
Charlson comorbidity index, mean (SD)	3.7 (3.9)	3.6 (3.8)	0.643
No. of chronic conditions, mean (SD)	4.0 (2.4)	3.4 (2.0)	<.001

- Unadjusted and adjusted HRU and costs were statistically significantly higher in patients with NID vs. those without NID, except for adjusted ED costs.
- After adjusting for baseline differences between groups, patients with NID had higher mean number of office visits, inpatient hospitalizations, and emergency department (ED) visits (all p<0.001) one year post CS diagnosis.

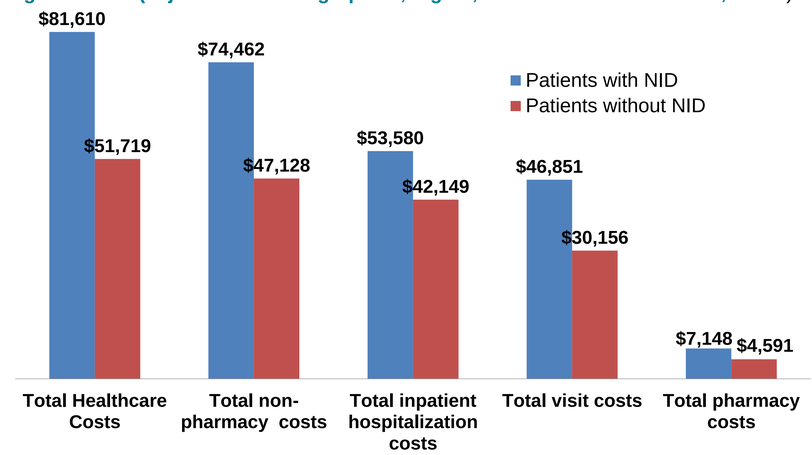
Table 2. Adjusted[a] HRU Means and Rates with 95% Confidence Intervals (CIs)[b]

Outcome	Adjusted Mean / Rate (95% CI)	
	With NID	Without NID
Number of office visits	24.2 (22.9 - 25.5)	19.0 (18.4 - 19.7)
Number of hospitalizations	0.97 (0.86 - 1.10)	0.61 (0.57 - 0.65)
Number of ED visits	0.67 (0.56 - 0.81)	0.38 (0.34 - 0.42)
Risk of hospitalization	49.4% (45.1% - 53.6%)	39.7% (37.7% - 41.7%)
Risk of ED visit	36.2% (32.2% - 40.5%)	20.7% (19.1% - 22.5%)

[a] Adjusted by age, gender, region, number of chronic conditions, and CCI.
[b] All adjusted HRU mean and rate comparisons had a p<.001.

- Patients with NID had higher adjusted total annual costs: (+$29,890), pharmacy costs (+$2,557), non-pharmacy costs (+$27,334), visit costs (+$16,695), and inpatient hospitalization costs (+$11,431) compared to those without NID (all p≤0.003).
- Adjusted ED costs were similar : $1864 in CS patients with NID vs. $1616 in those without NID (p>0.5).

Figure. Costs (adjusted for demographics, region, no. of chronic conditions, & CCI)



LIMITATIONS

- We attributed all NID diagnoses to CS but we mitigated the possibility of misdiagnosis by excluding certain ICD-9-CM codes (e.g., gastroenteritis [558.9]). Our patient identification algorithm allowed a relatively long interval to pass between the first and confirmatory diagnosis. This may have reduced the specificity of our algorithm but should have affected both groups equally.
- We adjusted for a variety of potential confounders but not for pre-diagnosis HRU or cost since we only examined newly diagnosed patients in whom controlling for pre-diagnosis resource use would be of limited value.
- Our results are only generalizable to the US commercially-insured population.

CONCLUSIONS

- **Our annual prevalence estimate of diarrhea (18.9%) was similar to a published estimate of 17.6% in NET patients in which the majority had CS (72%).[5]**
- **NID in CS patients is associated with a significantly increased annual healthcare utilization and an additional $30,000 in total annual healthcare costs, which predominately comprise medical costs.**
- **The odds of hospitalization among CS patients with NID are about 1.5 times of those without NID.**
- **Our study indicates that in cancer patients with CS compared to those without this highly burdensome symptom, diarrhea is a significant problem.**
- **It is possible that adequate control of diarrhea in CS patients may reduce healthcare costs.**

References

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NANETS Symposium, October 15-17,2015, Austin, TX, USA.

Research was conducted by Partnership for Health Analytic Research, LLC.

This study was sponsored by Novartis Pharmaceuticals Corporation.