BURDEN OF ILLNESS AMONG PATIENTS WITH HEREDITARY TRANSTHYRETIN (hATTR) AMYLOIDOSIS

Sheila R. Reddy, PhD, RPh[1], Spencer Guthrie, MBA[2], Eunice Chang, PhD[1], Ryan Tieu, MS[1], Marian H. Tarbox, MPP[1], Michael R. Pollock[3]

[1]Partnership for Health Analytic Research, LLC, Beverly Hills, CA, USA; [2]Aurora Bio INC, San Francisco, CA, USA; [3]Akcea Therapeutics, Boston, MA, USA

OBJECTIVE

- Hereditary transthyretin (hATTR) amyloidosis is a rare, progressive, multisystemic, and fatal form of amyloidosis caused by extracellular deposition of transthyretin amyloid fibrils primarily synthesized by the liver.[1,2]
- The economic burden of hATTR amyloidosis remains difficult to quantify due to the disease's rarity and its wide variety of clinical presentations.[1,3-5]
- We found no estimates of the disease cost in existing literature.
- The objective of this study was to estimate healthcare resource utilization (HCRU) and costs associated with newly diagnosed hATTR amyloidosis.

METHODS

- Retrospective study using IBM® MarketScan® Commercial and Medicare Supplemental databases* from 01/01/2013-12/31/2017

Patient identification

- Included adult patients (≥18 years of age at index) newly diagnosed with hATTR amyloidosis
  - ≥1 medical claim with a relevant diagnosis code for amyloidosis (ICD-9-CM 277.30-31, 277.39; ICD-10-CM E85.0-4, E85.89, E85.9; excludes light chain and wild type) during the identification (ID) period of 01/01/2014-12/31/2016 AND ≥1 occurrence of qualifying criteria for hATTR any time during the study period:
    - ≥15 days diflunisal use without 30-day gap OR liver transplant (patients with claim with code E85.1 or E85.2 at any time did not require additional qualifier)
  - Study index: date of first claim in the ID period with a diagnosis code for amyloidosis.
  - Patients enrolled 1 year pre-index (baseline) and followed 1 year post-index (follow-up).
  - To ensure a new diagnosis, patients with amyloidosis diagnosis in baseline period excluded
- Patients enrolled during baseline period and followed 1 year post-index (follow-up)

*MarketScan is a trademark of IBM Corporation in the United States and other countries.

Study measures

- Baseline:
  - Demographics (age, gender, region, insurance type)
  - Charlson Comorbidity Index (CCI)
- Follow-up:
  - Comorbidities of interest identified with diagnosis and procedures codes (ICD-9-CM, ICD-10-CM, and Current Procedural Terminology)
  - HCRU and costs reported quarterly (every 3 months; Q1-Q4) and for the first year after diagnosis
    - Hospitalization, inpatient days, outpatient services (e.g., emergency department [ED] and physician office visits), and pharmacy utilization
    - Total, inpatient, outpatient medical (ED and non-ED services), and outpatient pharmacy costs

Statistical analysis

- Descriptive statistics, including means, standard deviations (SD), and relative frequencies and percentages for continuous and categorical data, respectively, reported
- All data transformations and statistical analyses performed using SAS® version 9.4.

RESULTS

- Among 185 qualifying newly diagnosed patients, mean age was 59.2 (SD:15.2), 54.1% were female, and baseline Charlson Comorbidity Index was 2.2 (2.5) (**Table 1**).
- The majority of patients (65.9%) had PPO/POS insurance coverage during baseline (**Table 1**).
- Neuropathy was the most common comorbidity of interest during follow-up (**Figure 1**).
- Nearly a quarter of patients (24.9%) were hospitalized during follow-up with an average of (SD) 20.2 (39.1) hospital days annually among utilizers (quarterly values shown in **Table 2**).
- At 1-year follow-up, occurrence of ED visits was 28.6% (17.8%, 11.4%, 3.8%, 9.2%); mean (SD) number of physician office visits was 14.2 (17.2); and mean prescription fills was 25.9 (26.7) (quarterly values shown in **Table 2**).
- The annual mean (SD) total cost was $64,066 (214,317), with inpatient services contributing the majority of the expenses ($34,461 [179,301]), followed by outpatient ($23,853 [51,325]), and then pharmacy ($5,752 [16,774]) (**Figure 2**).

Table 1. Patient Demographics and Baseline Charlson Comorbidity Index

	Newly Diagnosed hATTR Amyloidosis Patients N = 185
Age, years, mean (SD)	59.2 (15.2)
18-34, n (%)	14 (7.6)
35-54	46 (24.9)
55-64	62 (33.5)
65+	63 (34.1)
Gender, n (%)	
Female	100 (54.1)
Male	85 (45.9)
Region, n (%)	
Midwest	38 (20.5)
Northeast	68 (36.8)
South	64 (34.6)
West	15 (8.1)
Insurance type, n (%)	
PPO/POS	122 (65.9)
Comprehensive	23 (12.4)
CDHP/HDHP	21 (11.4)
HMO	17 (9.2)
Missing/Unknown	2 (1.1)
Charlson Comorbidity Index, mean (SD)	2.2 (2.5)

hATTR: hereditary transthyretin; CDHP/HDHP: Consumer Directed Health Plan/High Deductible Health Plan; HMO: Health Maintenance Organization; PPO/POS: Preferred Provider Organization/Point of Service Plan.

Table 2. Healthcare Utilization During 1-Year Follow-up and Stratified by Quarter

	Post Q1 N = 185	Post Q2 N = 185	Post Q3 N = 185	Post Q4 N = 185	1-Year Follow-up N = 185
Any inpatient hospitalizations, n (%)	35 (18.9)	13 (7.0)	9 (4.9)	10 (5.4)	46 (24.9)
Inpatient days among all patients, mean (SD)	3.0 (16.0)	1.3 (7.4)	0.5 (3.5)	0.3 (1.3)	5.0 (21.2)*
Inpatient days among utilizers, n mean (SD)	35 15.8 (34.2)	13 17.8 (22.6)	9 11.1 (12.2)	10 4.6 (3.6)	46 20.2 (39.1)
Any ED visits, n (%)	33 (17.8)	21 (11.4)	7 (3.8)	17 (9.2)	53 (28.6)
No. of physician office visits, mean (SD)	5.4 (5.2)	3.7 (5.7)	2.7 (5.0)	2.5 (4.6)	14.2 (17.2)
No. of prescription fills, mean (SD)	8.9 (8.7)	7.1 (8.7)	5.5 (7.4)	4.4 (7.0)	25.9 (26.7)

ED: emergency department; SD: standard deviation.
*Differences in the sum of mean quarterly values and 1-year follow-up are due to rounding.

Figure 1. Comorbidities in 1-Year Follow-Up

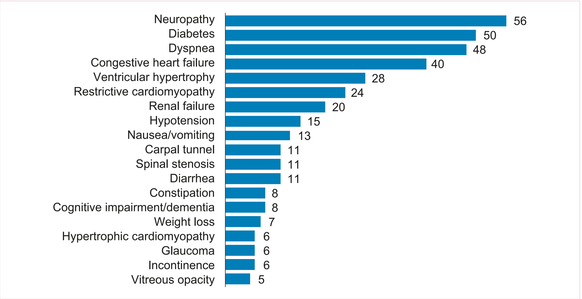
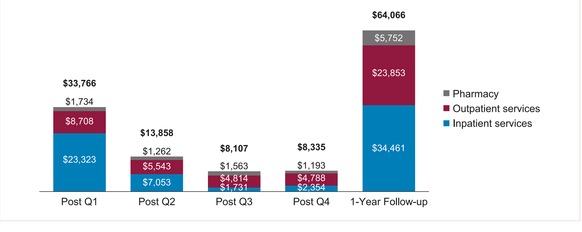


Figure 2. Healthcare Costs (Adjusted to 2017 USD) During 1-Year Follow-Up



CONCLUSIONS

- Patients newly diagnosed with hATTR amyloidosis have substantial HCRU and costs in the first year following diagnosis, with the largest proportion of costs occurring in the first quarter after diagnosis.
- Further research should examine later costs associated with disease progression and end-of-life care.
- This study has potential limitations:
  - The reported estimates of economic burden associated with hATTR amyloidosis may be underestimated as until recently there were no ICD codes specifically for hATTR amyloidosis, and our approach to patient identification has not been validated using medical records.
    - However, the majority of patients in the final sample were included because they had codes for hereditary amyloidosis (ICD-10-CM: E85.1 or E85.2), increasing our confidence that the correct population was identified.
  - The fixed 12-month follow-up period would have excluded those who died within 12 months of diagnosis, which might have resulted in an underestimate of cost.
  - Additionally, this study examines only direct healthcare costs and does not include indirect costs such as decreased quality of life or productivity, which add to the picture of disease burden.

REFERENCES

1. Gertz MA. Hereditary ATTR amyloidosis: burden of illness and diagnostic challenges. Am J Manag Care. 2017;23(7 Suppl):S107-S112.
2. Ihse E et al. Amyloid fibril composition is related to the phenotype of hereditary transthyretin V30M amyloidosis. J Pathol. 2008;216(2):253-261.
3. Mahmood S et al. Update on treatment of light chain amyloidosis. Haematologica. 2014;99(2):209-221.
4. National Organization for Rare Diseases. Amyloidosis [Internet]. Rare Disease Database. [cited 2019 Aug 29]. Available from: https://rarediseases.org/rare-diseases/amyloidosis/.
5. Lachmann HJ et al. Misdiagnosis of hereditary amyloidosis as AL (primary) amyloidosis. N Engl J Med. 2002;346(23):1786-1791.

http://bit.ly/2onQ2OH

AKCEA THERAPEUTICS

International Society of Pharmacoeconomics & Outcomes Research (ISPOR) Annual European Congress 2019; November 2-6, 2019; Copenhagen, Denmark