EE305

# Cost Burden of Geographic Atrophy and Visual Impairment/Blindness in US Elderly Patients

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Main poster

Supplement

## Introduction

- Geographic atrophy (GA) is an advanced form of age-related macular degeneration (AMD) for which, until recently, there was no approved treatment[1]
- AMD is one of the leading causes of visual impairment (VI) and blindness in the United States (US)[2], affecting 11 million people[3]
- In addition, VI and blindness lead to more direct healthcare resource utilization (HRU) and considerable indirect costs to society due to productivity loss, low employment rates, and loss of income among patients and caregivers[4–6]
- However, there is a lack of real-world evidence quantifying the HRU and cost burden of GA and the consequences of untreated GA

## Purpose

- To evaluate and compare HRU and healthcare costs among patients with GA vs. those without GA, and the consequent burden of VI or blindness.

## Methods

### Data Source

- Optum® Clinformatics® Data Mart database between January 1, 2016, and September 30, 2021

### Study Design

- A retrospective cohort study design (**Figure 1**)

### Study Population

*Patient cohorts*

- Without GA, GA-only, GA + VI, and GA + blindness (GA + B)

*Index date*

- The index date was defined as 12 months after start of continuous eligibility among patients with GA-only or without GA. Among patients with GA + VI or GA + B, the index date was defined as the later of 12 months after start of continuous eligibility or first diagnosis of VI / blindness

*Inclusion criteria*

- ≥65 years of age on the index date
- Medicare Advantage insurance coverage on the index date
- Patients without GA: No diagnosis for GA between January 1, 2016, and September 30, 2021
- Patients with GA: ≥1 diagnosis for GA within the first 12 months of patients' eligibility
  - Patients with GA who had ≥1 medical claim with a diagnosis for VI or blindness after the first observed medical claim for GA were classified into the GA + VI and GA + B cohorts, respectively, and all remaining patients with GA and no medical claim with a diagnosis for VI or blindness were classified into the GA-only cohort (**Figure 2**)

*Exclusion criteria*

- Patients without GA: ≥1 medical claim with a diagnosis for VI or blindness prior to the index date

### Statistical Analysis

- Cohorts between (1) GA-only vs. without GA, (2) GA-only vs. GA + VI, and (3) GA-only vs. GA + B were weighted using the inverse probability of treatment weighting approach based on the propensity score. Variables used in the propensity score calculation included: age, sex, region, race, year of index date, Quan-Charlson comorbidity index score, frailty indicator score, and comorbidities (i.e., Elixhauser and Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition comorbidities, selected ophthalmic-related comorbidities) with prevalence ≥5%

### Study Outcomes

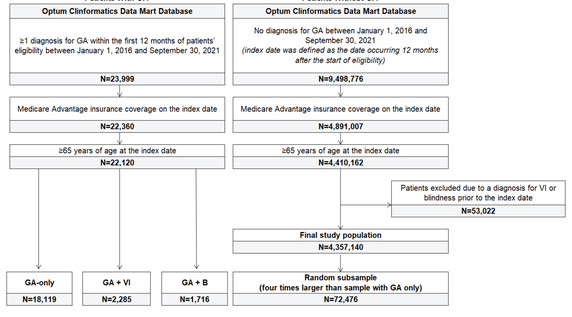
- All-cause HRU included hospitalizations, emergency room (ER) visits, outpatient (OP) visits, and other visits (e.g., home services and hospice)
- Rates of all-cause HRU per person-year (PPY) were compared between weighted cohorts using rate ratios (RR) estimated from Poisson regression models
- All-cause healthcare costs (reported per person per year [PPPY]) included medical costs (i.e., hospitalization costs, ER visit costs, OP visit costs, and other visit costs) and pharmacy costs
- Mean cost differences between weighted cohorts were estimated from linear regression models
- Robust variance estimators were used to derive the corresponding 95% confidence intervals (CIs) and p-values

### Figure 1. Study design




B=blindness; GA=geographic atrophy; HRU=healthcare resource utilization; VI=visual impairment.

### Figure 2. Patient disposition




B=blindness; GA=geographic atrophy; N=number of patients; VI=visual impairment.

## Results

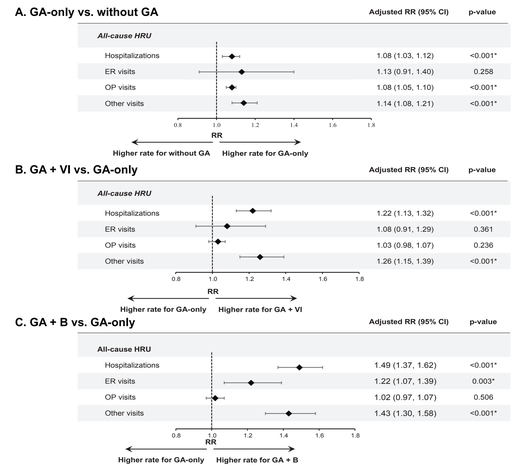
### Baseline Characteristics

- A total of 72,476 patients without GA and 22,120 patients with GA were selected, including patients with GA-only (N=18,119), with GA + VI (N=2,285), and with GA + B (N=1,716) (**Figure 2**)
- Patients without GA, with GA-only, with GA + VI, and with GA + B had a mean age of 74, 82, 84, and 85 years, respectively, with 59%, 67%, 69%, and 72% female patients before weighting
- After weighting, baseline demographics and clinical characteristics were well-balanced between cohorts (**Supplemental Table 1; see QR Code**)

### All-Cause Healthcare Resource Utilization

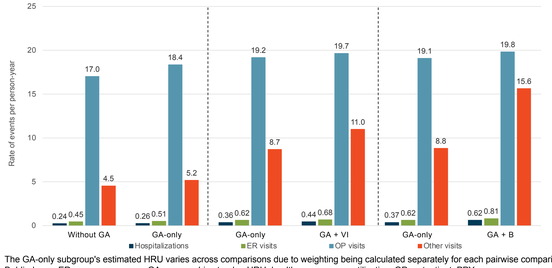
- Patients with GA-only had significantly higher all-cause HRU relative to patients without GA (RR [95% CI]: hospitalizations, 1.08 [1.03, 1.12]; OP visits, 1.08 [1.05, 1.10]) (**Figure 3A and Figure 4**)
- When compared with GA-only, all-cause HRU was significantly higher for patients with GA + VI (RR [95% CI]: hospitalizations, 1.22 [1.13, 1.32]; other visits, 1.26 [1.15, 1.39]) (**Figure 3B and Figure 4**)
- The differences in hospitalization and ER visit rates were statistically significant when comparing patients with GA + B with GA-only (RR [95% CI]: hospitalizations, 1.49 [1.37, 1.62]; ER visits, 1.22 [1.07, 1.39]) (**Figure 3C and Figure 4**)

### Figure 3. Healthcare resource utilization during follow-up of GA subgroups: weighted analysis




*p<0.05. B=blindness; CI=confidence interval; ER=emergency room; GA=geographic atrophy; HRU=healthcare resource utilization; OP=outpatient; RR=rate ratio; VI=visual impairment.

### Figure 4. All-cause healthcare resource utilization: weighted rate of events PPY

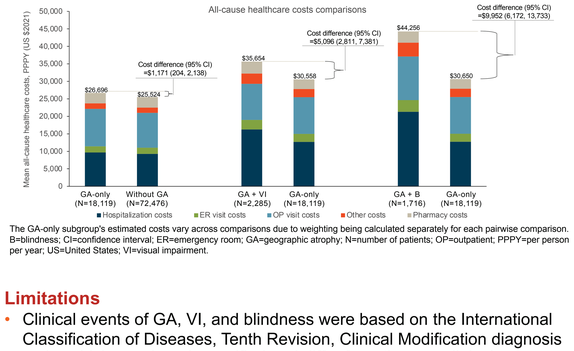



The GA-only subgroup's estimated HRU varies across comparisons due to weighting being calculated separately for each pairwise comparison. B=blindness; ER=emergency room; GA=geographic atrophy; HRU=healthcare resource utilization; OP=outpatient; PPY=per person-year; VI=visual impairment.

### All-Cause Healthcare Costs

- Compared with patients without GA, GA-only patients had significantly higher all-cause total healthcare costs PPPY (cost difference [95% CI]: $1,171 [$204, $2,138]), driven primarily by significantly higher OP visit costs (cost difference [95% CI]: $740 [$194, $1,286]) (**Figure 5**)
- Patients with GA + VI had significantly higher all-cause total healthcare costs PPPY compared with patients with GA-only (cost difference [95% CI]: $5,096 [$2,811, $7,381]), driven by significantly higher hospitalization costs (cost difference [95% CI]: $2,853 [$774, $4,933]) (**Figure 5**)
- The added burden of blindness was associated with significantly larger differences in all-cause total healthcare costs PPPY; the cost difference [95% CI] for patients with GA + B compared with patients with GA-only was $9,952 [$6,172, $13,733] (**Figure 5**)

### Figure 5. Healthcare costs during follow-up of GA subgroups: weighted analysis




The GA-only subgroup's estimated costs vary across comparisons due to weighting being calculated separately for each pairwise comparison. B=blindness; CI=confidence interval; ER=emergency room; GA=geographic atrophy; N=number of patients; OP=outpatient; PPPY=per person per year; US=United States; VI=visual impairment.

## Limitations

- Clinical events of GA, VI, and blindness were based on the International Classification of Diseases, Tenth Revision, Clinical Modification diagnosis code, which may be misspecified and differ from the true clinical event
- Patients without GA could have other ophthalmic-related conditions (e.g., cataract, glaucoma) that may affect study outcomes
- As in all observational studies, confounding adjustments can only account for factors that are observable and recorded in the database; thus, residual confounding factors due to unobservable confounders may remain
- The data source includes Medicare Advantage-insured individuals in the US; thus, findings may not be generalizable to elderly populations outside of this group, such as veterans

## Conclusion

- GA is associated with substantial HRU and cost burden among Medicare Advantage-insured patients in the US, highlighting the need for treating GA.
- Relative to patients with GA-only, this burden further increased among subgroups of patients who developed VI or blindness. Early treatment of patients with GA may mitigate the burden associated with disease progression to VI or blindness.

## References

**1.** Halawa OA, et al. *J Clin Med*. 2021;10:2580; **2.** Centers for Disease Control and Prevention. Common Eye Disorders and Diseases. Available at: https://www.cdc.gov/visionhealth/basics/ced/index.html [accessed April 2023]; **3.** National Eye Institute. Age-Related Macular Degeneration (AMD). Available at: https://www.nei.nih.gov/learn-about-eye-health/eye-conditions-and-diseases/age-related-macular-degeneration [accessed April 2023]; **4.** Wittenborn JS, et al. *Ophthalmology*. 2013;120:1728–35; **5.** Köberlein J, et al. *BMJ Open*. 2013;3:e003471; **6.** Rein DB, et al. *Arch Ophthalmol*. 2006;124:1754–60.

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**Disclosures**

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