Geographic atrophy diagnosis in the IRIS® Registry: a comparison between images and ICD-10 codes

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Purpose

To assess the accuracy of clinically documented geographic atrophy (GA) diagnosis and subfoveal involvement status using real-world imaging and electronic health record data in the American Academy of Ophthalmology IRIS® Registry (Intelligent Research in Sight).

Methods

- The IRIS® Registry (Intelligent Research in Sight) is the nation's first electronic health record-based comprehensive eye disease and condition registry.
- A subset of patients with dry age-related macular degeneration (AMD) identified through ICD-10 codes from 2016 to 2022 was sampled and labeled for the following categories:
  - 1) GA without subfoveal involvement; 2) GA with subfoveal involvement; and 3) non-GA.
- Fundus autofluorescence (FAF), infrared reflectance (IR) and optical coherence tomography (OCT) images were used for labeling by two fellowship-trained retina specialists.
- A three round consensus workflow was implemented to ensure both graders agreed on all labels with the center point of the fovea being involved as the definition of subfoveal involvement.
- With the image-derived ground truth, three comparisons were made against classifications by ICD-10:
  - GA vs non-GA;
  - GA without subfoveal involvement vs non GA with subfoveal involvement (includes GA without subfoveal involvement and non-GA);
  - GA with subfoveal involvement vs non GA with subfoveal involvement (includes GA with subfoveal involvement and non-GA).

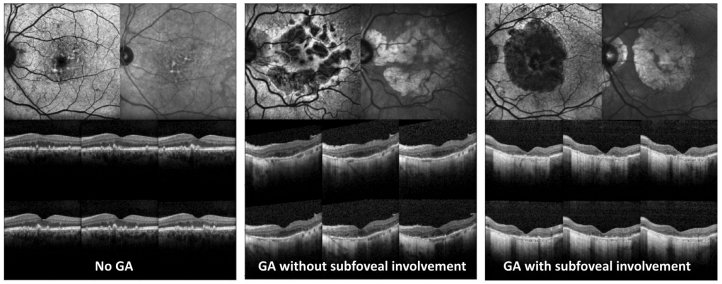
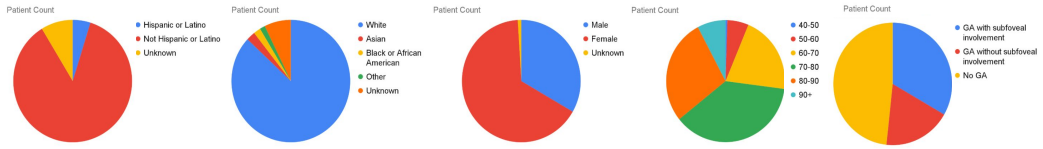


Figure 1.
Examples of labeled images in the training/testing set. Each label job must include FAF and IR images of the same patient visit, OCT images were also included when available.

Results

- 207 sets of FAF, IR and OCT images from 207 patients were labeled (Figure 1).
- Using images as the ground truth, clinical codes for GA vs non-GA resulted in a sensitivity of 82%, a specificity of 88% and an accuracy of 85%.
- After excluding non-GA images based on image labels, 107 patients were included in further analyses.
- Clinical codes for GA with subfoveal involvement resulted in an accuracy of 62% and clinical codes for GA without subfoveal involvement resulted in an accuracy of 63%.

Figures 1a-e. Patient demographics and image-derived diagnosis breakdown.



Tables 1a-c: Confusion matrices and performance metrics (95% CI) of the comparisons between clinical documentation and image-derived (ground truth) for GA, GA with subfoveal involvement and GA without subfoveal involvement.

Table 1a: GA

		Image-derived	
		Positive	Negative
Clinical documentation	Positive	88	12
	Negative	19	88

Precision: 0.88 (0.84, 0.92)
Recall: 0.82 (0.77, 0.87)
F1 score: 0.85 (0.80, 0.90)
Specificity: 0.88 (0.84, 0.92)
Accuracy: 0.85 (0.80, 0.90)

Table 1b: GA with subfoveal involvement

		Image-derived	
		Positive	Negative
Clinical documentation	Positive	39	11
	Negative	30	27

Precision: 0.78 (0.70, 0.86)
Recall: 0.57 (0.48, 0.66)
F1 score: 0.66 (0.57, 0.75)
Specificity: 0.71 (0.62, 0.80)
Accuracy: 0.62 (0.53, 0.71)

Table 1c: GA without subfoveal involvement

		Image-derived	
		Positive	Negative
Clinical documentation	Positive	18	20
	Negative	20	49

Precision: 0.47 (0.38, 0.56)
Recall: 0.47 (0.48, 0.66)
F1 score: 0.47 (0.57, 0.75)
Specificity: 0.71 (0.62, 0.80)
Accuracy: 0.63 (0.54, 0.72)

Conclusions

This study shows that clinically documented GA diagnosis codes are relatively accurate compared to image-derived ground truth while the clinically documented specific subfoveal involvement status is less accurate. Real-world studies should consider employing additional parameters such as requiring two of the same code within six months, removing patients with conflicting codes, as well as including additional imaging data when available.

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