NHANES DIGITAL GRADING PROTOCOL

INTRODUCTION

The objective of grading digital retinal images taken of participants in the ancillary eye study of the National Health and Nutrition Examination Survey (NHANES) is to estimate the prevalence and severity of age-related ocular conditions and their relationship to visual loss in different racial/ethnic groups. Photographs are evaluated in semi-quantitative fashion by a grader or reader using a custom written Access database, EyeQ Lite (an image processing database for storage, retrieval and manipulation of digital images), and a dual monitor computer display. Among the features evaluated are diabetic retinopathy severity level, and its supporting lesions, age-related maculopathy (ARM) lesions, glaucomatous changes to the optic nerve and other vascular and retinal changes.

EQUIPMENT AND MATERIALS

CAPTURING DIGITAL IMAGES

Two 45^{o} digital retinal images (Field 1, 2) will be taken of each eye for every NHANES participant using the Canon CR6 nonmydriatic camera with a Canon 10D camera back (6.3 megapixels per image). Field 1 is centered on the optic disc, and Field 2 is centered on the macula, providing photographic documentation of the optic disc, macula, and substantial portions of the superior temporal arcades

REVIEWING DIGITAL IMAGES

The NHANES grader views each retinal image with a high resolution monitor using the EyeQ Lite image processing software and database, and references the written protocol and the digital photographic standards and examples to evaluate retinal abnormalities. The NHANES grader directly enters his/her evaluations in a microcomputer database. The following materials are used in the reading process:

(1) Minimum Intel based 900 Mghz PC running Windows 2000 or XP with 256 MB of RAM and a dual monitor capable graphics card (recommended ATI Radeon All-in-Wonder card);

(2) Primary monitor, 21 inch for image viewing, set to a resolution of 1600 X 1200 with 32 bit color, standardized using Verilum calibration software;

(3) Secondary monitor, recommended minimum 15 inch LCD, set to 1024 X 768 resolution (actual value not as critical as this monitor will display the data collection database);

(4) Digital Healthcare EyeQ Lite or Pro image processing software version 4.8 or higher;

(5) NHANES ACCESS database, a direct entry software with a series of data collection screens built in ACCESS available to graders on networked personal computers, and based on the paper data collection form in.

USING THE IMAGE PROCESSING SOFTWARE/DATABASE

LOGGING IN

To access the image processing database the grader will double click on the Digital Healthcare EyeQ grading icon on the desktop. The grader will then be asked to log into the database. The login is the same for all workstations with the user name being X and the password XX. Then the grader selects OK from the login screen.

Login: Name: X
Password: X.X
Select OK

SELECTING A PATIENT VISIT FOR VIEWING

The first screen to appear is the *Identify a Patient* screen. The grader may type in the Study ID # of the patient to be reviewed and then click on *Next*. The database will find any patient visits with that study ID and display a list of visits with their corresponding study dates in the *Patient Found in Database* menu. (For NHANES purposes there should only be one study visit per patient). Double click on the patient visit to be viewed. A final menu called *Select Visit/Study* will appear. Again double click on the visit to be viewed. A contact strip of 4 or more images will appear. This contact strip should contain fields 1 and 2 of both eyes. (Additional images may be present.)

To select an image from the Contact Strip for further viewing or measurements either, right click on that image and the image will enlarge to full size (left clicking on the image (a purple frame will appear around the selected image) and selecting *view image* from the side bar menu will accomplish the same thing). Note: The title of the sidebar menu is helpful to remember in negotiating through the software.

IMAGE MANIPULATION TOOLS

There are many image manipulations available using the EyeQ software. Change in magnification, various manipulations of contrast, and splitting the image into the separate red, green and blue color channels are among the most commonly used. Further descriptions of the EyeQ software can be found in the user's manual.

The manipulations that will be performed on all NHANES images before measurements are performed are listed below in order. After each manipulation the image should be returned to its normal state before starting the any measurements. If at any time the grader notes a suspicious area in the image the grader may zoom in/out and/or lighten/darken to enhance the area of concern

Zoom In (or *Zoom Out*): This will magnify the entire image for viewing. Magnifying the image two times at most is usually adequate (available on the View Image Menu). To magnify a localized area of the retina (to closely examine retinal vessels or specific lesions or color changes) the grader can left click on mouse when the magnifying glass is displayed. This can be done at any time during image manipulation even after a complete zoom has been performed. Another method for zooming in is to use the scrolling wheel on the mouse. This can be done at any time.

Lighten (or *darken*): (This option is available in the contrast menu only.) When an image is particularly light or dark this function is very helpful. One or two clicks is adequate to allow better viewing of poorly illuminated areas of the retina (similarly for overly exposed retinal images and darkening).

Image Manipulation Steps for all images:

1. Zoom in (lighten/darken/stretch as needed)
2. Red-Free (or 3 RGB components) (stretch lighten/darken as needed)

Optional steps if above steps demand more manipulations

3. Equalize Histogram
4. Invert image
5. Median $\geq$ 128

View Image Menu

1. *Red-free* or *RGB color* option: This provides the grader with a full screen view of the green channel. The grader should select *Zoom In* (or *Zoom Out*) and left click on the mouse to magnify a given area, and scan the entire photo. After magnification the grader should select the *Contrast* submenu, and *Lighten* (or *darken*), and/or *Stretch* the image for another view. (Again, suggest manipulating the image two times at most). To return the image to its normal state, click *Undo* to negate the lightening (or darkening) of the image and return grader to the original image. (Instead of choosing the *Red-free* option, the grader can view all of the color channels (red, green and blue) by selecting *RGB*. This will display a montage of the color image and each of its color components. The 3 color channels can be split and saved back to the contact strip for additional manipulations or measurements (*lighten/darken*, *zoom in/out*, *stretch*, etc) or the entire montage can be save as one image to the contact strip. It should be noted that saving these images is only temporary, remaining intact only while the

grader has that patient file open. This montage is helpful in gauging areas of overexposure in the red channel, among other things.)

Contrast Menu

This menu takes the grader to a submenu of options for increasing contrast of an image. All manipulations are temporary and will never overwrite the study images. If the grader wishes to restore the image to its original state they should select Undo. If the grader wishes to perform additional manipulations or measurements on the image that are not available in the *Contrast Menu* then the grader should select *Quit and Store*. This will return the manipulated image to the contact strip. When the grader quits this patient visit, the contact strip will return to the original study images only.

2. *Equalize histogram*: This function examines the distribution of levels and redistributes them as evenly as possible across the range from 0 to 255 in all three channels. Values of pixels are changed so that an equal number of pixels have each of the possible levels. Thus, details in areas that are particularly bright, where there are many pixels at a similar brightness, are seen clearer. While this function dramatically shifts the colors of the image when combined with *Lighten/Darken,* it is often quite helpful in detecting small color changes, drusen or microaneurysms.

3. *Invert* image: This function alters every pixel so that its grey-level, initially G, becomes 255 - G. This reverses the grey scale or in the case of a color image, reverses each color channel. The operation works over the window selected in the processing menu. If the range option is in the menu and the limits shown by it are not 0 and 255, the contrast is inverted linearly within the narrower range. Pixels with grey levels less than the minimum range limit are all set to 255. Pixels with grey levels greater than the maximum range limit are all set to zero.

4. *Median ->128*: This option determines the median grey level, then scales the grey levels so that pixels at median value get a level of 128 (halfway between 0 and 255).

Contact Strip Menu-
Grading Tools and Grids

After all standard manipulations are performed on the study images for the eye the grader is ready to perform measurements using the *Macular Grid*, *Neovascular or Optic Nerve Grid* and *Measure Lesions* found in the *View Image Menu* under *Grading Tools*. **Any measurement performed can only be done on the original color or the red free image. *Stretching, Lightening/Darkening* and *Zoom In/Out* are the only acceptable manipulations during the measurement session. Measurements may not be performed on any other type of manipulated image.**

Before any measurements the grader should confirm that the disc diameter calibration measurements are correct. To do this the grader selects the *Grading Tools* option, and confirms that *Measure disc diameter* is 346.7 (the number of pixels in a standard disc diameter) for a Canon 10D (as well as the D60), the camera used in NHANES. For a Canon D30 Camera the measurement should be 243.8 pixels for a standard disc diameter. If 0 or an incorrect measurement is shown, then grader selects *Enter disc diameter pixels*, and inserts the correct measurement, then selects OK.

There are two grids available to the grader for use in areas of measurement. The grids, were developed for use with Canon 45^{o} retinal photographs, are based on the diameter of an average optic disc as calculated by comparing Zeiss 30^{o} and Canon 45^{o} photographs of the same eye from several individuals and appropriately scaling down from the standard disc diameter (DD) for Zeiss 30^{o} photographs.

Neovascular or Optic Nerve Grid: The first grid is the optic nerve grid. The optic nerve grid will be used for grading both new vessels on the disc and for defining the 4 quadrants evaluated for arterial narrowing and A/V nicking. The grid consists of three concentric circles centered on the optic disc and four spokes at 12:00, 3:00, 6:00 and 9:00. The inner circle approximates the disc margin assuming an average size disc (diameter = 1 DD or one disc diameter, radius = 1/2 DD); the second circle demarcates a zone extending to 1/2 DD from an average disc margin (radius of circle = 1 DD), hereafter referred to as Zone A; and the outer circle demarcates a zone extending from 1/2 DD to 1 DD from the disc margin (radius of circle = 1 1/2 DD), hereafter referred to as Zone B. The four spokes extend outward from the edge of Zone A and demarcate the four quadrants named for their relationship to the posterior pole (the most posterior retinal region which contains the optic disc and the macula, or center of acute vision). Beginning at the upper left and moving clockwise, the four quadrants in the right eye are the superior temporal, superior nasal, inferior nasal and inferior temporal; in the left eye, the superior nasal, superior temporal, inferior temporal and inferior nasal.

Macular Grid: The second grid to be used is the macula grid. This grid will be placed over the center of the macula to define the macular area for grading of Age-Related Maculopathy (ARM) and for Clinically Significant Macular Edema (CSME). It consists of 3 concentric circles with diameters of 1000 microns (.6666 DD), 2 DD and 4 DD and has 4 radiating lines from the central circle radiating out at 1/4 hours (1:30, 4:30, 7:30 and 10:30). The grader will left click on the mouse to position the grid in the center of the fovea, then release the mouse button to "drop" the grid onto the image. Once centered, the X and Y coordinates of the center point, or the fovea, should be recorded for future grid placements. Once placed on the image, the grid can be tilted or adjusted by using *Meridian angle 0 degrees*.

Meridian angle 0 degrees. This option adjusts the tilt of the macular grid. Left click, and select the location on the image where the horizontal line will cross the optic nerve (Right eye at about 7:30, Left eye about 4:30 on the disc margin). This X and Y coordinates of the first point will need to be recorded for future grid placement. For the second point, plug in the X and Y coordinates saved from the macular grid placement earlier (center of the macula). The grid should rotate into the correct position.

Measure lesions. This measurement tool is used primarily for measuring drusen size and area. The grader can size lesions using the circle sizes ranging from Co (comparable to 63 microns diameter) to 1 DA/DD (a circle of 1500 microns in diameter). Right click on the mouse for ascending order in size; left click for descending order. By using the center scroll wheel the image can be zoomed in and out during measurement.

GRADING PROCEDURES AND RULES

All sets of participant images are assigned a sequential reading list (five participants per list) as the images are received at the Reading Center. The grader selects a reading list from the NHANES coordinator's tracking binder at the beginning of a grading session. Upon completion, the grader initials and dates the tracking sheet and forwards the list to the appropriate basket provided for completed lists.

Photograph graders at the Reading Center use the following conventions in evaluating the presence and severity of abnormalities:

a) *None* is used to indicate that a lesion is absent. If there is a suggestion that a lesion may be present, but the grader is less than 50% certain that the lesion is in fact present, the grader uses none, or absent, for that lesion.

b) *Questionable* is used to indicate the probable presence of the lesion. If the grader is more than 50% certain but less than 90% certain that the lesion is present, he/she selects questionable as the answer. Stated alternatively, if the grader thinks that the lesion is present but is unsure that all observers would agree, he/she marks the lesion as questionably present.

When an abnormality is present but the grader is uncertain of its identity, the grader chooses questionable for the lesion considered most likely and answers none, or absent, for the lesion(s) considered less likely.

c) *Definite* indicates the definite presence of a lesion. If the grader is at least 90% certain that the lesion is present, he/she marks the lesion as definitely present.

d) In questions with several codes for definite presence of the lesion, there may be several steps to indicate ascending severity of the lesion. The ascending severities may be described in general terms as mild, moderate and severe. The severities of a lesion are usually defined either in terms of the number, length, or area present, or in relation to photographic standards.

e) *Cannot grade* is used to indicate that the lesion is ungradable due to impaired photographic quality or a confounding condition. In general, if no evidence of the lesion is seen and more than 50% of the area of measurement (subfield, grid area, quadrant etc) is missing or obscured, the grader selects cannot grade rather than none. Cannot grade is also used where the area of measurement is present and unobscured but impaired to a degree that the typical appearance of the lesion in question could not be identified. For focal narrowing of arterioles in the quadrants, at least 1 1/2 DD total length of arterioles should be visible in the quadrant; if no abnormality of the arteriole is seen and less than 1 1/2 DD of arterioles are available for assessment, the grader selects cannot grade as the appropriate answer. (In judging A/V Nicking, if no arterioles cross over veins (only veins crossing over arterioles) then None is the appropriate grade.)If a specific lesion can be seen in any part of the field, it should be assessed as such even if the remainder of the field is ungradable.

f) Lesions occupying more than one quadrant are assessed as present in each quadrant and the number, length, or area involved is estimated in each quadrant separately.

THE GRADING FORM

The data collection form exists in both an original paper format (attached) and as a direct entry screens. In both, the data collection begins with identifying information and is followed by the collection of substantive grading data.

The identifying information (participant identification number, photo date, and name code or acrostic) is entered first. In direct entry, the grader must correctly enter the participant identification number, photo date, and name code, which are then checked against the photograph inventory, before entering data for the eye. The direct entry software does not permit data entry for an uninventoried identification number, and shows the grader if data are already present for the identification number.

Some items such as Arterial Changes, ARM lesions, Other Vascular Lesions or Any Other Lesions, are organized under gatekeeper questions. The gatekeeper for each eye asks the grader if any arterial changes (ARM Lesions, Other Vacular Lesions, etc) are questionably or definitely present in the eye, or ungradable. If yes (code 2), the grader completes all items specific to that group. Comments are used to describe other abnormalities not listed in the grading form, or to provide additional details for items graded.

PRELIMINARY GRADING

The purpose of preliminary grading is four fold: to provide immediate pathology notification to the participant and his/her primary eye care provider, to provide timely image quality review and feedback to photographers, to provide an overview of the health of the eye for general feedback letters, and for purposes of editing. The items to be evaluated are detailed below.

QUALITY GRADING

Field 1 and 2: If field 1 photograph is present, the grade is "Present", code=2. If the field 1 photograph is absent, the grade is "Absent", code=0. If neither field 1 or 2 are present for an eye then the grader will not be allowed to access the grading form as the grading will already be considered final.

Focus: Focus refers to the clarity of retinal image. Because of the importance of detecting lesions in the macular area, the grader is to consider focus in 75% or more of the macula area as defined by the 3000µ diameter circle of the Macular Grid. If retinal vessels are sharply defined or slightly fuzzy and small lesions such as retinal microaneurysms and small drusen are visible, the grade is "Good/Fair", code=0. If clarity is decreased so that small retinal lesions might be missed but larger lesions such as geographic atrophy, can be seen, the grade is "Borderline", code=1. If there is a pronounced decrease in sharpness where detail of larger lesions cannot be recognized, the grade is "Poor", code=2. Focus will be graded in both Field 1 and 2.

Photo Quality Problems: Other photo quality problems will be assessed for both images together. If there are other photo quality problems that affect the grader=s ability to grade the image set, the grader marks “Yes” code= 2 and chooses from the following list of problems.

Code	Definition
0	No problem
2	Yes, affects grading
8	CG photo problems

Illumination: If an image is poorly illuminated or overexposed, or there are pockets of uneven illumination (a dark macula) then Illumination should be graded “Yes”, code=2.

Field Definition: Field 1 is defined a centered on the optic nerve and Field 2 is centered on the macula. If either of these fields deviates more than 1 disc diameter from the optimum location then Field Definition should be graded “Yes”, code=2.

Haze - When a green/white halo or partial halo; or a green/white cast throughout the entire photograph is noted, Haze should be graded “Yes”, code=2;

Dust - White dots or spots that may be varying size but are in the same location of the image no matter what field of the retina is imaged are usually caused by one or more dirty lenses on the camera. When dust or dirt spots are prominent or located in just the wrong place and cause difficulty in grading, Dust should be graded “Yes”, code=2;

Lashes - Lashes or a partial blink often appear on the bottom of the image as either light or dark linear “shadows”. These “shadows” can easily obscure the lower half of the image. Occasionally lashes will appear in the upper half of the image as a bright reflectance but don=t affect the ability to grade as much. When lashes (or a blink) are present Lashes should be coded “Yes”, code =2;

Arc - A small pupil or incorrect patient to camera distance can cause a crescent shaped arc to appear on the image. This arc can range in color from yellow orange to blue and in size from a small slice to an arc that obscures more than half of the field. Arcs normally are found along the nasal or temporal margin rather than the superior or inferior margins although they can occur anywhere. When an Arc is present the grade should be “Yes”, code = 2.

Red Channel - A digital image is composed of three color channels, red, green and blue. When the retina=s pigmentation is particularly “red” or “light” there can be an overexposure effect where the red channel is saturated or washed out. This will often appear as a pink bleaching between the optic nerve and the macula and can make evaluating retinal lesions in these locations very difficult. When the red channel is washed out the grade should be “Yes”, code =2.

Other - if "Other" is noted, describe the quality problem or artifact in the Comment section

Gradability: The grader will judge the overall quality of both images to determine the gradability. If the both fields are focused clearly enough to image the retina, optic nerve and blood vessels without any portion missing or obscured, the image is considered completely gradable. If the more than 75% of optic nerve cannot be graded, but it is possible to grade the macula, the grade is "Disc ungradable", code=1. If a portion of the macula, between 25% (1 DA) and 75 % of the macula cannot be graded, but the optic nerve is gradable, the grade is "Portion macula ungradable", code=2.

If more than 75% of the macula area (diameter=3,000µ, inner circle of Macular Grid) is in poor focus, missing, or obscured by a retinal hemorrhage, vitreous hemorrhage, asteroid hyalosis or some other condition and no lesion of any type is seen but it is possible to grade the disc, the grade is "Macula Ungradable", code=3.

If a portion of the disc and the macula are ungradable (between 25-75% or each) , the grade is code=4. If neither the disc nor the macula can be graded (more than 75% of each), but other portions of the retina are visible, the grade is code=5. If no part of the fields can be graded, the grade is code=6.

If both fields are judged to be ungradable the remaining eye variables will be coded "Cannot Grade" and the grader will complete grading on that eye.

Code	Definition
0	All Fields Gradable.
1	Disc Ungradable
2	Portion of Macula Ungradable
3	Macula Ungradable
4	Portion of Disc and Macula Ungradable
5	Disc and Macula Ungradable
6	All Fields Ungradable

Retinal Grading

Pathology Notification Sub-section:

If an eye is judged to have a treatable pathologic condition that poses an imminent threat to vision, the Coordinating Center will be notified within three working days of receipt of the images from the site. Notifications will be divided into Immediate (seen by an ophthalmologist ASAP) and Early (seen within 2 months). The reason for pathology notification and the date of notification will be recorded during preliminary grading. If Other is chosen a Comment should detail the reason for pathology notification. Typical pathology notification reasons are listed below.

Reason for Notification	Type
Suspicious Cup/Disc (C/D) (> 0.7, **or** 0.7 + notching/undercutting)	*Early*
Proliferative Diabetic Retinopathy (level 65+)	*Immediate*
Preproliferative Diabetic Retinopathy (level 51)	*Early*
Clinically Significant Macular Edema (CSME)	*Immediate*,
Edema, not CSME	*Early*
Branch Vein Occlusion (BVO) or Central Vein Occlusion (CVO)	*Either*
Treatable ARM (signs of neovascularization)	*Immediate*
Hollenhorst Plaque	*Immediate*
Irregular Nevus	*Immediate*
Macular Hole	*Early*
Epiretinal Membrane with traction in center circle	*Early*
Other	*Either*

ARM Grading Subsection:

ARM Exclude : If a condition exists in the macula which confounds the grader from evaluating Age-Related Macular Degeneration (ARM) lesions from similar changes in the retina due to another process the eye should be excluded (cannot grade) from evaluation of **all** ARM lesions. Typical reasons for excluding an eye are listed below and should be noted in this item. If Other is chosen a Comment should detail the reason for excluding the eye.

Trauma
Laser Rx (burns)
Vessel Occlusion
Macular Dystrophy
Myopic Degeneration
Histoplasmosis / Toxoplasmosis
Inflammatory
Coloboma / Staphyloma
Retinopathy of Prematurity (ROP)
Non ARM RPE changes
Non-ARM detachment
Unknown etiology
Other

ARM Feedback: A preliminary ARM summary variable will be coded to provide timely feedback to the coordinating center for letters to study participant. This variable in no way reflects what the final definition of ARM will be for this eye but is rather a preliminary grade based on clinical definitions rather than research definitions.

No ARM is defined as gradable images with no evidence of lesions associated with ARM.
Drusen Only is defined as at least one soft drusen with a diameter greater than or equal to 125μ and a grid area of greater than 500μ.

Early ARM is defined as either soft drusen present with a grid area of greater than a 500μ circle and a pigmentary abnormality present (increased pigment or depigmentation in the grid) **or** soft drusen present in the center circle and a pigmentary abnormality is present (increased pigment or depigmentation in the grid).

Late ARM is defined as the presence of any late lesions, such as geographic atrophy, PED/RD detachments, subretinal hemorrhage, subretinal fibrous scar, subretinal new vessels, or laser treatment and/or /photodynamic therapy for ARM.

Cannot Grade ARM is defined as all or some of the ARM lesions are ungradable or confounded by another condition making evaluation of ARM difficult.

The grades for ARM Feedback are:

Code	Definition
0	No evidence of age-related macular degeneration
1	Drusen only
2	Early ARM
3	Late ARM
8	Cannot Grade ARM

All other Preliminary Grading variables are defined in the detail grading portion of the protocol. The remaining variables graded during preliminary grading are:

ARM Lesions

- Hard Drusen
- Maximum Drusen Size > 125 micron diameter circle
- Soft Drusen (any soft type)
- Soft Drusen Area > 500 micron diameter circle
- Increased Pigment
- RPE Depigmentation
- Geographic Atrophy
- PED/RD Detachment
- Subretinal Hemorrhage
- Subretinal Fibrous Scar
- Laser Rx for ARM
- Atypical ARM

Diabetic Retinopathy Level
Macular Edema

Other Vascular Lesions

- Focal Narrowing
- Arterio-venous Crossing Abnormalities
- BVO/CVO (branch vein occlusion/central vein occlusion)
- BAO/CAO (branch artery occlusion/central artery occlusion)
- Hollenhorst Plaque

Other Lesions

- Macular Hole
- Surface Wrinkling Retinopathy-Traction
- Other

Cup to Disc Ratio

- Cup Diameter
- Disc Diameter

DETAIL GRADING

Image Quality

Field 1 and 2 Presence: If field 1 (or 2) photograph is present, the grade is "Present", code=2. If the field 1 (or 2) photograph is absent, the grade is "Absent", code=0. If neither field 1 or 2 are present for an eye then the grader will not be allowed to access the grading form as the grading will already be considered final.

Field 1 and 2 Gradability: The grader will be asked to assess the gradability of both Field 1 and Field 2. If at least one disc area of a field is gradable (good enough focus and illumination to see retinal details) the grader indicates the field is gradable and proceeds with evaluation of the eye. If both fields are judged to be ungradable the remaining eye variables will be coded “Cannot Grade” and the grader will complete grading on that eye.

Age-related Maculopathy Sub-Section (ANY ARM)

The following lesions are graded using the codes listed below. ARM lesions are only to be evaluated in the macular grid area in Field 2 (or using overlap from Field 1). If soft drusen or other ARM-like lesions are present outside the grid they should be coded under Any Other/ Other and detailed in the comments.

Code	Definition
0	None present.
1	Questionably present.
2	Definitely present but not in the center circle.
3	Definitely present and the center circle is involved.
7	Excluded for ARM (or for increased pigment, other causes)
8	Cannot grade.

Drusen - Drusen are described as round or ovate, sometimes slightly elevated deposits of variable size, usually located in the plane of the retinal pigment epithelium (RPE). Drusen are classified according to diameter. It is assumed that all drusen are round or oval in shape and that a single druse is no more than twice as long as it is wide. If a druse is oval, its shorter diameter is used to classify its size. Standard circles C-0 (63 micron diameter), C-1 (125 micron diameter) and/or C-2 (250 micron diameter) are superimposed over or placed next to the largest druse in the grid area. If the shorter diameter of the druse equals or exceeds the diameter of the circle, the druse is judged to be equal to or greater than this circle in size. In using the circles, judge from the center of the line.

Distinct Drusen – Hard distinct drusen are always less than 125 microns in size and are usually less than 63 microns in diameter. These drusen are hard edged and punctuate.

Maximum Drusen Size > 125 micron diameter circle - If any portion of a drusen judged to be > 125 microns in diameter (C1) is contained inside the grid then the grade is “Yes”.

Soft Distinct Drusen- These drusen are usually larger in size then hard distinct drusen (between 63 and 300 microns in diameter). Soft distinct drusen have sharp margins and a round nodular appearance with a uniform density (color) from center to periphery.

Soft Indistinct (or Reticular) Drusen- Soft indistinct drusen are the same size as the soft distinct but have indistinct margins and a softer, less solid appearance. These druse appear to be disintegrating around the edges and quite often have uneven coloring and thickness within. Reticular drusen appear to be Soft Indistinct Drusen arranged into ill-defined networks of broad interlacing ribbons. They form a grid pattern with very subtle borders.

Soft Drusen Area - The area involved with soft drusen is measured using the appropriate grid. If the area of soft drusen *within the center circle* is greater than a 500 micron diameter circle than code 3 (Yes, Center Circle) is selected. Otherwise, if the area is greater than a 500 micron diameter circle (not in the center circle) within the entire grid area than code 2 (Yes) is selected. If soft drusen is present but the area is less than a 500 micron circle than code 0, No is selected. (Questionable is not an allowed answer for this item.)

Increased Pigment (Hyperpigmentation) – Increased retinal pigment is described as the deposition of granules or clumps of grey or black pigment in or beneath the retina. When increased pigmentation is present outside of the macular area or is considered due to another cause, code 7 "Pigment Other" is marked and a comment may be included.

RPE Depigmentation (RPE degeneration) - Age-related depigmentation of retinal pigment epithelium is characterized by faint grayish-yellow or pinkish-yellow areas of varying density and configuration without sharply defined borders. Increased pigment is frequently seen over and adjacent to these areas. When RPE degeneration is judged to definitely not be a result of ARM, Any Other "Other" should be marked and a comment included.

Geographic Atrophy – This lesion appears as a sharply defined area of drop-out of retinal pigment epithelium and choriocapillaries, exposing choroidal vessels as a result of degeneration of the deep layers of the retina. When atrophic lesions are definitely not a result of ARM, Any Other “Other” should be marked and a comment included.

PED/Retinal Detachment (SSR Detachment) – Age-related macular degeneration detachments will appear as a clear or solid dome-shaped fluid-filled elevation indicating a serous or retinal pigment epithelium detachment of the retina. In the absence of stereo the grader will look for lines of demarcation, color change and vessel deviation in the macula as cues. The presence of other early or late ARM lesions in the vicinity of these changes will help to confirm a detachment is present. When PED/RD is definitely not a result of ARM, "Other" should be marked and a comment included.

Sub-retinal Hemorrhage - Hemorrhage below the retinal surface which may appear as a dark red, dark grey or greenish area. When sub-retinal hemorrhage is definitely not a result of ARM, "Other" should be marked and a comment included.

Sub-Retinal New Vessels (SRNV) –Abnormal blood vessels that grow beneath the RPE/retina are difficult to detect in a color fundus image without the aid of an angiogram, but occasionally they can be seen. They will often appear as a dilated choroidal like vessel adjacent to a detachment, or subretinal scar or hemorrhage.

Sub-retinal Fibrous Scar (Disciform Scar) – Subretinal fibrous scars, often called disciform scar, appears as sheets or mounds of "white" material involving the retina. When sub-retinal fibrous scarring is definitely not a result of ARM, "Other" should be marked and a comment included.

Photocoagulation Treatment for ARM- This item is to categorize localized treatment within the arcades for subretinal new vessels due to ARM. This often appears as a deep and heavy white scar. Other types of treatment for ARM such as photodynamic therapy(PDT, a light activated chemical, which “clots” in neovascular membranes) and TTT (transpupillary thermal therapy) should be included in this category.

Atypical ARM – Pigmentary abnormalities and/or certain late ARM lesions in the absence of drusen are an unusual appearance for age-related macular degeneration and often are due to another cause or confounding condition (i.e. trauma, hereditary condition etc.). When the grader is suspicious that the lesions present are **not** due to ARM, Atypical ARM is marked “yes” to prompt review by the director of the reading center. Further information, if available, may be requested to clarify the etiology of the retinal appearance.

Retinopathy Sub-section

Retinopathy Level:

If there is no evidence of diabetic retinopathy, the grade is code=10, Skip to Item [Other Abnormalities]. If diabetic retinopathy is present, the grader assigns a retinopathy level (see attached Retinopathy Severity Level and Descriptions) and answers all lesion questions. A list of acronyms and their definitions are listed below

Acronym	Definition
BVO	branch vein occlusion
DA	disc area - a standard area of measurement representing the size of the average optic nerve
DRS	Diabetic Retinopathy Study
FPD	fibrous proliferation on the disc
FPE	fibrous proliferation elsewhere
HE	hard exudates
HMA	hemorrhages and microaneurysms
HRC	high risk characteristics for visual loss
IRMA	intraretinal microvascular abnormality
MA	microaneurysm
NPDR	nonproliferative diabetic retinopathy
NVD	new vessels on the disc
NVE	new vessels elsewhere
PDR	proliferative diabetic retinopathy
PED	pigment epithelial (detachment)
PRH	preretinal hemorrhage
Q	questionable
SE	soft exudates (cottonwool spots)
SSR	sensory serous retinal (detachment)
VB	venous beading
VH	vitreous hemorrhage

RETINOPATHY SEVERITY LEVEL

LEVEL	DESCRIPTION
10	No diabetic retinopathy visible. No other lesions that could be mistaken for diabetic retinopathy.
11	Questionable diabetic retinopathy visible. Usually one questionable MA. Especially useful with non-mydriatic or monocular 45° fields as very small MAs may be difficult to discern in these photographs.
12	Retinopathy that is non-diabetic in nature, but which could be mistaken for diabetic retinopathy, should be noted in the lesion list (i.e. hard exudate from a SSR/RPE, detachment and HMA and/or IRMA etc. from a BVO). Some of the abnormalities from the global "Other" list would constitute a level 12 in the absence of other diabetic retinopathy.
14	Any combination of definite HE, SE, IRMA and/or venous loops in the absence of definite MAs.
15	Retinal hemorrhage present without any definite MAs.
20	MAs only with no other diabetic lesions present.
31	MAs and one or more of the following: HMA < 2A, HE, Venous Loops, Q SE, Q IRMA, Q VB.
41	MAs and one or more of the following: SE, IRMA < 8A.
51	MAs and one or more of the following: VB, HMA <2A, IRMA <8A.
60	FP only with no other proliferative lesions.
61	No retinopathy and scatter treatment (rx) scars present
62	Level 20 (MA=s only) and scatter treatment (rx) scars present
63	Level 31 (Early NPDR) and scatter treatment (rx) scars present
64	Levels 41 or 51 (Moderate or Severe NPDR) and scatter treatment (rx) scars present
65	PDR < HRC. Any proliferative lesions that do not constitute DRS high risk characteristics.
70	PDR ≥ HRC: NVD ≥ 10A **or** NVD < 10A plus VH or PRH **or** NVE ≥ 1/2 DA plus VH or PRH **or** VH/PRH ≥ 1 DA
80	Total VH. Cannot grade the fundus through the VH haze. This can be verified with a dark or black-red reflex picture
88	Cannot assign an accurate retinopathy level usually due to poor photo quality. While the level may be 88, some lesions may be gradable.

All diabetic lesions HMA, HE, SE, IRMA, VB, NVD, NVE, FP, and PRH/VH are graded according to the ETDRS protocol.[9]

Macular Edema (ME): Increased permeability of retinal capillaries and retinal microaneurysms may result in an accumulation of extracellular fluid and thickening of the normally compact retinal tissue. Initially, there may be a slight loss of the normal transparency of the retina and the edema may be missed easily. The leakage and resulting edema may be focal around retinal microaneurysms or be diffuse and in some cases lead to the appearance of cystoid spaces in the outer retina. In the absence of stereo the grader will look for signs of leakage, such as rings of organized hard exudate, localized areas of color change and a deviation of the normal pathway of the retinal blood vessels. Clinically significant macular edema (CSME) is considered present when edema involves the fovea or is within 500 microns of the fovea, or when a 1+ disc area of edema is present with at least a portion of it within the macula.

Code	Definition
0	No Macular Edema (ME) is present.
1	Questionable ME
2	Definite ME but not Clinically Significant (CSME)
3	CSME is present
7	Edema is present but not diabetic
8	Cannot grade.

Macular Edema-Central Circle (CC): The grader assesses edema in the center circle. The choices are:

Code	Definition
0	No ME in the center circle
1	Questionable ME in the center circle
2	Definite, CSME, but no cysts
3	CSME with cysts
7	Edema is present but not diabetic
8	Cannot grade center circle

Photocoagulation (PC) Scar: Local and/or scatter photocoagulation (panretinal or PRP) treatment is usually done to treat neovascularization (also retinal detachment) as a result of diabetes. (also used for retinal vein occlusion or a retinal tear.)

Code	Definition
0	No photocoagulation scars are present
1	Questionable or incomplete photocoagulation scars are present
2	Local photocoagulation scars only are present
3	Scatter photocoagulation scars only are present
4	Scatter + Local photocoagulation scars are present
8	Cannot grade for photocoagulation scars

Focal Photocoagulation (PC) Treatment: Focal laser photocoagulation, either as treatment of leaking retinal microaneurysms (MA=s) or in a grid pattern, is done for the treatment of localized (MA Rx) or diffuse macular edema (grid Rx). If focal treatment cannot be assessed the grade is code 8.

Code	Definition
0	No focal burns present
1	Questionable focal burns present
2	Focal MA burns only
3	Grid pattern of burns only
4	Focal + grid burns are present
8	Cannot grade focal burns

Other Sub-Section

Arteriolar Abnormalities

The arteriolar abnormalities assessed are: focal narrowing and arterio-venous crossing abnormalities (arterio-venous nicking). All abnormalities are assessed outside of Zone A on the Optic Nerve Grid.

Focal Retinal Arteriolar Narrowing in Quadrants

The grader assesses all marked constrictions of retinal arteries and arterioles in Field 1 outside of Zone A as focal narrowing. (The overlapping portions of Field 2 may be used to confirm the presence of focal narrowing in Field 1.) Definite focal narrowing in Field 1 is graded when the involved vessel is at least 40μ in diameter, or about 1/3 of the diameter of a vein at the disc margin, and the constricted area has a caliber less than or equal to 1/2 the caliber of proximal and distal vessel segments. The focal “pinch” must be at least 250μ in length to be considered definite. If the grader observes constriction in vessels less than 40μ in diameter, such constrictions should be assessed as questionable focal narrowing. If the grader feels that subtle constriction of vessels is present or that a definite “pinch” is present but the length is shorter than 250μ long, the grader marks questionable focal narrowing.

Focal narrowing or constriction of retinal arterioles is assessed in each of the four quadrants, excluding the area within 1/2 DD of the disc (Zone A). The grader places the Optic Nerve Grid on the Field 1 image and carefully examines all arterioles greater than or equal to 40μ in diameter, or about 1/3 the diameter of a vein at the disc margin, and evaluates the arteriole for constricted segments. There is sometimes a gradual tapering from the original caliber of the arteriole to the most constricted caliber; only the length of constriction to 1/2 or less of the original caliber is considered definite. If focal narrowing extends from one quadrant to another, the narrowing is estimated separately in each quadrant. If the total length of arterioles available for examination in a quadrant totals

less than 1 1/2 DD, then the grader marks that quadrant ungradable, code 8. Cannot grade is also used if the arterioles in a given subfield are out-of-focus or obscured by artifact.

Each quadrant, superior temporal (ST), superior nasal (SN), inferior temporal (IT) and inferior nasal (IN) is evaluated for the absence of presence of focal narrowing. The following codes are used:

Code	Definition
0	No focal narrowing.
1	Questionable focal narrowing.
2	Definite focal narrowing
8	Cannot grade.

Arterio-Venous Nicking in Quadrants

The photograph grader assesses abnormalities of arterio-venous crossings, or arterio-venous nicking (AV nicking), in each quadrant. Both Field 1 and 2 are used for this evaluation with the grader mentally extending the temporal quadrants through Field 2. Crossings within 1/2 DD of the disc margins (Zone A) are excluded, as are the atypical crossings where the vein crosses over the artery. The grader examines all crossings of artery over vein, and evaluates crossings where the venous blood column is narrowed as abnormal.

Tapering or narrowing of the venous blood column on three or all four sides of the crossing is required for definite AV nicking. If the venous blood column appears tapered on only two sides of the crossing, and the appearance is not due to normal vessel undulation, then the grader assesses AV nicking as questionable. If only one side of the venous column is “nicked” the grader considers A/V nicking absent. The grader discounts any apparent diminishments in venous caliber if the vein appears to be partially obscured by nerve fiber reflex as it approaches and crosses under the artery.

Each quadrant, superior temporal (ST), superior nasal (SN), inferior temporal (IT) and inferior nasal (IN) is evaluated for the absence of presence of AV nicking. The following codes are used:

Code	Definition
0	No AV nicking.
1	Questionable AV nicking.
2	Definite AV nicking.
8	Cannot grade.

Other Vascular Changes

The grader is asked to evaluate the absence or presence of other vascular abnormalities in the retina. The following list of abnormalities are evaluated and graded using these codes:

Code	Definition
0	None present.
1	Questionably present.
2	Definitely present but not in the center circle.
3	Definitely present and the center circle is involved.
8	Cannot grade.

Branch Vein Occlusion- Obstruction of a branch retinal venule. An older occlusion may demonstrate sheathed venules and retinal collateral vessels. Localized hemorrhages and/or IRMAs are commonly present. The occluded vessel may not always be obvious.

Central Vein Occlusion- Obstruction of a central retinal venule. A fresh occlusion is distinguished by dilated retinal venules and diffuse retinal hemorrhages.

Branch/Central Artery Occlusion- Obstruction of a branch or central retinal arteriole. If "fresh", may be associated with large grayish-white area of retinal infarction. Either generalized or localized ischemia may be noted.

Hollenhorst Plaque- Cholesterol emboli. These highly-refractile to smudgy-white lesions lie within arterioles and are quite often seen at artery bifurcations. Care must be taken to distinguish from old retinal macroaneurysms or underlying drusen. (Code 3, center circle, is not applicable.)

Other Abnormalities:

The following lesions are graded using same codes as the Other Vascular Changes list that is detailed above.

Peripapillary Atrophy - Choroidal atrophic area around disc, usually $\geq$1/2 the circumference of the disc and definitely not considered scleral crescents. If the atrophic area is on temporal side of the disc and fairly symmetric, it is usually a myopic or scleral crescent and should not be marked as peripapillary atrophy. (Code 3, center circle, is not applicable.)

Macular Hole - Round or sharply defined hole in the center of the macula. May be surrounded by a gray halo of detachment of the retina. Thinning and depigmentation of the RPE develop within the hole and small retinal cysts may be evident near the hole.

Asteroid Hyalosis- Multiple spherical and stellate opacities in the vitreous. May be difficult to differentiate in non-stereoscopic photographs. Should appear in front of vessels and disc. Care must be taken to differentiate from retinal drusen. If asteroid hyalosis is dense, may prevent grading drusen.

Nevus - Localized increase in number of pigment bearing cells of the choroid, usually in a round or oval shape. Lack of stereopsis will make it difficult to differentiate from raised lesion (melanoma). May have drusen overlying the lesion. If possible, should be distinguished from "bear tracks" and other hyperpigmentation of the retinal pigment epithelium.

Surface Wrinkling Retinopathy -Traction - (SWR-Traction) Slight contraction of the thin membrane on the inner surface of retina. Can be associated with patches of cellophane reflex (see below). If only cellophane reflex is present, SWR-Traction should be not be coded, instead SWR -Cello should be coded as present.

Surface Wrinkling Retinopathy - Cellophane Reflex - (SWR-Cello) A patch or patches of irregular increased reflection from the inner surface of retina (cellophane reflex) which may be associated with fine traction lines and vascular tortuosity. If only traction lines are present , SWR-Cello should not be coded, only SWR-Traction should be coded as present.

Histoplasmosis (POHS) - Presumed Ocular Histoplasmosis Syndrome (POHS) is characterized by one or more of the following: multiple peripheral atrophic chorioretinal scars, peripapillary chorioretinal scarring, and/or macular subretinal fibrous scar. If the latter is present without other signs of POHS, code only **Sub-retinal Fibrous Scar** as code=2.

Retinal Detachment - A condition in which the inner layers of the retina are pulled/separated from the pigment layer.

Photocoagulation Treatment for other conditions (Rx Other)- Miscellaneous treatment for other conditions such as branch vein occlusions or retinal detachment.

Chorioretinal Abnormalities/Other- Retinal and/or choroidal degeneration, regardless of cause, which does not appear to be associated with age-related maculopathy.

Other - Detail in the Comment section.

Cup to disc ratio:

Measurements These measurements will be made on a nonstereo image, so it is imperative that the grader utilize as many tools as possible to accurately determine the edges of the cup and disc respectively. First and foremost, if there is overlap of the optic nerve in the two fields photographed (fields 1 and 2) in each eye, the grader should try to evaluate the images in stereo noting 'landmarks' to be used as measuring points in the nonstereo image. Additionally, the grader will use vessel contour and deviations in its path, as well as color to aid in determining where the measurements will be taken. Vertical cup and disc measurements should be taken between 11 and 1:00 superiorly and 5 and 7:00 inferiorly. The lines drawn to make the measurements for both the cup and the disc should be at least parallel if not superimposed on each other. The grader will draw a line vertically from the top of the cup to the bottom and record the measurement. The measurement will be repeated using the top and the bottom of the disc. Both of these measurements will be recorded in the grading screen as the the cup to disc ratio will be calculated automatically by the database program.

Comments: A comment is necessary if:

- Photo Quality Problem, "Other" is chosen;
- ARM Exclude, "Other" is chosen;
- Pathology Notification, "Other" is chosen;
- Any Other, "Other" is chosen;
- A comment may be noted for any other unusual feature found.

NHANES Preliminary Grading Form

ID #	EYE:	PHOTO DATE: / /	GRADER	DATE GRADED: / /

	Abs	Pre
Field 1	0	2
Field 2	0	2

Focus	Good	Bord	Poor
	0	1	2
	0	1	2

Problems	N	Y
Illumination	0	2
Field def	0	2
Haze	0	2
Dust/dirt	0	2
Lashes	0	2
Arc	0	2
Red Chan	0	2
Other	0	2

Gradability		
All fields gradable	0	
Disc ungradable		1
Portion Mac Ungrad	2	
Macula Ungrad		3
Portion disc/mac ungrad	4	
Disc/macula ungradable		5
All fields ungradable	6	

Other Vasc Lesions	Any?	No = 0	Yes=2	CG=8
	No	Q	Y	CG
Focal art narrow	0	1	2	8
AV nicking	0	1	2	8
BVO/CVO	0	1	2	8
BAO/CAO	0	1	2	8
Hollenhorst Plaque	0	1	2	8
Other Lesions	0		2	8
Mac Hole	0	1	2	8
SWR - traction	0	1	2	8
Nevus	0	1	2	8
Other	0	1	2	8

CUP _____ **DISC** _____

ARM Exclude

No	0		
Trauma		1	
Laser Rx	2		
Vessel Occlusion		3	
Dystrophy	4		
Myopic Degen		5	
Histo / Toxo	6		
Inflammatory		7	
Coloboma / Staph	16		
ROP		9	
nonARM RPEChg	10		
non-ARM Detach		11	
Unknown Etiology	12		
Other		15	
CG	88		

Path Notification

None	0		
Suspicious C/D		1	
PDR	2		
Pre-PDR		3	
CSME	4		
BVO/CVO		5	
Treatable ARM	6		
Hollen Plaque		7	
Elevated Nevus	8		
Mac Hole		9	
Epiret Memb	10		
Other		99	
Path Date __ / ___ / __			

Retinopathy Level

None	10		
Non-diabetic		12	
Quest	13		
HE, SE, IRMA, W/O MAS		14	
Hem Only (no MAs)	15		
MAs Only		20	
Early NPDR	31		
Moderate NPDR		41	
Severe NPDR	51		
FP Only		60	
No Ret w/RX	61		
Mas Only w/RX		62	
Early NPDR w/RX	63		
Mod/Severe NPDR w/RX		64	
PDR < HRC	65		
PDR≥ HRC		70	
Total VH	80		
CG		88	

ARM LESIONS	No	Q	Y	Y-CC	CG
	0	1	2	3	8
Hard Drusen	0	1	2	3	8
Max drusen ≥ 125	0	1	2	3	8
Soft drusen	0	1	2	3	8
Soft area ≥ 500µ	0	1	2	3	8
Increased Pig	0	1	2	3 7	8
RPE Depigment	0	1	2	3	8
Geog Atrophy	0	1	2	3	8
PED/RD Detach	0	1	2	3	8
Subret Hem	0	1	2	3	8
SRNV	0	1	2	3	8
Subret Scar	0	1	2	3	8
ARM Rx	0	1	2	3	8
Atypical ARM	0	1	2	3	8

ARM FEEDBACK			
None	0		
Drusen		1	
Early	2		
Late		3	
CG	8		

MAC-ED		
None	0	
Quest		1
Pr, not CSME	2	
Pr, CSME		3
Non-diabetic	7	
CG		8

Comments:

NHANES Detailed Grading Form

ID #	EYE:	PHOTO DATE: / /	GRADER	DATE GRADED: / /

IMAGE QUALITY

	Absent	Present	Ungradable	Gradable
Field 1	0	2	0	2
Field 2	0	2	0	2

RETINOPATHY LEVEL

None	10	FP Only	60
Non-diab	12	No Ret w/RX	61
Quest	13	Mas Only w/RX	62
HE, SE, IRMA, W/O MAS	14	Early NPDR w/RX	63
Hem Only (no MAs)	15	Mod/Severe NP w/RX	64
MAs Only	20	PDR < HRC	65
Early NPDR	31	PDR ≥ HRC	70
Moderate NPDR	41	Total VH	80
Severe NPDR	51	CG	88

HMA

None	0
Quest	1
MAs Only	2
Hem Only	3
HMA <2A	4
HMA ≥2A	5
CG	8

HE

None	0
Quest	1
Present	2
CG	8

SE

None	0
Quest	1
Present	2
CG	8

IRMA

None	0
Quest	1
<8A	2
≥8A	3
CG	8

VB

None	0
Quest	1
Present	2
CG	8

NVD

None	0
Quest	1
<10A	2
≥10A	3
CG	8

NVE

None	0
Quest	1
<½ DA	2
≥½ DA	3
CG	8

FP

None	0
Quest	1
FPE Only	2
FPD Only	3
FPD+ FPE	4
CG	8

PRH-VH

None	0
Quest	1
< 1 DA	2
> 1 DA	3
CG	8

MAC-ED

None	0
Quest	1
Pr, not CSME	2
Pr, CSME	3
Non-diabetic	7
CG	8

CTR

None	0
Quest	1
Pr, CSME	2
CSME w/cysts	3
Non-diabetic	7
CG	8

PC-SCAR

None	0
Quest/Incomplete	1
Local	2
Scatter Only	3
Scatter + Local	4
CG	8

FOC-RX

None	0
Quest	1
Ma Rx Only	2
Grid Only	3
Ma's + Grid Rx	4
CG	8

ARTERIOLAR CHANGE

Focal Narrowing Quads — 0 = No, 2 = Yes, 8 = CG

	ST	SN	IN	IT
None	0	0	0	0
Quest	1	1	1	1
Present	2	2	2	2
CG	8	8	8	8

AV Nicking Quads — 0 = No, 2 = Yes, 8 = CG

	ST	SN	IN	IT
None	0	0	0	0
Quest	1	1	1	1
Present	2	2	2	2
CG	8	8	8	8

OTHER VASCULAR

0 = No, 2 = Yes, 8 = CG

	NO	Q	YES	CC	OTH	CG
Branch Vein Occlusion	0	1	2	3		8
Central Vein Occlusion	0	1	2	3		8
Br/Cent Artery Occlus	0	1	2	3		8
Hollenhorst Plaque	0	1	2	--		8

ANY ARM

0 = No, 2 = Yes, 7= Excluded, 8 = CG

Hard Drusen	0	1	2	-	8
Drusen ≥ 125 µ	0	1	2	3	8
Soft Distinct	0	1	2	3	8
Soft Indistinct	0	1	2	3	8
Soft Area ≥500µ	0	1	2	3	8
Increased Pigment	0	1	2	3	7 8
RPE Depig	0	1	2	3	8
Geographic Atrophy	0	1	2	3	8
PED/RD	0	1	2	3	8
Subret Hemorrhage	0	1	2	3	8
SRNV	0	1	2	3	8
Subret Fibrous Scar	0	1	2	3	8
Rx for ARM	0	1	2	3	8
Atypical ARM	0	1	2	3	8

ANY OTHER

0=No, 2=Yes, 8 = CG

Peripapillary Atrophy	0	1	2	-	8
Mac hole	0	1	2	-	8
Asteroid Hyalosis	0	1	2	3	8
Nevus	0	1	2	3	8
SWR - traction	0	1	2	3	8
SWR - cello	0	1	2	3	8
Histoplasmosis (POHS)	0	1	2	3	8
Retinal Detachment	0	1	2	3	8
Rx / Other	0	1	2	3	8
Chorioret Abnorm/Other	0	1	2	3	8
Other	0	1	2	3	8

VERTICAL CUP/DISC

CUP _____ Disc _____

COMMENTS: