

FUNDUS PHOTOGRAPH READING CENTER

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To: Collaborating FIND Study Photographers

From: Michael W. Neider
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Re: Photography for the Family Investigation of Nephropathy in Diabetes (FIND) Study

The Fundus Photograph Reading Center at the University of Wisconsin – Madison will be involved with your clinic in a new study entitled: *Family Investigation of Nephropathy in Diabetes (FIND)* sponsored by the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK) and the National Eye Institute (NEI). This study is designed to identify genes responsible for diabetic nephropathy and to evaluate whether there is a genetic link between diabetic nephropathy and diabetic retinopathy. We welcome your collaboration with us and appreciate your taking fundus photographs for us for grading of diabetic retinopathy severity.

Most of the study participants will have their eyes photographed at one of the Participating Investigator Centers (PICs) located in the United States. However, some siblings and parents may not live near one of the PICs. This is where we need your help. One of our PICs has arranged for a participant to visit your office for an eye exam and fundus photographs. The purpose of this memo is to help you understand what photos we would like you to obtain.

Section 1 describes the photography procedure for taking the modified 7-standard fields and fundus reflex photographs in stereo, using a 30° or 35° setting on the fundus camera. This is the procedure we prefer, if you are comfortable with it.

Section 2 contains an abbreviated version of the full 30°-35° procedure, in which stereo photographs are taken of the disc and macula fields, where stereoscopic effect is most important, and single photographs are taken of the peripheral fields.

Section 3 describes an alternative 3-field procedure for 30°- 35° fields.

Section 4 describes a procedure for a single 45°, 50° or 60° wide-angle field.

Section 5 describes slide handling and labeling.

Attachment A provides some pointers on photographic technique that we hope may be helpful.

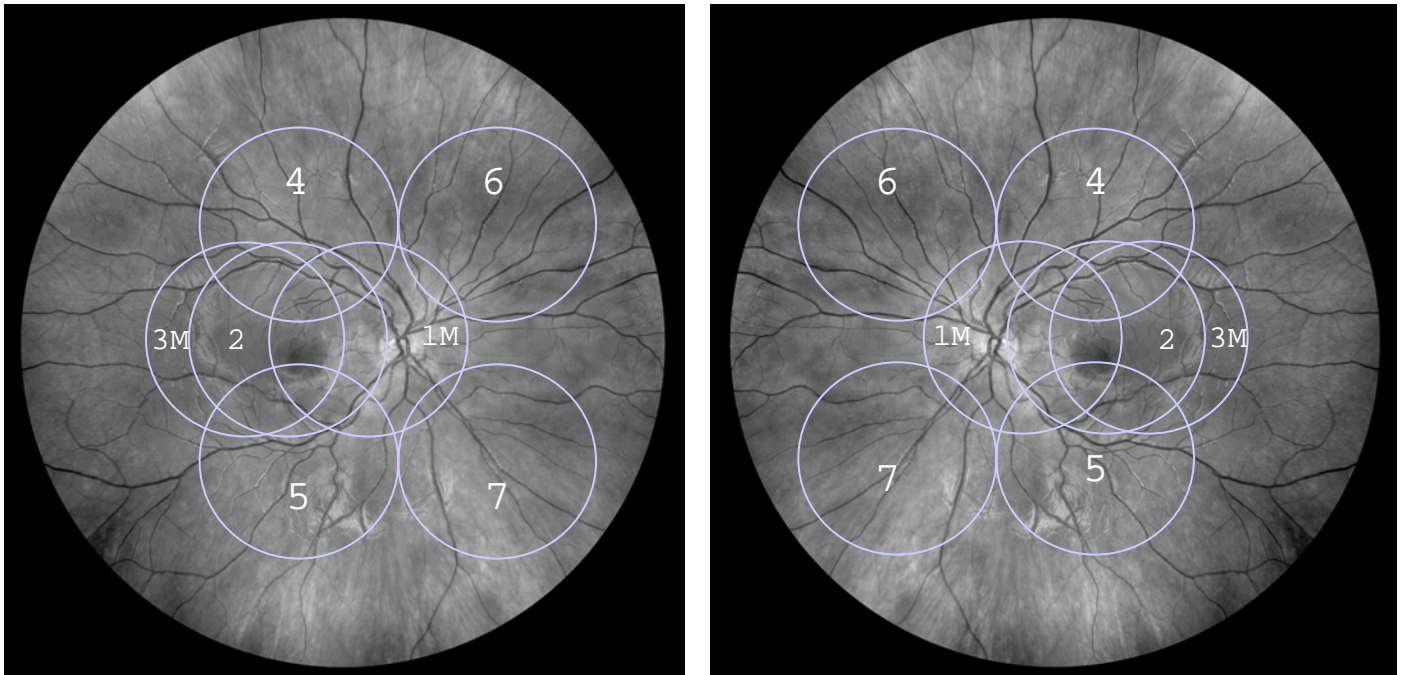
There is only one photography visit and your photos are extremely important to document retinopathy severity. We encourage you to review the following photographic options and use the most complete procedure with which you feel comfortable. In all cases, color slides are preferred over Polaroid prints, though both are acceptable. If you customarily shoot only digital color images, digital files are preferred over digital prints. Please save the files as full-

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resolution images (TIF or BMP files are good choices for us to read) and put them on a CD, if possible.

In addition to the retinal photographs, please take a stereo fundus reflex photograph (easily obtained using the anterior segment setting available on most fundus cameras). Stereo effect is obtained by a slight (2-3mm) lateral shift of the camera between exposures. Focus should be on the pupillary margin or on any cortical lens opacities. This photo is used for our assessment of anterior segment and lens status. An example illustrating the optimal magnification for the fundus reflex photo is shown on the next page.

Section 1 Modified 7-standard fields (taken in stereo) - If you have a 30° or 35° camera and are accustomed to taking 7-standard fields in stereo please use the University of Wisconsin, Fundus Photograph Reading Center's Modified 7-Standard Field Photography Procedure, outlined below. The modified 7-standard field color photography procedure specified here differs from the ETDRS 7-standard field protocol in the position of two fields: Field 1M and Field 3M are both modified to include the center of the macula, in Field 1M near the temporal edge of the field and in Field 3M midway between the nasal edge and the center of the field. The retinal fields for both the right and left eyes are shown below.



The following descriptions of the standard fields assume that there are two cross hairs in the camera ocular, one vertical and the other horizontal intersecting in the center of the ocular.

Field 1M - Disc: Center the temporal edge of the optic disc at the intersection of the cross hairs.

Field 2 - Macula: Center the macula **near** the intersection of the cross hairs in the ocular. To keep the central gray artifact created by some cameras from obscuring the center of the macula, the intersection of the cross hairs should be placed **about 1/8 – 1/4 DD above the center of the macula**. A suitable position can often be obtained by rotating the camera temporally from the Field 1M position, without vertical adjustment.

Field 3M - Temporal to Macula: Position the intersection of the cross hairs in the ocular 1.0-1.5 DD temporal to the center of the macula. If Field 2 was centered above the center of the macula, as suggested above, Field 3M may be centered 1.0-1.5 DD temporal to Field 2, a position easily achieved by rotating the camera without making any vertical adjustment or movement of the fixation device.

Field 4 - Superior Temporal: The lower edge of the field is tangent to a horizontal line passing through the upper edge of the optic disc and the nasal edge of the field is tangent to a vertical line passing through the center of the disc.

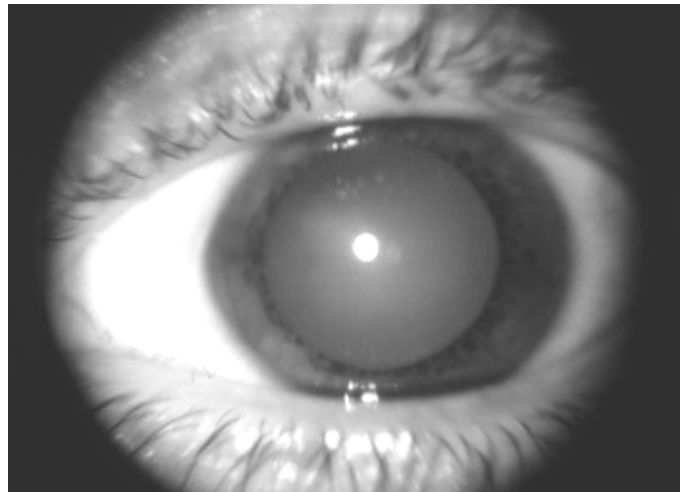
It is convenient to take Field 6 immediately after Field 4 by rotating the camera nasally.

Field 6 - Superior Nasal: The lower edge of the field is tangent to a horizontal line passing through the upper edge of optic disc and the temporal edge of the field is tangent to a vertical line passing through the center of the disc.

Field 5 - Inferior Temporal: The upper edge of the field is tangent to a horizontal line passing through the lower edge of the optic disc and the nasal edge of the field is tangent to a vertical line passing through the center of the disc.

Field 7 - Inferior Nasal: The upper edge of the field is tangent to a horizontal line passing through the lower edge of the optic disc and the temporal edge of the field is tangent to a vertical line passing through the center of the disc.

Field 8 - An optional field outside the modified 7-standard fields should be taken to document new vessels and/or pre-retinal or vitreous hemorrhage when these features are not well documented in the standard fields. The label should reflect the area photographed.

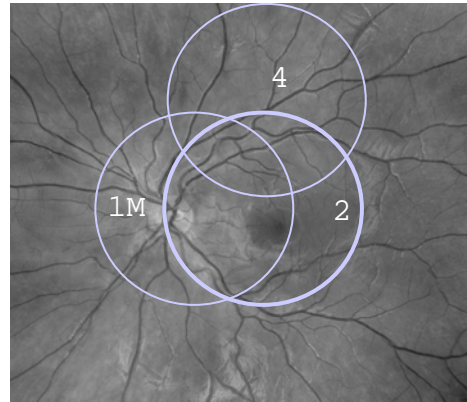
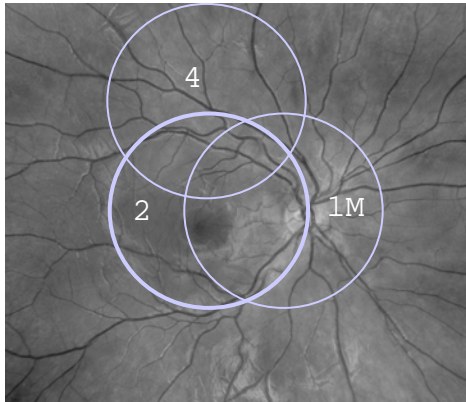


Example of optimal magnification for the stereo fundus reflex photos

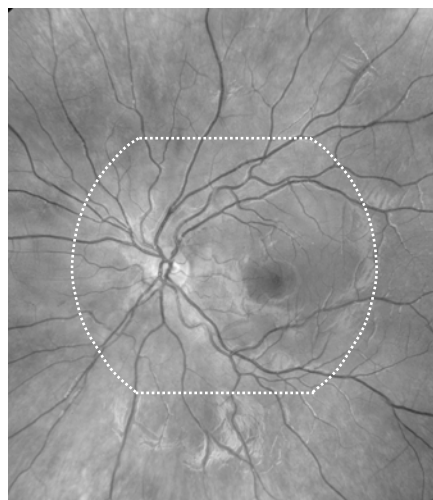
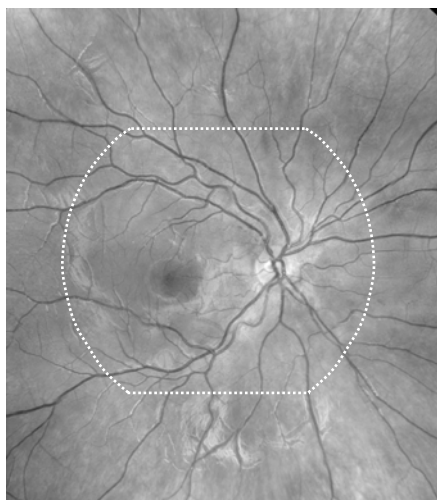
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Section 2 Streamlined modified 7-standard fields - If you are *not accustomed* to taking 7-standard fields in stereo, but take stereo posterior pole photographs using a 30° or 35° camera, please take only fields 1M and 2 and 3M in stereo, taking the remaining fields 4-7 as single, non stereo frames. Remember to take a stereo fundus reflex photograph.

Section 3 Streamlined 3-standard fields - If you have a 30° or 35° camera and are not accustomed to taking peripheral fields, please take fields 1M and 2, preferably in stereo, and field 4 as a single, non-stereo photo. These fields are diagrammed below for both the right and left eyes. Remember to take a fundus reflex photograph too, preferably in stereo but a single photo will do.

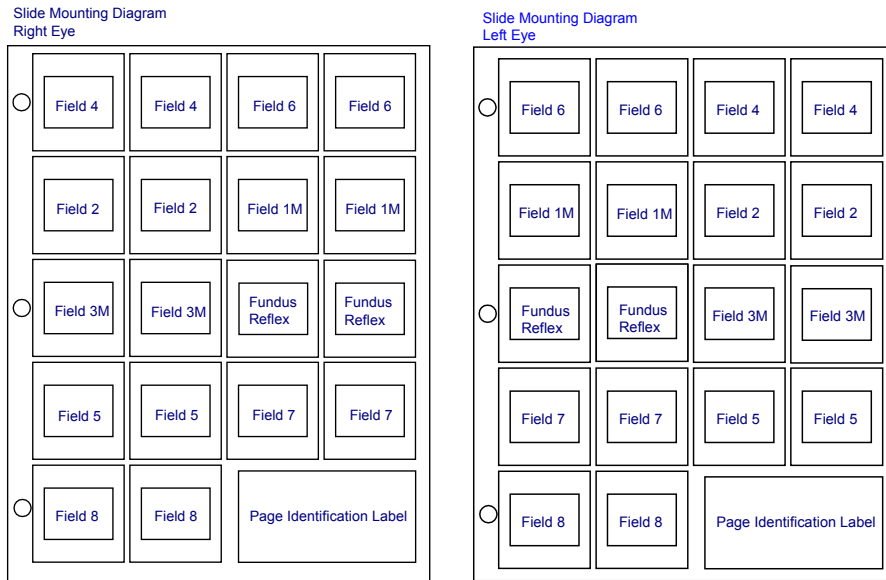


Section 4 Wide-angle posterior pole photography – If you do not have a 30° or 35° camera, please use a 45°, 50° or 60° field to take one field in each eye centered between the disc and the macula. If you are comfortable taking stereo photographs, please take this field as a stereo pair. Remember to take a fundus reflex photograph too, preferably in stereo but a single photo will do.



Section 5 Slide and photo page labels – We will provide two plastic slide pages and enough slide labels for all of the slides for each participant you photograph. We will also provide slide page labels. Please complete and attach one slide page label to the bottom right-hand corner of each slide page.

Please attach the slide labels to the bottom ½ of each slide mount. The labels indicate specific fields or the red reflex photo for each eye. For example, if you shoot the 7 modified fields and fundus reflex photos in stereo of each eye, please apply the appropriate label to each field. Please notice that there are two labels for each field, one identified as “RS” and the other as “LS”. The “RS” label is used on the right member of the stereo pair and the “LS” label is placed on the left member of the stereo pair. See the sample layout below for mounting the 7 standard fields in plastic pages for the right and left eyes.



If you take fewer than 7 fields, please mount those that you do take in the appropriate positions.

Digital and Polaroid Photos

If you have the capability to produce both digital CDs and digital prints, we prefer the digital CD. Please omit any reference to the patient’s name, using instead “FIND” and the FIND 10-digit participant ID. If you submit digital files on CD, please attach a completed CD or slide page label to the backside of the CD. If you submit digital or Polaroid prints, please complete the photo date and photographer blanks on the enclosed labels and send the entire page back with your shipment. We will determine the best way to label your photographs. Please return any unused labels with your photos. If you have questions about digital images, please contact UW FPRC digital imaging consultants, Ericka Lambert or Anne Goulding, at 608-263-9858 for assistance.

We hope you find this material helpful when taking FIND study participant photographs. We sincerely appreciate your taking the time to photograph these participants.

Attachment A

Pointers on Photographic Technique
Prepared by the UW-FPRC

Field Definition

When the modified seven standard stereo fields are taken, the following sequence is recommended: disc (Field 1M), macula (Field 2), temporal to macula (Field 3M), superior temporal (Field 4), superior nasal (Field 6), inferior temporal (Field 5), inferior nasal (Field 7). Stereo Fields 1M, 2 and 3M may be taken on the same horizontal plane.

The following technique may be used for attaining proper definition of Field 4: (1) move the camera from the center of the disc upwards until the upper edge of the disc meets the bottom of the photographic field, (2) take note of some landmark at the intersection of the cross hairs (e.g., a small vessel or microaneurysms), (3) swing the camera temporally until this landmark is at the nasal border of the photographic field (at this point, the lower edge of the field will fall on the same plane as the upper edge of the disc) -- this is the proper position for Field 4. To locate Field 6, rotate the camera nasally until the landmark is at the temporal edge of the field. A similar approach can be used to obtain Fields 5 and 7.

Focus/Clarity

Constant attention must be paid to keeping the cross hairs in the camera ocular in focus, otherwise the photos will be out of focus.

Proper camera-to-eye distance should be maintained to avoid haziness and artifacts.

If it is not possible to get the entire photographic field in crisp focus, the photographer should concentrate on getting the center of the field in focus, sacrificing a bit on the periphery if necessary. This is especially important in Fields 1M and 2.

When the photographer moves to Field 2, having just taken Field 1M, **he/she should refocus on retinal vessels near the center of the field.** *Failure to do so results in photographs that show the foveal area to be slightly out of focus while the periphery is in focus.*

A common problem is focusing too deep. Photographs which include the disc (Fields 1M and often Field 2) sometimes show clear focus on the bottom of the cup, while the retina is slightly out of focus. It appears that some photographers use the lamina cribrosa (at the bottom of the cup), the disc margin, or the granular pattern of the pigment epithelium for focusing. Instead, it is desirable to focus on fine retinal vessels. Since the depth of focus is greater posterior to the plane of absolute focus than anterior to it, it makes sense to err on the side of focusing slightly up into the vitreous rather than too deep. This should keep both the anterior surface of the retina and the pigment epithelial background in focus. **Such a strategy is of special importance when macular edema is present.**

Stereoscopic Effect

The technique described by Allen¹ is used for taking stereo fundus photographs. An Allen stereo separator or manual lateral movement of the camera may be used to obtain the required, non-simultaneous stereo pairs. If the manual method is used, the camera should not be rotated; instead, it should be moved from left to right with the joystick (or by sliding the camera base on its table, if preferred). It is customary to take the left member of the pair first, but this is

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optional. The first member of the pair is taken as far to one side of the pupil as possible, while maintaining good illumination and a clear image. If the separator is used, it is then flipped to the other side and the second photograph is taken if its quality is good. If the quality is not good, refocusing with spherical or astigmatic correction and/or slight vertical movement of the camera (to avoid lens opacity) may be needed. Such vertical movement will not impair the stereoscopic effect. **Somewhat less than optimal focus and clarity is acceptable, if necessary, in the second member of the pair in order to maintain the stereoscopic effect.** The same principles apply when the manual technique is used. If the stereo separator is used, it should be set between 2.25 and 2.75mm. About 2mm is the minimum separation between members of the stereo pair to be aimed for when moving the joystick or sliding the camera.

Photographers should monitor their own work

A 4X or 5X magnification stereoscopic viewer for examining stereo fundus photographs is required, so that the photographer can critically examine his/her work and make appropriate corrections in technique. Examples of good stereoscopic photos can be found at the UW-FPRC website, <http://eyephoto.opth.wisc.edu>.

Questions or Comments

For questions or comments concerning this photography procedure, please contact the UW-FPRC photographic consultants, Michael Neider or Hugh Wabers, at 608-263-9858. For general questions about the FIND Eye Study appointments, materials, and shipments, please contact Kathy Glander, the FIND project manager, at 608-263-6983.

Reference

1. Allen L. Ocular fundus photography. *Am J Ophthalmol* 1964;57:13-28.