

Table S1. Rubric for DR severity assessment			
Question	Possible answers	Included in	
		TA	TA-F
<b>Gradability</b>			
How gradable is this image for DR?	<u>Gradable</u> <u>Ungradable</u> : Images do not show key regions with good enough quality for a confident grading. Also the other visible areas do not show any obvious pathology.	Yes	Yes
<b>Fundus Features</b>			
Microaneurysms?	<u>No</u> <u>Yes</u> <u>Ungradable</u>	No	Yes
Cotton-wool spots?	<u>No</u> <u>Yes</u> <u>Ungradable</u>	No	Yes
Hard exudates?	<u>No</u> <u>Yes</u> <u>Ungradable</u>	No	Yes
Retinal hemorrhage?	<u>No</u> <u>Yes, but not extensive in 4 quadrants</u> <u>Extensive in 4 quadrants</u> : "Extensive" means that there are more than 20 retinal hemorrhages, or hemorrhages at least as severe as in ETDRS standard photo 2A. <u>Ungradable</u>	No	Yes
Definite venous beading?	<u>No</u> <u>In 1 quadrant only</u> <u>In 2+ quadrants</u> <u>Ungradable</u>	No	Yes
IRMA?	<u>No</u> <u>Yes, but not prominent</u> <u>Prominent</u> : "Prominent" means there is any IRMA at least as severe as in ETDRS standard photo 8A. <u>Ungradable</u>	No	Yes
Neovascularization or fibrous proliferation?	<u>No</u> <u>Yes</u> <u>Ungradable</u>	No	Yes
Vitreous or preretinal hemorrhage?	<u>No</u> <u>Yes</u> <u>Ungradable</u>	No	Yes
PRP laser scars?	<u>No</u> <u>Yes</u> <u>Ungradable</u>	No	Yes
Focal laser scars?	<u>No</u> <u>Yes</u> <u>Ungradable</u>	No	Yes
<b>Diagnosis</b>			
DR Grade	<u>No diabetic retinopathy</u> : No abnormalities <u>Mild NPDR</u> : Microaneurysms only <u>Moderate NPDR</u> : More than just microaneurysms but less than Severe NPDR <u>Severe NPDR</u> : No signs of proliferative disease and one of: extensive (>20) intraretinal hemorrhages in each of 4 quadrants or definite venous beading in 2+ quadrants or prominent IRMA <u>Proliferative DR</u> : Neovascularization or vitreous/preretinal hemorrhage	Yes	Yes
Hypertensive retinopathy	<u>No</u> <u>Yes</u>	No	Yes
Retinal vein occlusion (CRVO, BRVO, HRVO)	<u>No</u> <u>Yes</u>	No	Yes
Retinal artery occlusion (CRAO, BRAO)	<u>No</u> <u>Yes</u>	No	Yes

Abbreviations: TA, Tool-based Adjudication; TA-F, Tool-based Adjudication with Feature Rubric; DR, Diabetic Retinopathy; ETDRS, Early Treatment Diabetic Retinopathy Study; IRMA, Intraretinal Microvascular Abnormalities; PRP, Panretinal Photocoagulation; NPDR, Non-Proliferative Diabetic Retinopathy; PDR, Proliferative Diabetic Retinopathy; RVO, Retinal Vein Occlusion; CRVO, Central Retinal Vein Occlusion; BRVO, Branch Retinal Vein Occlusion; HRVO, Hemi-central Retinal Vein Occlusion; RAO, Retinal Artery Occlusion; CRAO, Central Retinal Artery Occlusion; BRAO, Branch Retinal Artery Occlusion;

<b>Table S2. Confusion matrix for comparing the gradings between Tool-based Adjudication (TA) Panel A and Baseline Adjudication</b>							
<b>Baseline</b>	<b>TA: Panel A</b>						
	<b>No Apparent DR</b>	<b>Mild NPDR</b>	<b>Moderate NPDR</b>	<b>Severe NPDR</b>	<b>PDR</b>	<b>Not Gradable</b>	<b>Total</b>
<b>No Apparent DR</b>	206	8	2	0	0	0	216
<b>Mild NPDR</b>	5	7	2	0	0	1	15
<b>Moderate NPDR</b>	4	5	89	6	2	0	106
<b>Severe NPDR</b>	1	0	15	46	7	1	70
<b>PDR</b>	0	0	3	3	49	0	55
<b>Not Gradable</b>	18	0	3	2	0	3	26
<b>Total</b>	234	20	114	57	58	5	488

The columns represent the grades from Tool-based Adjudication (TA) Panel A. The rows represent the grades from Baseline Adjudication. DR = Diabetic Retinopathy; NPDR = Non-Proliferative Diabetic Retinopathy; PDR = Proliferative Diabetic Retinopathy. The two cases with persistent disagreement from TA Panel A were grouped with ungradable images in this table.

<b>Table S3. Confusion matrix for comparing the gradings between Tool-based Adjudication (TA) Panel B and Baseline Adjudication</b>							
<b>Baseline</b>	<b>TA: Panel B</b>						
	<b>No Apparent DR</b>	<b>Mild NPDR</b>	<b>Moderate NPDR</b>	<b>Severe NPDR</b>	<b>PDR</b>	<b>Not Gradable</b>	<b>Total</b>
<b>No Apparent DR</b>	199	4	5	0	1	7	216
<b>Mild NPDR</b>	5	5	5	0	0	0	15
<b>Moderate NPDR</b>	0	3	100	2	0	1	106
<b>Severe NPDR</b>	0	0	23	44	2	1	70
<b>PDR</b>	0	0	6	4	45	0	55
<b>Not Gradable</b>	12	1	0	2	0	11	26
<b>Total</b>	216	13	139	52	48	20	488

The columns represent the grades from Tool-based Adjudication (TA) Panel B. The rows represent the grades from Baseline Adjudication. DR = Diabetic Retinopathy; NPDR = Non-Proliferative Diabetic Retinopathy; PDR = Proliferative Diabetic Retinopathy.

**Table S4. Confusion matrix for comparing the gradings between Tool-based Adjudication with Feature Rubric (TA-F) Panel C and Baseline Adjudication**

Baseline	TA-F: Panel C						
	No Apparent DR	Mild NPDR	Moderate NPDR	Severe NPDR	PDR	Not Gradable	Total
No Apparent DR	208	3	0	0	0	5	216
Mild NPDR	9	3	3	0	0	0	15
Moderate NPDR	4	3	95	1	0	3	106
Severe NPDR	3	0	37	23	5	2	70
PDR	2	0	3	2	46	2	55
Not Gradable	14	0	1	0	1	10	26
<b>Total</b>	240	9	139	26	52	22	488

The columns represent the grades from Tool-based Adjudication with Feature Rubric (TA-F) Panel C. The rows represent the grades from Baseline Adjudication. DR = Diabetic Retinopathy; NPDR = Non-Proliferative Diabetic Retinopathy; PDR = Proliferative Diabetic Retinopathy.

<b>Table S5. Confusion matrix for comparing the gradings between Tool-based Adjudication with Feature Rubric (TA-F) Panel D and Baseline Adjudication</b>							
<b>Baseline</b>	<b>TA-F: Panel D</b>						
	<b>No Apparent DR</b>	<b>Mild NPDR</b>	<b>Moderate NPDR</b>	<b>Severe NPDR</b>	<b>PDR</b>	<b>Not Gradable</b>	<b>Total</b>
<b>No Apparent DR</b>	212	2	1	0	0	1	216
<b>Mild NPDR</b>	4	10	1	0	0	0	15
<b>Moderate NPDR</b>	3	5	88	7	3	0	106
<b>Severe NPDR</b>	0	0	13	49	7	1	70
<b>PDR</b>	0	0	1	4	50	0	55
<b>Not Gradable</b>	14	1	0	2	0	9	26
<b>Total</b>	233	18	104	62	60	11	488

The columns represent the grades from Tool-based Adjudication with Feature Rubric (TA-F) Panel D. The rows represent the grades from Baseline Adjudication. DR = Diabetic Retinopathy; NPDR = Non-Proliferative Diabetic Retinopathy; PDR = Proliferative Diabetic Retinopathy.

**Table S6. Confusion matrix for comparing the gradings between Tool-based Adjudication (TA) Panels B and A**

TA: Panel A	TA: Panel B						
	No Apparent DR	Mild NPDR	Moderate NPDR	Severe NPDR	PDR	Not Gradable	Total
No Apparent DR	207	5	7	0	0	15	234
Mild NPDR	8	5	6	0	1	0	20
Moderate NPDR	1	3	99	7	2	2	114
Severe NPDR	0	0	18	38	1	0	57
PDR	0	0	7	7	44	0	58
Not Gradable	0	0	2	0	0	3	5
<b>Total</b>	216	13	139	52	48	20	488

The columns represent the grades from Tool-based Adjudication (TA) Panel B. The rows represent the grades from Tool-based Adjudication (TA) Panel A. DR = Diabetic Retinopathy; NPDR = Non-Proliferative Diabetic Retinopathy; PDR = Proliferative Diabetic Retinopathy. The two cases with persistent disagreement from TA Panel A were grouped with ungradable images in this table.

<b>Table S7. Confusion matrix for comparing the gradings between Tool-based Adjudication with Feature Rubric (TA-F) Panels D and C</b>							
	<b>TA-F: Panel D</b>						
<b>TA-F: Panel C</b>	<b>No Apparent DR</b>	<b>Mild NPDR</b>	<b>Moderate NPDR</b>	<b>Severe NPDR</b>	<b>PDR</b>	<b>Not Gradable</b>	<b>Total</b>
<b>No Apparent DR</b>	223	6	3	2	3	3	240
<b>Mild NPDR</b>	2	6	1	0	0	0	9
<b>Moderate NPDR</b>	1	4	95	33	5	1	139
<b>Severe NPDR</b>	0	0	2	22	2	0	26
<b>PDR</b>	0	0	1	2	48	1	52
<b>Not Gradable</b>	7	2	2	3	2	6	22
<b>Total</b>	233	18	104	62	60	11	488

The columns represent the grades from Tool-based Adjudication with Feature Rubric (TA-F) Panel D. The rows represent the grades from Tool-based Adjudication with Feature Rubric (TA-F) Panel C. DR = Diabetic Retinopathy; NPDR = Non-Proliferative Diabetic Retinopathy; PDR = Proliferative Diabetic Retinopathy.

Table S8. Discussions from the two Cases with persistent disagreement in Panel A		
Round	Case 1	Case 2
0	G1: [Severe NPDR] <i>"IRMA temp"</i> G2: [Mild NPDR] G3: [Mild NPDR] <i>"large ma's"</i>	G1: [PDR] G2: [Moderate NPDR] G3: [Moderate NPDR]
1	G1: [Severe NPDR]	G2: [Severe NPDR]
2	G2: [Mild NPDR]	G3: [Severe NPDR] <i>"looks like irma rather than full on nve, but hard to tell due to picture quality"</i>
3	G3: [Mild NPDR] <i>"not sure i see the irma. not apparent on red-free either"</i>	G1: [PDR] <i>"I think it is NV"</i>
4	G1: [Severe NPDR] <i>"so I use the zoom function and see abnormal flat vessels at 9 o clock temp to fovea"</i>	G2: [Severe NPDR]
5	G2: [Mild NPDR]	G3: [Severe NPDR]
6	G3: [Mild NPDR]	G1: [PDR]
7	G1: [Severe NPDR]	G2: [Severe NPDR] <i>"Think its IRMA"</i>
8	G2: [Mild NPDR]	G3: [Severe NPDR] <i>"i still think it's irma"</i>
9	G3: [Mild NPDR] <i>"[G1] want to go with majority?"</i>	G1: [PDR]
10	G1: [Moderate NPDR]	G2: [Severe NPDR] <i>"Don't believe this is NV. I am going towards IRMA. Think majority should go here so we can move on."</i>
11	G2: [Mild NPDR]	G3: [Severe NPDR] <i>"agree"</i>
12	G3: [Mild NPDR]	G1: [PDR]
13	G1: [Severe NPDR]	G2: [Severe NPDR]
14	G2: [Mild NPDR]	G3: [Severe NPDR]
15	G3: [Mild NPDR]	G1: [PDR]

Abbreviations: G1, Grader 1; G2, Grader 2; G3, Grader 3; IRMA, Intraretinal Microvascular Abnormalities; MA, Microaneurysm; NPDR, Non-Proliferative Diabetic Retinopathy; NV, Neovascularization; NVE, Neovascularization elsewhere; PDR, Proliferative Diabetic Retinopathy; Temp, Temporal.



<b>Table S9. Discussions from two example cases resolved in round 3 in Panel A</b>		
<b>Round</b>	<b>Case 1</b>	<b>Case 2</b>
0	G1: [PDR] <i>“disc hemorrhage and prh may be nvd”</i> G2: [Moderate NPDR] <i>“Could also be preretinal heme on disc from NVD”</i> G3: [Moderate NPDR]	G1: [Severe NPDR] G2: [Severe NPDR] G3: [Moderate NPDR]
1	G3: [PDR] <i>“agree with the preretinal heme likely from nvd”</i>	G3: [Moderate NPDR] <i>“not as much hemorrhage inferiorly”</i>
2	G1: [PDR]	G1: [Moderate NPDR]
3	G2: [PDR]	G2: [Moderate NPDR]

Abbreviations: G1, Grader 1; G2, Grader 2; G3, Grader 3; NPDR, Non-Proliferative Diabetic Retinopathy; NVD, Neovascularization of the disc; PDR, Proliferative Diabetic Retinopathy; PRH, Pre-Retinal Hemorrhage.

<b>Table S10. Counts and percentages of cases resolved in different phases of Tool-based Adjudication, split by DR severity according to Baseline Adjudication.</b>							
<b>When was an agreement reached?</b>	<b>DR severity according to Baseline adjudication</b>						<b>Total</b>
	<b>No Apparent DR</b>	<b>Mild NPDR</b>	<b>Moderate NPDR</b>	<b>Severe NPDR</b>	<b>PDR</b>	<b>Not Gradable</b>	
<b>Independently , without adjudication</b>	723 (83.7%)	19 (31.7%)	269 (63.4%)	125 (44.6%)	160 (72.7%)	55 (52.9%)	1351 (69.2%)
<b>At most 1 round of review / grader</b>	99 (11.5%)	31 (51.7%)	126 (29.7%)	139 (49.6%)	50 (22.7%)	40 (38.5%)	485 (24.8%)
<b>At most 2 rounds of review / grader</b>	31 (3.6%)	7 (11.7%)	24 (5.7%)	10 (3.6%)	9 (4.1%)	8 (7.7%)	89 (4.6%)
<b>&gt; 2 rounds of review for at least one grader</b>	11 (1.3%)	2 (3.3%)	5 (1.2%)	5 (1.8%)	1 (0.5%)	1 (1.0%)	25 (1.3%)
<b>Persistent disagreement after 5 rounds / grader</b>	0 (0.0%)	1 (1.7%)	0 (0.0%)	1 (0.4%)	0 (0.0%)	0 (0.0%)	2 (0.1%)
<b>Total</b>	864 (100.0%)	60 (100.0%)	424 (100.0%)	280 (100.0%)	220 (100.0%)	104 (100.0%)	1952 (100.0%)

The columns represent the grades from Baseline Adjudication. The rows represent different phases of tool-based adjudication. DR = Diabetic Retinopathy; NPDR = Non-Proliferative Diabetic Retinopathy; PDR = Proliferative Diabetic Retinopathy. This table includes 1952 cases in total, i.e., 488 cases adjudicated by four independent adjudication panels, two panels in TA and TA-F each.

**Table S11. Time needed by each of the four panels in tool-based adjudication to fully adjudicate 499 images.**

<b>Adjudication Panel</b>	<b>Hours on Task Total</b> (sum for all graders)	<b>Days Total</b> (end to end)
TA: Panel A	23	43
TA: Panel B	39	54
TA-F: Panel C	23	58
TA-F: Panel D	33	19