

## Supplementary Online Content

Gupta DK, Khandker N, Stacy K, Tatsuoka CM, Preston DC. Utility of combining a simulation-based method with a lecture-based method for fundoscopy training in neurology residency. *JAMA Neurol*. Published online September 11, 2017. doi:10.1001/jamaneurol.2017.2073

**eAppendix 1.** Fundoscopy Knowledge Test Part 1

**eAppendix 2.** Fundoscopy Knowledge Test Part 2

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**eTable 1.** Baseline Distribution of Survey Scores by Control and Intervention Groups

**eTable 2.** Baseline Distribution of Survey Scores by Postgraduation Year (PGY)

**This supplementary material has been provided by the authors to give readers additional information about their work.**

**eAppendix 1. Fundoscopy Knowledge Test Part 1**

**Pre-Intervention / Post-Intervention**

**Fundoscopy Knowledge Test – Part I (20 questions)**

Date:

Subject ID:

1. Which structure represents the communication between the anterior and posterior chambers?
  - a. Pupil
  - b. Iris
  - c. Ciliary body
  - d. Sclera
  
2. Which of the following is false of sympathetic agonists used for pupil dilation?
  - a. Does not cause blurry vision
  - b. Tends not to work as well as parasympathetic antagonists
  - c. Phenylephrine is most commonly used
  - d. Acts by paralyzing sphincter muscles and ciliary lens muscles.
  
3. Where are the third order neurons projecting sympathetic fibers to dilator pupillae?
  - a. Hypothalamus
  - b. Cilio-spinal centre of Budge
  - c. Superior cervical ganglion
  - d. Trigeminal nerve
  
4. Which of the following is an advantage of the pan-optic ophthalmoscope over a traditional direct ophthalmoscope?
  - a. Ability to visualize a larger area
  - b. Easier technique
  - c. Presence of a red free light
  - d. No need to darken room
  
5. What happens when the focusing wheel is adjusted to be more positive (green)?
  - a. Focuses on objects that are farther
  - b. Better view for near sighted examiners
  - c. Focuses objects that are closer
  - d. Worse view for far-sighted examiners
  
6. What setting is ideal for small pupils?
  - a. Large light
  - b. Medium light
  - c. Small light

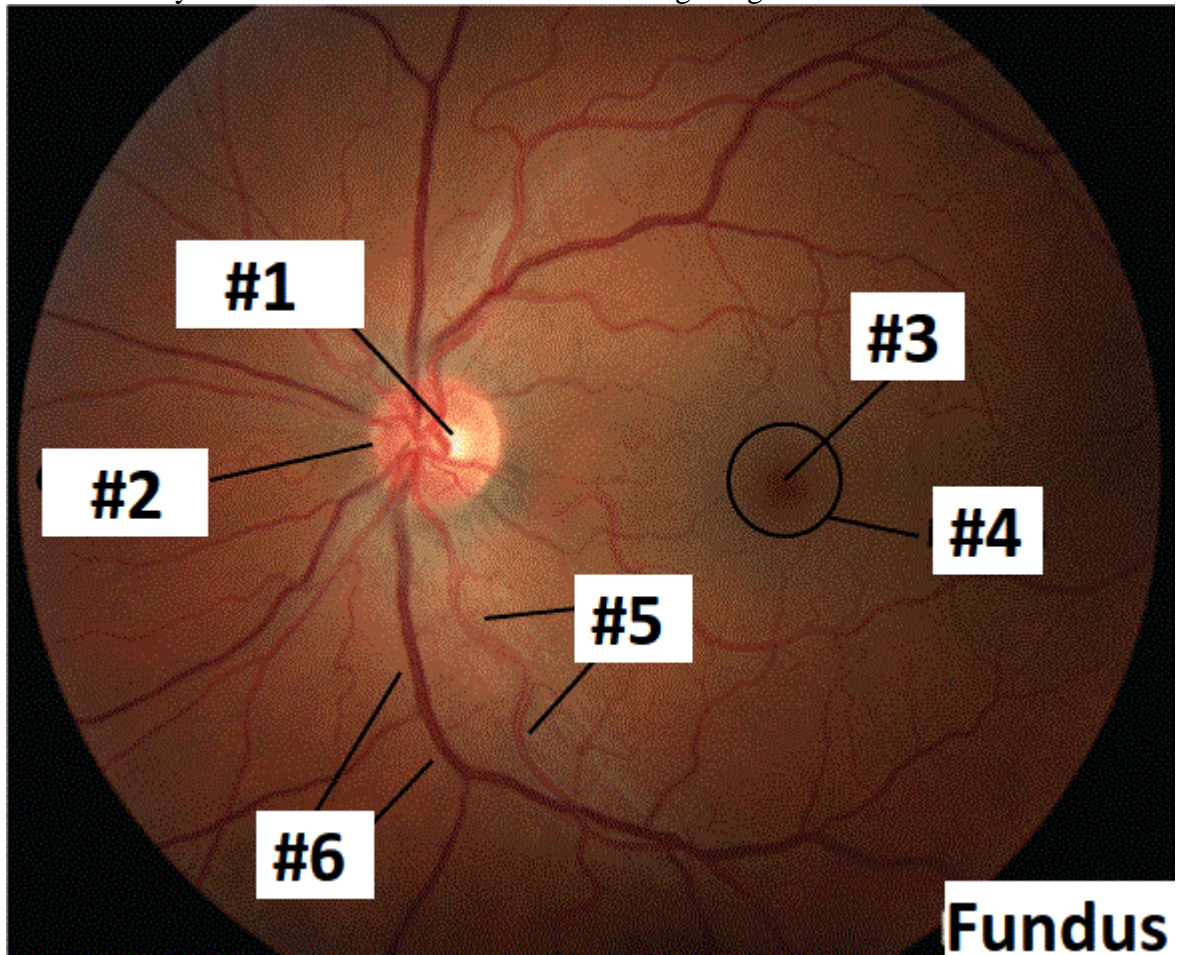
- d. Blue light
7. Which anatomic structure corresponds to the physiologic blind spot?
- a. Superior arcade
  - b. Macula
  - c. Fovea
  - d. Optic disc
8. In which of the following clinical scenarios is fundoscopic examination critical?
- a. Evaluation of headache
  - b. Evaluation of visual loss
  - c. Evaluation of altered mental status
  - d. All of the above
9. Where is aqueous humour absorbed?
- a. Posterior chamber
  - b. Lens
  - c. Trabecular meshwork
  - d. Vitreous
10. Which nucleus mediates pupillary constriction?
- a. Geniculate nucleus
  - b. Edinger-Westphal nucleus
  - c. Nucleus of CN IV
  - d. Hypothalamus
11. Which muscles are paralyzed by parasympathetic antagonist eye drops?
- a. Sphincter pupillae, ciliary lens muscles
  - b. Sphincter pupillae, dilator pupillae
  - c. Dilator pupillae, superior oblique
  - d. Ciliary lens muscles, dilator pupillae
12. Where is aqueous humour produced?
- a. Posterior chamber
  - b. Lens
  - c. Trabecular meshwork
  - d. Vitreous
13. Which of the following do not help distinguish arteries from veins?

- a. Arteries are narrower than veins
- b. Venous pulsations may be visible
- c. Use of red free light
- d. Veins enter eye from temporal side

14. Which is the best setting when attempting to visualize the fundus in a patient with cataracts?

- a. Half light
- b. Red free light
- c. Slit beam
- d. Grid

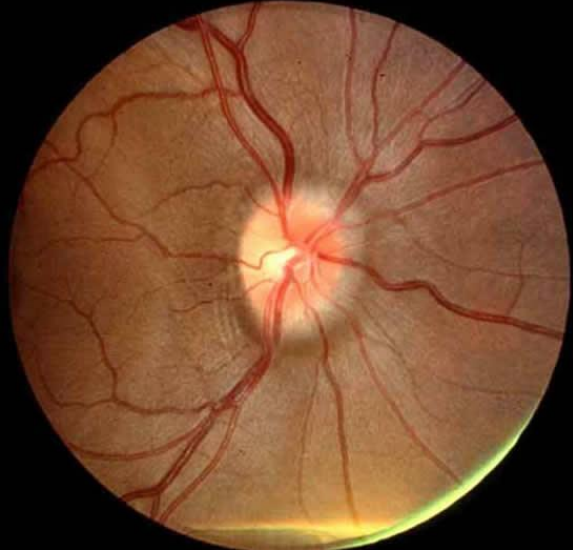


15-20. Please identify the structures labelled in the following image:



- 1. \_\_\_\_\_
- 2. \_\_\_\_\_
- 3. \_\_\_\_\_
- 4. \_\_\_\_\_

5. \_\_\_\_\_
6. \_\_\_\_\_

**eAppendix 2. Fundoscopy Knowledge Test Part 2**

Number	Finding Name & Description	Image
1.		
2.		
3.		

4.		
5.		
6.		 

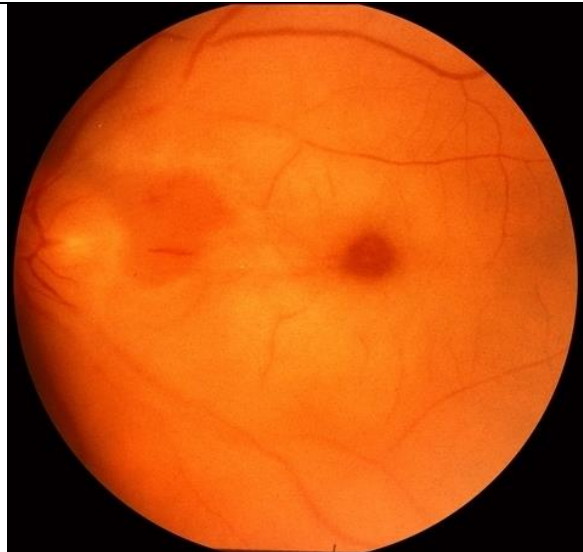
7.



8.

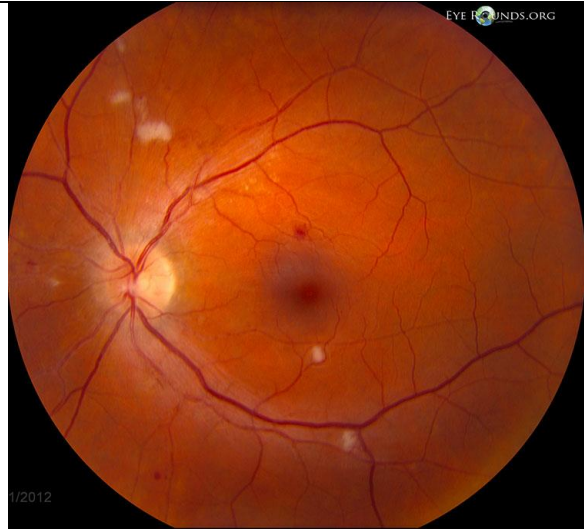


9.

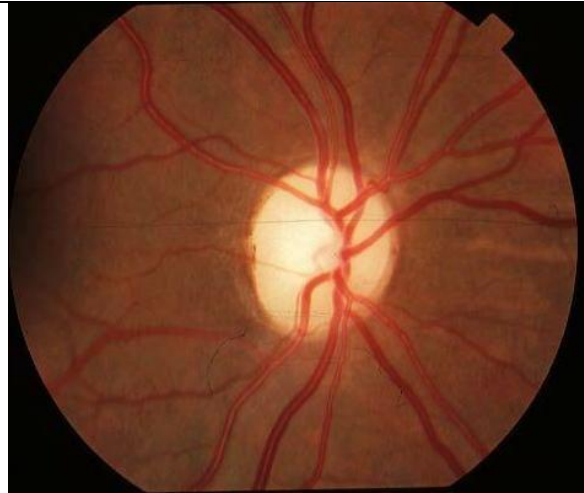




10.






11.



12.



13.		
14.		
15.		

### **eAppendix 3. Fundoscopy Skills Test**

*Answers not included in the original test file use in the study.*

Please identify the slides on Adam,Rouily simulator and name/describe the finding(s) below:

1. Background/Non-proliferative Diabetic Retinopathy
2. Proliferative Diabetic Retinopathy
3. Normal fundus
4. Glaucomatous optic disc
5. Papilledema
6. Optic atrophy
7. Multiple retinal hemorrhages
8. Hypertensive Retinopathy
9. Toxoplasmosis
10. Choroidal nevus
11. CMV retinitis
12. CRVO
13. CRAO
14. Hollenhorst plaque
15. Malignant melanoma

**eAppendix 4. Fundoscopy Attitude & Practice Survey**  
**Pre-Intervention / Post-Intervention**

Date:

Subject ID:

1. How comfortable do you feel in performing a fundoscopic exam?

Mark only one oval.

	1	2	3	4	5	6	7	8	9	10	
very uncomfortable	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	very comfortable

2. How often do you attempt a fundoscopic exam?

Mark only one oval.

	1	2	3	4	5	6	<input checked="" type="radio"/>	7	8	9	10	
10% of time	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	100 % of time

3. How often are you successful in visualizing the fundus?

Mark only one oval.

	1	2	3	4	5	6	7	8	9	10		
10% of time	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	100 % of time

4. How confident do you feel in describing common fundoscopic findings after successful visualization?

examples: papilledema, disc pallor, AV nicking, disc-to-cup ratio, etc.

Mark only one oval.

	1	2	3	4	5	6	7	8	9	10	
No t	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	confident

Very  
confi

dent

5. How useful do you think that simulation based training will be in improving your fundoscopic skills?

e.g. Adam,Rouilly, Kyoto, OphoSim etc

Mark only one oval.

1      2      3      4      5      6      7      8      9      10

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not useful



very useful

**eTable 1.** Baseline Distribution of Survey Scores by Control and Intervention Groups

<b>Survey Item</b>	<b>Control (n=24)</b>	<b>Intervention (n=24)</b>	<b>p- Value</b>
Comfort Level in Attempting Fundoscopy (1-10)	4.7 ± 2.2 (5.0, 1 - 8)	4.0 ± 2.1 (3.0, 1 - 10)	0.235
Frequency of Attempting Fundoscopy (1-10)	6.0 ± 2.3 (6.0, 1 - 9)	6.3 ± 2.7 (7.0, 1 - 10)	0.668
Success in Visualizing Retina (1-10)	5.5 ± 2.1 (6.0, 1 - 8)	5.1 ± 2.1 (5.0, 1 - 9)	0.416
Confidence in Describing Findings (1-10)	4.8 ± 2.3 (5.0, 1 - 8)	3.4 ± 1.7 (3.0, 1 - 7)	0.038*
Usefulness of Fundoscopy Simulator (1-10)	7.8 ± 1.9 (8.0, 2 - 10)	8.3 ± 2.2 (9.0, 1 - 10)	0.250

n is number of subjects per group. Mann-Whitney U test was used for statistical testing and \* indicates significant results based on p value of < 0.05. Values are shown as mean ± standard deviation (median, range).



**eTable 2.** Baseline Distribution of Survey Scores by Postgraduation Year (PGY)

Survey Item	PGY1 (n=12)	PGY2 (n=12)	PGY3 (n=13)	PGY4 (n=12)	p- Value
Comfort Level in Attempting Fundoscopy (1-10)	3.6 ± 2.1 (3.0, 1 - 7)	3.7 ± 1.7 (3.5, 1- 7)	4.8 ± 2.2 (5.0, 2 - 8)	5.7 ± 2.3 (5.0, 2 - 10)	0.175
Frequency of Attempting Fundoscopy (1-10)	3.3 ± 2.2 (2.5, 1 - 8)	6.8 ± 1.7 (6.5, 4 - 10)	6.6 ± 1.8 (6.0, 3 - 9)	8.0 ± 1.4 (8.0, 5 - 10)	0.000*
Success in Visualizing Retina (1-10)	3.8 ± 2.2 (3.5, 1 - 7)	4.8 ± 1.9 (5.0, 1 - 8)	6.5 ± 1.7 (7.0, 4 - 9)	6.2 ± 1.5 (7.0, 4 - 8)	0.005*
Confidence in Describing Findings (1-10)	2.9 ± 2.0 (3.0, 1 - 8)	3.6 ± 2.1 (3.0, 1- 8)	5.2 ± 2.0 (6.0, 2 - 8)	4.6 ± 2.0 (5.0, 2 - 7)	0.043*
Usefulness of Fundoscopy Simulator (1-10)	7.4 ± 2.4 (7.5, 1 - 10)	7.3 ± 2.5 (7.0, 2 - 10)	8.6 ± 1.3 (9.0, 6 - 10)	8.8 ± 1.3 (9.0, 6 - 10)	0.187

n is number of subjects per PGY. Kruskal-Willis test was used for statistical testing and \* indicates significant results based on p value of < 0.05. Values are shown as mean ± standard deviation (median, range).