

## ORIGINAL ARTICLE

# Effectiveness of simple interventions to remind eye doctors to educate glaucoma patients about the dangers of driving

Adeline Low, Sujaya Singh, Ee Ling Ang, Azida Juana Kadir, Amir Samsudin

Low A, Singh S, Ang EL, et al. Effectiveness of simple interventions to remind eye doctors to educate glaucoma patients about the dangers of driving. *Malays Fam Physician*. 2021;16(2):45–49. <https://doi.org/10.51866/oa1147>

### Keywords:

Driving; glaucoma; visual field; education

### Authors:

#### Sujaya Singh

(Corresponding author)  
MOphthal  
University of Malaya Eye  
Research Centre, Department of  
Ophthalmology, Faculty of Medicine  
University of Malaya, Kuala Lumpur  
Malaysia  
Email: drsujaya@gmail.com

#### Adeline Low

MBBS  
University of Malaya Eye  
Research Centre, Department of  
Ophthalmology, Faculty of Medicine  
University of Malaya, Kuala Lumpur  
Malaysia

#### Ang Ee Ling

MOphthal  
Department of Ophthalmology  
Penang Hospital, Penang, Malaysia

#### Azida Juana Kadir

MOphthal  
University of Malaya Eye  
Research Centre, Department of  
Ophthalmology, Faculty of Medicine  
University of Malaya, Kuala Lumpur  
Malaysia

#### Amir Samsudin

PhD  
University of Malaya Eye  
Research Centre, Department of  
Ophthalmology, Faculty of Medicine  
University of Malaya, Kuala Lumpur  
Malaysia

### Abstract

**Purpose:** A clinical audit to establish whether eye doctors achieve the benchmark in reminding glaucoma patients about the dangers of driving. After introducing two simple interventions, a follow-up audit was performed.

**Methodology:** Initially, we interviewed 85 patients with established glaucoma who underwent Humphrey visual field (HVF) testing and also reviewed their medical notes. We looked for documentation of their driving status, specifically whether those with bilateral visual field (VF) defects recalled being given advice about the dangers of driving and whether this was documented in the notes. After this initial audit, doctors were educated on the availability of guidelines on visual requirements for driving, and reminder adhesive labels were put on the front of medical notes of driving glaucoma patients. A follow-up audit was then performed on 95 different patients.

**Results:** In the initial audit, none of the patients had their driving status recorded. Only 36% of drivers with bilateral VF defects recalled being advised of the dangers of driving, with no documentation of whether the advice was given to them. Following the interventions, documentation of driving status became 86%. All drivers with bilateral VF defects recalled being advised regarding the dangers of driving, with documentation of the advice being given recorded in 73% of the medical notes.

**Conclusion:** Eye doctors are inadequately identifying, advising, and documenting the dangers of driving in the medical notes of glaucoma patients with bilateral VF defects. This can be improved with simple interventions, such as the education of doctors and creating reminder labels, for the benefit of our glaucoma patients.

### Introduction

Vision contributes 90–95% of the sensory input required by the brain for driving;<sup>1</sup> therefore, it is vital that adequate standards of vision are set for all drivers to ensure road safety. Glaucoma is an irreversible disease that typically results in slowly-progressive peripheral visual field (VF) defects, such that patients are often unaware of their increasingly restricted VFs and potential inability to drive safely. Those with bilateral VF defects especially may miss vehicles, pedestrians, or other objects that are present in their peripheral fields e.g., a person who is about to cross the road.

Ophthalmologists are often sought in matters related to driver licensing for both private and commercial vehicles. These consultations may be for new licenses, renewals, professional views in cases of road traffic accidents, insurance claims, and compensation.<sup>2</sup> Every country has its own visual standards

for a driving license. In Malaysia, there are guidelines on visual requirements for driver licensing issued by the Malaysian Society of Ophthalmology (MSO), as seen in **Table 1**.<sup>2</sup> These guidelines are consistent with the visual standards for driving in Europe.<sup>3</sup> However, the criteria are not officially endorsed by the Malaysian Road Transport Department (RTD).<sup>2</sup> Instead, the Malaysian RTD's inherent visual standard for a driving license is a minimum visual acuity of Snellen 6/60 in each eye, best-corrected visual acuity of Snellen 6/12 in the better eye, and a pass in the Ishihara colour vision test.<sup>1</sup> Hence, VF assessment has never been emphasized for drivers in Malaysia.

We undertook a clinical audit in Hospital Pulau Pinang, Penang, Malaysia, modelled after a similar audit by Puvanachandra et al.<sup>4</sup>, to establish whether eye doctors meet the benchmark set by the MSO in informing

or reminding glaucoma patients about the dangers of driving. In particular, we assessed the documentation of their driving status, whether advice was given to those with bilateral VF defects about the dangers of driving with their condition, and whether there was documentation of the advice given.

### Methodology

This audit was registered under the National Medical Research Register (NMRR), reference number 36435. We identified 85 consecutive

actively-driving glaucoma patients who visited the eye clinic for their routine follow-up. The diagnosis of glaucoma included having at least 2 out of 3 clinical features of the disease: glaucomatous optic disc appearance, elevated intraocular pressure, and repeatable VF abnormality consistent with optic nerve damage. Exclusions included patients with ocular hypertension, glaucoma suspects, and those with VF defects secondary to causes other than glaucoma.

**Table 1:** Visual requirements for driver licensing in Malaysia (source: Malaysian Society of Ophthalmology).

	Private vehicle/ Personal license	Public vehicle/ Commercial license
Vision	Better than 6/12 in <u>at least one eye</u>	Better than 6/12 in <u>both eyes</u>
Visual field	Binocular VF of at least 120 degrees along the horizontal meridian and 20 degrees above and below the horizontal midline	Binocular VF of at least 120 degrees along the horizontal meridian and 20 degrees above and below the horizontal midline
Colour vision	No restriction on the license	<u>Not qualified</u> if severe protanopia (severe red defect) is present
Diplopia	Not qualified if diplopia is present within the central 40 degrees of primary gaze	Not qualified if diplopia is present within the central 40 degrees of primary gaze
Night blindness	No restriction on the license	<u>Not qualified</u>

Data was collected via an interview and subsequent review of patients' medical notes. This included age, type of glaucoma, whether the patient had unilateral or bilateral disease, visual acuity, VF index (from Humphrey visual field [HVF] testing) of each eye, and driving status (including motorcycle riders). Additional data were whether driving status had been recorded in the notes, whether the patient had been told about the dangers of driving with their condition, and whether this advice had in turn been recorded in the notes. The audit standard was to achieve 100% documentation of patients' driving status and issuance of appropriate advice.

The most common glaucoma staging system used in published research is that of Hodapp, Parish, and Anderson.<sup>5</sup> Patients with mean deviation (MD) values of  $-6$  dB or better are classified as having mild glaucoma, an MD between  $-6$  and  $-12$  dB as moderate glaucoma, and an MD of  $-12$  dB or worse as severe glaucoma.<sup>5,6</sup> In this audit, visual field index (VFI) measurements derived from the HVF test were used as the primary indicator of the severity of glaucoma damage. VFI is expressed as a percentage of age-corrected

visual function, from a normal of 100% to blindness at 0%. VFI is found to have a strong linear correlation with MD across the spectrum of glaucomatous vision loss, except in mild glaucoma.<sup>7,8</sup> A 3.2% reduction in the VFI is correlated with one dB loss in the MD index.<sup>8</sup> In our audit, patients with VFI in the better eye of  $\leq 80\%$  (approximate mean deviation of  $-6$  dB or worse) were advised to stop driving. Those with a VFI of 81–90% in the better eye were cautioned to be more careful when driving while those with a VFI of  $\geq 91\%$  in the better eye could continue driving. This was an arbitrary guideline used by our glaucoma specialist.

Consequently, the following measures were implemented. First, continuing medical education (CME) sessions were organized to educate eye doctors on the availability of guidelines on the visual requirements for driving,<sup>2</sup> the dangers of driving for glaucoma patients with bilateral VF defects, and the need to counsel patients regarding their eye condition and driving safety. Second, we created reminder labels to alert doctors during the consultation that the patient has glaucoma and the need to counsel those who are drivers.

These adhesive labels were stuck to the front of the medical notes of every glaucoma patient who underwent HVF testing. Additionally, optometrists and nurses helped to fill in the patients' driving status. Finally, the doctors were also tasked to give counselling to all drivers with bilateral VF defects on their eye condition and the dangers of driving in their situation. Two months after the remedial measures were implemented, another set of 95 consecutive glaucoma patients were audited in the same manner described above.

### Results

There were similar age distribution and breakdown of glaucoma subtypes for patients in both audits (Table 2). The most common subtype of glaucoma was primary open-angle

glaucoma, and the majority of patients had vision of 6/12 or better in both eyes.

In the initial audit, none of the patients had their driving status recorded in the medical notes (Table 3). Only 36% of drivers with bilateral VF defects recalled being advised by their doctors regarding the dangers of driving, with no documentation of any advice being given to them. After the implementation of the doctor education and reminder label interventions, the follow-up audit showed an improvement in documentation of driving status to 86%. All drivers with bilateral VF defects recalled being advised regarding the dangers of driving, with documentation of advice being given recorded in 73% of the medical notes.

**Table 2:** Demographic data in initial and follow-up-audits.

	Number of patients in initial audit (n = 85)	Number of patients in follow-up audit (n = 95)	p-value
Age	67.1 +/- 9.1	69.2 +/- 9.8	0.149 <sup>§</sup>
<b>Gender</b>			
Male	47	38	0.725
Female	55	40	
<b>Age distribution</b>			
Less than 40 years	2	1	0.280 <sup>#</sup>
40 - 59 years	12	9	
60 - 79 years	67	74	
80 years and above	4	11	
<b>Type of glaucoma</b>			
Primary open angle glaucoma	40 (47.1)	55 (57.9)	0.059 <sup>#</sup>
Normal tension glaucoma	28 (32.9)	19 (20.0)	
Primary angle closure glaucoma	10 (11.8)	18 (18.9)	
Secondary and congenital glaucoma	7 (8.2)	3 (3.2)	
<b>Visual acuity</b>			
6/12 or better in both eyes	56 (65.9)	57 (60.0)	0.621 <sup>#</sup>
6/12 or better in at least one eye	18 (21.2)	26 (27.4)	
Worse than 6/12 in both eyes	11 (12.9)	12 (12.6)	

§ - T-test, # - chi-square test

**Table 3:** Results of initial and follow-up audits.

Objective	Target rate	Rate achieved in the initial audit	Rate achieved in the follow-up audit	p-value
Documentation of driving status	100%	0% (0/85)	86% (82/95)	<0.01 <sup>#</sup>
Advising driving drivers with bilateral field defects of the danger of driving	100%	36% (13/36)	100% (40/40)	<0.01 <sup>#</sup>
Documenting in this group that advice was given	100%	0% (0/36)	73% (29/40)	<0.01 <sup>#</sup>

# - chi-square test

## Discussion

It is important to identify glaucoma patients who are at higher risk of getting into road traffic accidents due to their reduced VFs and counsel them appropriately. Proper documentation is also imperative to reduce legal implications on eye doctors in the event patients assert that they have not been properly warned of their conditions. Our initial audit showed that eye doctors were poor at identifying, documenting, and giving appropriate advice to glaucoma patients with VF defects regarding the implications of their eye condition and fitness to drive. With simple measures such as education programs via CME sessions and putting reminder labels on the front page of patients' medical notes, we managed to heighten awareness in giving appropriate advice to patients about their eye condition and ability to drive safely.

Due to the insidious nature of VF loss in glaucoma, patients are often unaware that their eye condition may affect their ability to drive safely. In the audit by Puvanachandra et al., HVF results were examined and any abnormality beyond an odd missed spot was labelled as a defect.<sup>4</sup> We found this to be slightly ambiguous and hence decided to use a more objectively measured glaucoma severity indicator, like the VFI, in our audit. The patients included in our audit had bilateral VF defects, but, despite this, had good visual acuity of 6/12 or better in both eyes. A good central visual acuity, even in the presence of extensive peripheral VF loss, may give glaucoma patients a false sense of security. A mass screening program involving automated VF examination on 10,000 volunteers showed that approximately 50% of those with previously undetected VF defects were unaware of any issues with their peripheral vision.<sup>9</sup> It also stated that accident and conviction rates were twice as high in drivers with binocular VF loss when compared to those with normal VFs.

This audit put forth certain shortcomings in the way driving licenses are issued in Malaysia. Firstly, VF assessment is not emphasized, as there are no VF criteria for drivers. A VF requirement for drivers is suggested by the MSO. However, it has to be mentioned that this requirement is based on the binocular Esterman VF test using a target equivalent to the white Goldmann III4e settings, instead of the monocular HVF test. This binocular test does have its shortcomings and has been reported to be not as efficient as the

monocular HVF test in detecting VF defects, which reduces its usefulness in evaluating visual capabilities in traffic.<sup>10</sup> The author suggested that glaucoma patients who obtained "borderline pass" results with the Esterman VF test should undergo monocular testing for more precise mapping of any defects.

Another vision-related issue with driver licensing in Malaysia is that assessment is only performed once before the issuance of a driver's license. The license can then be renewed every few years without reassessment of vision. Hence, if a driver develops certain eye diseases later in life, e.g., glaucoma, he or she may still have a valid driving license. In most European countries, drivers need to undergo repeated vision assessments after the age of 70 years.<sup>3</sup> Likewise, there should be an age limit to the validity of a driving license in Malaysia but with conditional renewals.

We recommend that a VF assessment is made mandatory for certain conditions like glaucoma, as part of the visual requirements before issuance of a Malaysian driving license. There should also be a vision reassessment for all drivers once they reach the age of 70 years, instead of auto-renewal of licenses. At the primary health care level, glaucoma patients should be reminded of how their eye disease can affect their vision and driving, the importance of being compliant with their anti-glaucoma medications, and of attending their scheduled clinic appointments. Additionally, patients with other medical conditions that can affect their VFs, such as post-stroke or other neurological disorders should also be sent for proper VF examination and review by ophthalmologists.

We acknowledge some limitations of this audit. The first one was recall bias as we relied on patients' recollection on whether advice had been given to them previously regarding the issue of driving. Further audits can be done to assess the compliance of patients to the advice given by their eye care providers. Besides this, the presence of reminder adhesive labels on patients' medical notes may lead to an artificially high initial success rate. Finally, this audit also did not take into account whether the patient had a private or commercial driving license.

## Conclusion

Our audit showed that there was suboptimal dispensing of advice to glaucoma patients with

VF defects regarding the implications of their eye condition and their ability to drive safely. This may be due to a lack of awareness of the roles of eye care practitioners in matters related to driving. This can be improved with simple measures such as educating eye doctors about the available guidelines on visual requirements for driving and using reminder labels to identify glaucoma patients who are drivers. It is

hoped that with these measures, the number of road traffic accidents due to glaucoma patients with bilateral VF defects can be reduced.

### Funding Support

All authors have none to declare

### Conflicts of Interest

All authors have none to declare

### How does this paper make a difference to general practice?

- Due to the insidious nature of visual field loss in glaucoma, patients are often unaware of disease progression. This will affect their ability to drive safely.
- There are guidelines on visual requirements for driver licensing in Malaysia, issued by the Malaysian Society of Ophthalmology (MSO), which includes visual field standards.
- Eye care providers should play their roles in identifying potential “high risk” drivers and counsel them appropriately.
- Proper documentation of driving status in glaucoma patients and whether counselling has been done is important and relevant to patient care and should be part of normal practice.

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