CLINICAL AND EXPERIMENTAL
OPTOMETRY

RESEARCH PAPER

Medical review licensing outcomes in drivers with visual field loss in Victoria, Australia

Clin Exp Optom 2016; 99: 462–468 DOI:10.1111/cxo.12442

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Submitted: 2 December 2015
Revised: 4 February 2016
Accepted for publication: 21 March 2016

Background: Good vision is essential for safe driving and studies have associated visual impairment with an increased crash risk. Currently, there is little information about the medical review of drivers with visual field loss. This study examines the prevalence of visual field loss among drivers referred for medical review in one Australian jurisdiction and investigates factors associated with licence outcome in this group.

Methods: A random sample of 10,000 (31.25 per cent) medical review cases was extracted for analysis from the Victorian licensing authority. Files were screened for the presence of six visual field-related medical conditions. Data were captured on a range of variables, including referral source, age, gender, health status, crash history and licence outcome. Prevalence analyses were univariate and descriptive. Logistic regression was used to assess factors associated with licence outcomes in the visual field loss group.

Results: Approximately 1.9 per cent of the 10,000 medical review cases screened had a visual field loss condition identified (n = 194). Among the visual field loss group, 57.2 per cent were permitted to continue driving (conditional/unconditional licence). Primary referral sources were the police, self-referrals and general medical practitioners. Key factors associated with licence test outcomes were visual field condition, age group, crash involvement and referral to the Driver Licensing Authority's Medical Advisors. Those who were younger had a crash involvement triggering referral and those who were referred to the Medical Advisors were more likely to have a positive licensing outcome.

Conclusion: The evidence base for making licensing decisions is complicated by the variable causes, patterns, progressions and measuring technologies for visual field loss. This study highlighted that the involvement of an expert medical advisory service in Victoria resulted in an increased likelihood that drivers with visual field loss will be allowed to continue driving. Further research is warranted to explore issues relating to severity of field loss and the capacity for compensation.

Key words: driver's vision, medical review, visual fields

Good vision is essential for safe driving[1,2] and studies have associated visual impairment with an increased crash risk.[3] A range of medical conditions can lead to visual impairment, through deficits in the eye or visual pathways. To assess the level of visual function required to operate a motor vehicle safely, different measures have been used, including tests of visual acuity, contrast sensitivity, colour and visual fields.[4] Tests of more complex visual function, such as the 'useful field of view' may also be administered in the driving assessment context.[5] Static visual acuity is the most commonly measured aspect of vision during licensing assessments, usually measured using the Snellen letter chart, notwithstanding its inadequacy for predicting driving ability.[6]

Adequate visual fields are also important for driving performance.[7] Drivers tend to foveate through head and eye movements but the initial detection of stimuli in the environment is through peripheral vision. Thus, while most visual information necessary for driving is received through the central region, peripheral vision is likely to be important for the initial detection of parked cars, road furniture, traffic signals and approaching hazards, such as oncoming or turning traffic and pedestrians.

Prevalence of visual impairment in Australia

In Australia, the prevalence of visual impairment (including low vision or blindness) in middle-aged people (40 to 49 years) has been estimated as less than one per cent, but this increases to 28.8 per cent in adults aged over 80 years.[8,9] The prevalence of visual field loss also increases with age.[10,11] Glaucoma, age-related macular degeneration (AMD), diabetic retinopathy, hemianopia or quadrantanopia and retinitis pigmentosa (RP) are conditions accounting for the majority of non-correctable visual field loss in Australia.[12,13]

While the prevalence of visual field loss is relatively well understood, the impact on driving performance is less clear. It is likely to vary depending on the type of loss (peripheral versus central), level of macular sparing, ageing and the presence of associated cognitive deficits, which may be associated with stroke or other co-morbidities.[14] Some conditions are progressive and thus, the extent of field loss will vary depending on the stage of the condition.

Recent studies have also suggested that some drivers with visual field loss adopt compensatory head movements enabling them to maintain safe driving performance. Such compensatory movements have been reported in drivers with hemianopic visual field loss and specifically, eye and head movements were found to be directed into the blind field, enabling them to maintain safe on-road driving,[15] detect pedestrians in their blind field[16] and detect potential collisions in a virtual intersection task.[17] A recent on-road study[18] also found that despite their hemianopic field loss, some drivers were rated as safe to drive (six out of 10) and made more extensive head and shoulder movements and more eye scans into their blind field. A small-scale study of drivers with binocular glaucomatous field loss, also found that a subgroup exhibited safe driving behaviour through increased visual scanning, leading the authors to conclude that binocular field loss does not necessarily impact on driving safety.[19]

Guidelines on driving with visual impairment

In the state of Victoria, Australia, it is mandatory for people with chronic medical conditions that may affect driving to self-refer to the VicRoads medical review department. Referrals also come from the police, medical practitioners or members of the public. Referred drivers are then requested by the Driver Licence Authority (DLA) to consult their medical practitioner and provide documentation of their medical condition, including an opinion on compliance with the national guidelines for fitness to drive. Further follow-up with medical specialists, occupational therapists or an on-road driving test may be required.

The Austroads *Assessing Fitness to Drive* guidelines[20] is the national standard in Australia for assessing the fitness of drivers with medical conditions to hold private and commercial licences. The guidelines recommend that after an initial screening by a medical practitioner, drivers suspected of having a visual field defect should be referred for specialist assessment by an optometrist or ophthalmologist. Drivers in Australia with binocular visual fields of less than 110 degrees, within 10 degrees above and below the horizontal midline, a significant scotoma within the central 20 degrees or those who have hemianopia or quadrantanopia are precluded from holding an unconditional private motor vehicle licence; however, they may be granted a conditional licence subject to periodic review at the discretion of the specialist and DLA. These requirements are similar across other countries, although some variation exists in the criteria for the range of visual fields.

The Austroads guidelines recommend that drivers suspected of having visual field loss should initially be assessed using an automated static perimeter; however, while static perimetry plots the useable field in terms of absolute response to light, these tests are not a realistic simulation of the driving task, where the driver is required to respond to moving objects of various sizes and intensities in different light conditions.[21] Similarly, perimetric tests, such as the Esterman have been criticised as they lack validity with respect to correlation with crash risk.[22] Currently there is no accepted gold standard for assessing visual field loss for driving and there may be a high degree of variability in the specific tests and techniques used in assessment. Overall, there is wide variation in the way the measures and outcomes are presented, making comparison and interpretation across cases difficult.

While there are limitations in the validity of tests and criteria currently used for assessing vision for safe driving,[23] there is a need to accurately assess and identify drivers who have visual impairment that places them at a significant risk for crashes. Currently, there is little information about the medical review of drivers with visual field loss, including the scope of the problem, the processes used to determine fitness to drive and the factors associated with licence outcomes.

This study examines the scope of the problem of visual field loss among drivers in the state of Victoria in Australia by identifying the prevalence of visual field loss among drivers referred for medical review and the processes used to determine their fitness to drive. The study also examines the characteristics of drivers with visual field loss and investigates the factors associated with licence outcomes in this group.

METHODS

There are approximately 4.2 million licenced drivers in Victoria, of whom approximately 32,000 have case files with the Victorian DLA medical review department. The medical review case files contain DLA correspondence, driving assessment records, medical evaluations of drivers, including associated test results and other licence review request documentation submitted by drivers, police officers, medical practitioners or members of the public. The DLA medical review office is staffed largely by non-medically trained officers with a small number of medical case managers having health-related qualifications. A Medical Review Panel acts as Medical Advisor to the Victorian DLA. Every year about 3,300 case files that require detailed medical assessment are referred to the Medical Review Panel and are allocated to experienced forensic physicians for review. These reviews may include discussions with the treating doctors or requests for further information. Written advice is then provided to the DLA. For especially complex and difficult cases the Medical Review Panel convenes an expert committee comprising senior specialists in neurology and ophthalmology, who meet regularly and provide detailed specialist advice for about 60 cases per year.

The protocol for the current study was approved by Monash University Human Research Ethics Committee. A random sample of 10,000 (31.25 per cent) medical review cases from 1 January 2002 to May 2007 were extracted from the Victorian DLA medical review database for analysis using numbers/letters generated by an online randomiser tool. Files were screened by the DLA for the presence of six conditions that can result in visual field loss: glaucoma, AMD, diabetic retinopathy, hemianopia, quadrantanopia and RP. As the prevalence of these conditions is relatively low in the general Australian population, a large sample was selected to ensure an adequate number of cases was identified. Licence number, age at initial referral and gender were captured for all cases. Where visual field loss was identified, paper files were de-identified and provided to the research team for coding using a predefined framework. Additional information captured from the files included: the date of first referral to the DLA, category of the health professional conducting the assessment, method of field loss measurement, driver's licence number, age, gender and health status (co-morbidities, medications et cetera),

crash history, on-road test outcome where available, and licence outcome. Licence outcomes were categorised into:

1. pass (conditional or unconditional)
2. fail/discontinued
3. voluntary surrender
4. further review (for example, referred to a specialist and no decision had been made) or
5. not recorded.

All data were entered into an MS Access database by the DLA. Case details were checked for accuracy by the research team and a sample of 200 files was reviewed to ensure that case details were accurately classified. Prevalence analyses were univariate and descriptive. Logistic regression was used to assess factors associated with licence outcomes in the group with visual field loss. The dependent variable was driver licence outcome (pass/continuing or fail/discontinued), as recorded in the case file. The 'pass/continuing' category included both conditional (that is, specific restrictions placed on the driver, for example no night time driving) and unconditional licences (that is, unrestricted). Reference groups for the regression model were arbitrarily defined as the category coded as 1.

RESULTS

A total of 194 records (1.94 per cent) was identified with drivers with a visual field loss from the 10,000 medical review records selected for review. Individuals with visual field loss were predominantly male (75.8 per cent) and aged over 60 years (mean: 67.4 ± 17.3 years). The most frequently recorded condition was glaucoma, comprising almost half of the cases of visual field loss (49.5 per cent). A summary of the characteristics of the groups with visual field loss is provided in Table 1.

Broadly, among the cases of visual field loss, 57.2 per cent of the group were allowed to continue driving (conditional/unconditional licence) and 21.9 per cent were not permitted to continue driving. The remainder were either referred to a specialist for further review, voluntarily surrendered their licence or no licence outcome was recorded in the file. Where the licence outcome was positive, the majority of decisions was for an unconditional licence (83.8 per cent). The highest percentage of restricted licences observed was for retinitis pigmentosa (n = 2, 66 per cent of pass outcomes) and AMD (n = 3, 50 per cent of pass outcomes).

A large proportion of the sample had comorbid medical conditions (64.4 per cent). Records for on-road assessments were available for 25.8 per cent of the sample and 14.4 per cent had been involved in a crash, which was the trigger for referral. Primary referral sources were the police, self-referrals and general medical practitioners. No referral source was recorded in almost half of the cases.

Of the 194 cases, 95 (48.9 per cent) were reviewed by an ophthalmologist and 47 (24.2 per cent) were reviewed by an optometrist. The remaining case files did not contain the relevant information. The methods for assessing field loss included the Humphrey Field Analyzer (n = 43), Goldmann (n = 6) or Medmont (n = 4) perimeters. Automated perimetry using the Esterman protocol was reported in an additional 18 files. The majority of case files did not include the measurement method (61.8 per cent) or visual field plots (62.4 per cent).

The dependent variable for the logistic regression model was driver licence outcome (pass/continuing or fail/discontinued). Excluded from analyses were: voluntary surrenders (n = 7), those undergoing further review and/or where the licence outcome was not recorded. Only three cases with RP had a licence outcome recorded, all of whom passed. The small sample and lack of variability in the outcome meant this group was unsuitable for inclusion in the model.

Four variables were independently associated with licence outcome: visual field condition, age group, crash involvement and referral to the Medical Advisors. Gender was not independently associated with licence outcome but was included in the model. The logistic regression results are summarised in Table 2. The Hosmer–Lemeshow test ($p = 0.621$) indicated that the overall model fit was good and the positive predictive value was 76.3 per cent.

Findings from the regression model revealed that (in comparison to diabetic retinopathy), those with hemianopia were significantly less likely to pass (odds ratio of 0.94). The odds of passing were also higher for the younger groups compared with those aged 70 years and over. Interestingly, the odds of passing were higher with a recorded crash involvement (odds ratio of 4.09) and higher with a referral to the Medical Advisors (odds ratio of 4.26).

DISCUSSION

This study sought to describe the prevalence and characteristics of drivers with visual field loss referred for medical review in the state of Victoria, Australia, and to identify the factors associated with licence outcome in this group. In summary, based on a random sample of 10,000 drivers with medical review case files held by the DLA, approximately 1.9 per cent had a visual field loss identified. Key factors associated with licence test outcome were visual field condition, age group, crash involvement and referral to the DLA's Medical Advisors.

Compared with drivers with diabetic retinopathy, those with hemianopia were less likely to have a pass outcome. The differential effects of visual field condition may in part, reflect the potential severity of the visual field loss. For example, hemianopia is generally associated with more extensive field loss than quadrantanopia. Moreover, as implied by the neural aetiology of hemianopia (and quadrantanopia), there is a greater likelihood of compounding brain damage and associated cognitive impairment. Thus, a lower likelihood of a pass outcome with hemianopia might be expected. However, for the other field loss groups studied here, there can be a broad range of severity levels which may influence the outcomes.

The present study found that almost two-thirds of the glaucoma group retained their licences following medical review. Crash risk has been widely reported to be increased in drivers with glaucoma, with recent studies identifying that glaucoma is an important risk factor for both self-reported[24] and state-recorded crashes.[25–27] Simulator studies have also identified driving difficulties in those with glaucoma, including problems with steering and detection[28] and higher numbers of simulator crashes in advanced glaucoma that were related to reductions in integrated visual field sensitivity.[29] A recent study found that a subgroup exhibited safe driving behaviour through increased visual scanning, suggesting that binocular field loss does not necessarily impact driving safety.[19] On-road assessments of drivers with glaucoma reveal problems with lane-keeping, curves and anticipation,[7] while in another study, drivers with glaucoma were six times more likely than controls to have a driving instructor intervention during the driving assessment.[25] The finding in the present study that a large proportion of the glaucoma group was assessed as fit to drive may reflect that the group comprised all levels of severity of visual field loss. A limitation of the study was that the visual field charts were available for fewer than half of the cases and therefore, it was not possible

	Hemianopia		Quadrantanopia		Glaucoma		Retinitis pigmentosa		AMD		Diabetic retinopathy		Total	
Number of cases (% of 194)	24 (12.4%)		28 (14.4%)		96 (49.5%)		3 (1.5%)		19 (9.8%)		28 (14.4%)		194	
Mean age and SD	62.1 ± 17.4		56.2 ± 17.9		72.0 ± 14.6		30.7 ± 15.0		82.2 ± 8.5		58.9 ± 14.4			
Percentage male	83.3%		79.2%		74.0%		66.7%		68.4%		78.6%			
	N	% VFL group	N	% VFL group	N	% VFL group	N	% VFL group	N	% VFL group	N	% VFL group	N	% VFL total
Licence outcome														
Pass	7	29.2%	18	75.0%	60	62.5%	3	100%	6	31.5%	17	60.8%	111	57.2%
Fail	14	58.3%	2	8.3%	14	14.6%	0	-	7	36.8%	5	17.9%	42	21.9%
Voluntary surrender	0	-	1	4.2%	3	3.1%	0	-	2	10.5%	1	3.6%	7	3.6%
Further review	3	12.5%	2	8.3%	15	15.6%	0	-	3	15.8%	5	17.9%	28	14.4%
Not recorded	0	-	1	4.2%	4	4.2%	0	-	1	5.4%	0	-	6	3.1%
Total	24	100%	24	100%	96	100%	3	100%	19	100%	28	100%	194	100%
Co-morbit conditions														
Yes	15	62.5%	17	70.8%	60	62.5%	0	-	11	57.9%	22	78.6%	125	64.4%
No	9	37.5%	5	20.8%	30	31.3%	3	100%	8	42.1%	4	14.3%	59	30.4%
Not recorded	0	-	2	8.4%	6	6.2%	0	-	0	-	2	7.1%	10	5.2%
Referral source														
GP	3	12.5%	3	12.5%	10	10.4%	0	-	1	5.3%	3	10.7%	20	10.3%
Optometrist	2	8.3%	2	8.3%	5	5.2%	0	-	0	-	1	3.6%	10	5.2%
Ophthalmologist	2	8.3%	1	4.2%	3	3.1%	0	-	0	-	2	7.1%	8	4.1%
Police	3	12.5%	0	-	21	21.9%	0	-	7	36.8%	6	21.4%	37	19.1%
Self	1	4.2%	2	8.3%	11	11.5%	1	33.3%	2	10.5%	4	14.3%	21	10.8%
Community member	0	-	0	-	11	11.5%	0	-	2	10.5%	1	3.6%	14	7.2%
Other	13	54.2%	16	66.7%	35	36.5%	2	66.7%	7	36.8%	11	39.3%	84	43.3%
Crash involvement (Y)	1	4.2%	2	8.3%	19	19.8%	0	-	2	10.5%	4	14.3%	28	14.4%
On-road assessment (Y)	5	20.8%	9	39.1%	24	25.0%	0	-	4	21.1%	8	28.6%	50	25.8%
DLA medical review (Y)	14	58.3%	15	62.5%	34	35.4%	2	66.7%	2	2.5%	14	50%	81	41.8%

AMD: age-related macular degeneration, DLA: Driver Licence Authority, GP, general practitioner

Table 1. Licence outcomes, co-morbidities and referral sources for visual field loss groups

Predictors of a pass†	Odds ratio	95% CI		Significance
		Lower	Upper	
Visual field condition				
Diabetic retinopathy‡	1			
Hemianopia	0.94*	0.20	0.45	0.003
Quadrantanopia	1.36	0.25	7.31	0.721
Glaucoma	3.53	0.95	13.14	0.060
Age-related macular degeneration	0.88	0.02	4.37	0.871
Age group				
70 plus years‡	1			
0–49 years	8.29*	1.81	38.04	0.007
50–69 years	3.17*	1.03	9.77	0.044
Crash involvement				
No‡	1			
Yes	4.09*	1.34	12.46	0.013
Referral to Medical Review Panel				
No‡	1			
Yes	4.26*	1.58	11.32	0.004

†Dependent variable: pass (continuing licence)
‡Reference category
*Significant at $p < 0.05$

Table 2. Factors associated with a pass licence outcome

to measure level of disease advancement or to include severity in the regression modelling. Those with the most severe field loss from glaucoma may have already stopped driving and those under review may have their disease controlled by treatment.

Owsley and McGwin[3] note that diagnoses are not well correlated with driving performance, as eye diseases can functionally manifest in many different ways, from very minor visual impairment to severe impairment. Other factors likely to play an important role in determining licence outcome include severity of impairment, age, response to treatment, capacity to adapt to impairment and co-morbidity. Further, the role of compensation for field loss (rather than the condition itself) needs to be considered. As discussed earlier, there is mounting evidence that some drivers with visual field loss are able to adopt compensatory head (or eye) movements, allowing them to maintain safe driving performance. Thus, a diagnosis alone is unlikely to provide much information about driving capacity.

In the current study, the mean age of the sample was over 65 years (mean: 67.4 ± 17.3 years). It was observed that the older age groups were less likely to have a positive licence outcome than the younger age groups. Compared with those aged over 70 years, those aged 50 to 69 had 3.2 times the odds of passing and those aged up to 49 years had 8.3 times the odds of passing. Previous research has found that older age is associated with higher crash risk in those with conditions affecting vision. For example, a recent study by McGwin and colleagues[30] found that drivers with glaucoma over the age of 54 years, who had severely impaired binocular visual fields, had a higher risk for at-fault motor vehicle crash involvement, compared to those with less severe or no impairment. Similarly, Huisingh and colleagues[31] assessed 2,000 licenced drivers aged 70 and older in central Alabama and found that drivers with visual field impairment have an increased rate of at-fault motor vehicle crashes compared to those with less impairment or normal visual fields. Johnson and Keltner[32] also reported that those with visual field loss had crash rates twice as high as an unimpaired control group of 10,000 drivers. Thus, it is possible that the results observed in the present study may reflect that the effects of visual field loss are compounded by advancing age and/or age-related functional impairment.

Gender effects in the present study showed a higher proportion of men in the cohort with visual field loss (75.8 per cent). This pattern generally reflects the gender distribution of the predominantly older driver population from which the visual field loss sample is drawn; many women in the older cohorts have never driven or may be more likely to rely on their male partners to do the majority of driving.[33] Additionally, older women are more likely to reduce or retire from driving due to loss of confidence in their functional abilities for safe driving.[34,35] Despite a higher proportion of men in the visual field loss group, gender was not associated with licence outcome. Thus, it would appear that fewer women were engaging in the licence review process, despite no differences in licence outcomes. This may reflect higher self-regulatory behaviour (or voluntary driving cessation) among women.[36–38]

The over-representation of men in our field loss sample is surprising given the

findings of previous research, which shows visual impairment is more prevalent among women. For example, one study found that 79 per cent of persons with severe visual impairment were female.[39] Further, after adjusting for age, women were less likely to achieve 6/6 visual acuity than men (odds ratio, 0.57; confidence interval, 0.48 to 0.66). Similarly, the Los Angeles Latino Eye Study found that participants with bilateral moderate or severe visual field loss were more likely to be female, have more co-morbidities and were significantly older than participants without visual field loss.[40] In the present study, the preponderance of men in the sample of medical review cases may suggest that older women have opted out of the licence review by voluntarily surrendering their licence. This lack of participation by women in the licence review process may render them more vulnerable to the negative consequences associated with losing their mobility. This issue warrants further investigation.

In the present study, 28 drivers were referred to the DLA's medical review due to a crash (14.4 per cent of the overall visual field loss sample). This crash rate is more than double the Victorian state-reported crash rate (6.7 per cent) or self-reported crash rate (5.8 per cent) identified in other studies involving older drivers with visual impairment.[41,42] The higher crash rate in this population may be the result of selection bias. As the cohort in this review was referred into the VicRoads system specifically for the purposes of a driving review (and in some cases because of a crash), they are likely to be a higher-risk group than a sample of visually impaired drivers drawn at random from the general population. The populations in the previous studies also included people with a broader range of visual impairments (for example, refractive errors), which may partially account for some of the differences in crash rates. It was also found that drivers with glaucoma had the highest rate of crash involvement (19.8 per cent) of any of the field loss groups. Often people with glaucoma are not aware of their decreased visual capabilities,[43] which may explain the increased crash involvement in this group.

Interestingly, while the crash prevalence was high in the current study, it did not appear to affect driver licence outcome. Our findings showed that those who had a crash (which triggered referral to medical review) had four times the odds of a positive licence outcome. This is relatively consistent with a previous study in Victoria. The authors reported that most drivers reported to VicRoads are referred by police and these referrals are predominantly triggered by an event such as poor driving and/or a crash.[44] In their sample of 141 drivers, police referral events were commonly associated with inappropriate/dangerous driving (62 per cent) or failing to obey road laws (47 per cent); however, the review process resulted in licence cancellation/suspension for only 46 per cent of police-referred drivers. Withdrawal of a licence was associated with increasing age, certain medical conditions, poor driving and inappropriate driver behaviour.[44]

Thus, the findings in the present study indicate that crash involvement does not necessarily lead to a negative licence outcome. It may be that other referral methods, such as doctor referral or notification by a community member are more predictive of overall driving ability rather than an isolated incident such as a crash. It is important to note that the files did not contain any information about whether the crashes were at-fault or driving exposure measures, which are important components in understanding overall driving risk.[3]

Few studies have documented the circumstances prompting referral of drivers for medical review. In Virginia, USA, one study considered the role of law enforcement in referring drivers and key findings from the evaluation of 100 drivers referred by law enforcement included:

1. more than two-thirds of the drivers came to the attention of the referring officer because they were involved in a crash
2. the most prevalent indications of a medical condition or functional impairment provided by law enforcement for these referrals included loss of consciousness, blackout or seizures (28 per cent); disorientation, confusion and mental disability (16 per cent); and physical impairments (eight per cent).

A large proportion of the drivers (88 per cent) received some type of licensing action (for example, restriction, suspension or periodic review). Only 12 per cent of the referred drivers did not require any licensing action.[45] These findings are in contrast with those in the present study. We found that crash involvement was not a good predictor of licence outcome; however, this likely reflects the type of medical conditions seen in the two studies. It may be that crash involvement is a good referral pathway for those with medical conditions, whereas it is less useful for those with conditions affecting vision.

We found that the most frequent referral sources were the police (22.2 per cent) and medical practitioners including general practitioners, optometrist/ophthalmologists or other health professionals (21.1 per cent). Around a third of cases had no referral source recorded. As Victoria does not have a mandatory licensing re-assessment procedure for older drivers, there is likely to be greater reliance on external community sources to report drivers who are suspected of being unsafe. The importance of family and community members in identifying unsafe older drivers and helping them plan for driving cessation has been previously noted. Due to the reliance on review referrals from non-medical sources, issues around driving cessation deserve further attention in the community. Our findings generally support previous work, which has identified the need to educate police and the community about indicators of declining driving competency.[44,45]

In our study population, a referral to the Medical Advisors was more likely to result in a pass outcome (odds ratio of 4.3). The specific reasons for this difference could not be interpreted from the available information but probably relate to the higher level of medical advice and intervention in the Medical Advisor cases, which were then available to inform a decision. This would include effective liaison with the treating practitioner and requests for additional testing. These sources of information may be helpful in ascertaining the drivers' potential use of compensatory strategies such as head and eye movement. Further, cases where there is an obvious visual field defect that would disqualify a person from driving would not be referred to the Medical Advisors at all, which means that the cases referred to them would be more likely to be those where a positive outcome was possible.

Limitations

The findings are limited by the accuracy and details of recorded data in the VicRoads medical review records. The crash rate reported for this cohort is based solely on drivers referred to VicRoads because of crash involvement rather than citation and crash records. Thus, it is likely to be an underestimate of overall crash involvement in this cohort of drivers. Current privacy legislation prevented the linkage of these records to official police crash or citation records and other medical records.

In some cases, documentation was incomplete and this may have led to an underestimation of the number of drivers with visual field loss or the adequacy of the assessment procedures. Additionally, results of the visual field assessments were not included in the majority of case records (55 per cent) making it difficult to evaluate the drivers' levels of visual field loss or the appropriateness of the assessment procedures and licensing decisions.

While we were interested in relative differences between visual field loss in the present study, our findings are limited by the lack of a control group. This is an important avenue for future studies.

CONCLUSION

Visual field loss may be an increasing problem in assessing fitness to drive as the driving population ages. The evidence base for making licensing decisions is complicated by the variable causes, patterns, progressions and measuring technologies for visual field loss. The study highlighted that the involvement of an expert medical advisory service in Victoria resulted in an increased likelihood that drivers with visual field loss will be allowed to continue driving. Further research is warranted to explore issues relating to severity of visual field loss and the capacity for compensation.

ACKNOWLEDGEMENTS

The authors wish to acknowledge the support of the industry partners involved in this research: Holden Innovation, VicRoads, The New Zealand Road Safety Trust, The Swedish National Road Authority and Zeiss.

This research was supported by the Australian Research Council Linkage grant LP0560272 Vision Impairment and Fitness to Drive.

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