

What is the profile of older drivers considered medically unfit to drive? A cross-sectional survey in Western Switzerland

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Summary

OBJECTIVE: We aimed to assess how often and for what reasons general practitioners (GPs) consider older drivers medically unfit to drive.

METHODS: All GPs certified to carry out fitness-to-drive assessments in Geneva (medical assessors, $n = 69$), as well as a random sample of 500 GPs practising in Vaud, Neuchatel and Jura, were asked to complete a questionnaire about the mean number of assessments per week, the number of negative decisions in the previous year and the main reason for the most recent negative decision.

RESULTS: Completed questionnaires were returned by 268 respondents (45 medical assessors and 223 other GPs, participation rate: 47%). The mean proportion of drivers with a negative decision was 2.2% (standard deviation [SD] 3.3). The proportion was slightly lower among medical assessors (1.1%, SD 1.3) compared to other GPs (2.3%, SD 3.3, $p < 0.001$). The main reasons for being considered medically unfit to drive were cognitive (64%) and visual acuity impairments (18%).

CONCLUSIONS: GPs in this survey reported considering approximately 2% of older drivers as medically unfit to drive, mainly because of cognitive and visual acuity impairments. Further research should identify how GPs decide if older drivers are fit or unfit, and assess the effectiveness of medical screening in reducing car crashes involving older drivers.

Keywords: *assessment, fitness-to-drive, older drivers, primary care*

Background

The number of older drivers has increased substantially in the last decades and this trend is expected to continue due to population ageing and the improved health of older drivers [1–4]. In addition, older drivers tend to retain their licences longer and travel greater distances [1, 3, 5, 6]. In Switzerland, more than 350,000 individuals over the age of 70 currently have a valid driving licence [7, 8].

Compared to younger populations, older drivers tend to have more favourable driving habits in relation to speed limits and alcohol use [1, 9], and tend to restrict their on-road exposure when driving situations are perceived to be more difficult (e.g. rain, night, heavy traffic) [10]. In addition, some medical conditions such as visual and hearing impairments often lead older drivers to abandon driving [11].

Despite these forms of self-regulation, the demographic shift could have implications for road traffic offices and fitness-to-drive decisions [2–5]. Indeed, according to some studies, a range of health conditions (e.g. neurological diseases, visual impairment, psychoactive medication use) which often occur in the elderly could impair driving performance [12, 13]. However, the linear predictions of older drivers' car crashes based on their increasing number are probably too pessimistic. For example, according to a Swedish study, the increase in the number of older drivers' car crashes in Sweden from 1983 to 1999 was smaller than the increase in the number of older drivers [14]. In addition, routine medical screening of older drivers does not necessarily bring safety gains [15–18]. Moreover, the negative health and safety outcomes resulting from this screening may in fact outweigh any safety gains.

Despite this, national programmes to assess older drivers from a medical perspective were implemented in several

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countries, but the age of first assessment and the assessment periodicity are highly variable [3, 4, 19]. In Europe, an age-based medical assessment is required from the age of 50 in Italy and Portugal, 60 in the Czech Republic and Luxemburg, 65 in Greece and Slovakia and 70 in Cyprus, Denmark, Finland, Ireland, Malta, The Netherlands and Slovenia, whereas a medical assessment for all age groups is required in Romania, Hungary, Lithuania, Latvia, Estonia and Spain [19]. In most countries, the time periods decrease from a certain age onwards. For example, in Italy the assessment is required every 5 years after 50 and every 3 years after 60, in Portugal at 50, 60, 65, 70 and then every 2 years, in Czech Republic at 60, 65, 68 and then every 2 years, and in Luxemburg every 10 years after 60, every 3 years after 70 and every year after 80 [19].

In Switzerland, a medical assessment is mandatory every other year for all drivers above the age of 70 (following revision of the Swiss Road Traffic Act this will change to drivers aged 75 and over from 2019 onwards) [3, 4, 20, 21]. The assessment is usually undertaken by general practitioners (GPs), except in Geneva where it is carried out by the medical assessors of the road traffic office, most of whom are also GPs. They are asked to identify medical conditions that could affect the ability to drive [3, 4] and are encouraged to base their judgement on the available Swiss recommendations [20–29], despite the fact that most of these recommendations are not evidence-based, but only expert opinions. Upon completion of the assessment they return a “recommendation” to the road traffic office of fit to drive, drive with constraints, or unfit to drive pending further evaluation [3, 4]. Despite the high number of fitness-to-drive assessments carried out each year in many countries including in Switzerland, there is currently no detailed information as to how often and for what reasons older drivers are considered medically unfit to drive.

The aim of this survey, carried out in the French-speaking part of Switzerland, was therefore to assess the proportion of older drivers with negative decisions and to explore the reasons for these decisions. We also aimed to identify potential *physician* determinants of negative decisions. In particular, we hypothesised a lower proportion of negative decisions among GPs, mainly because, unlike medical assessors, GPs generally assess their own patients and their evaluations could therefore be less “stringent” for fear of offending or losing their patients due to a negative decision.

Methods

As planned by the study team, this cross-sectional study was nested within a practice review carried out in 2017, exploring the decisional process involved when investigating the fitness to drive of older drivers (drivers over the age of 70) in the French-speaking part of Switzerland [30].

Survey site and survey population

We used simple random sampling to select 500 GPs practising in the cantons of Vaud, Jura and Neuchâtel. They were invited to participate by post (sample fraction: 500/1075; probability weight: 2.15). In addition, we selected all the medical assessors of the road traffic office practising in the canton of Geneva ($n = 69$; probability weight: 1) who were invited to participate either by post or during an edu-

cational meeting held in Geneva in February 2017. We sent a maximum of one reminder message. We excluded physicians who did not practise during the previous year.

Data collection

The selected physicians were asked to complete the questionnaire (English version made available as supplementary material) and to return it in hand in a closed envelope at the end of the education meeting or to send it back in a stamped envelope. The questionnaire included *sociodemographic items* (age, gender, medical specialty, location of the practice, number of half-days worked per week, number of working years in private practice), as well as *questions about these assessments* (estimated mean number of assessments per week, estimated number of negative decisions in the previous year (number of times that older drivers were considered unfit), and the main reason for the most recent negative decision in free text). The questionnaire was piloted with five medical assessors of the road traffic office of the canton of Geneva.

Confidentiality and ethics approval

All collected data remained confidential. We presumed tacit consent if the physicians handed back or sent back a completed questionnaire. This survey did not require ethics review according to current Swiss law because we did not collect personal health-related data.

Statistical analyses and sample size

We described physicians’ socio-demographic characteristics using frequency tables for categorical variables and mean and standard deviation (SD) for numerical data. For each physician, we estimated the proportion of drivers with a negative decision using the reported mean number of negative decisions in the previous year divided by the reported mean number of assessments per week (extrapolated to the entire year, i.e. multiplied by 52.143 weeks). In addition, we computed the frequency of the reasons for negative decisions, having regrouped them into seven predefined categories (cognitive impairment, visual acuity impairment, visual field impairment, neurological diseases (except cognitive impairment), age, at-risk drinking and other).

We compared the sociodemographic characteristics and the responses to the questionnaire of the medical assessors (physicians practising in Geneva) and the GPs (physicians practising in Vaud, Neuchâtel and Jura) using design-based F tests (corrected weighted Pearson chi-square tests) for categorical variables and linear regressions for survey weighted data for continuous variables. We used survey data analyses because we had to take into account the stratified simple random sampling of our study.

Finally, we used univariate linear regressions for survey weighted data to identify potential determinants of the proportions of negative decisions, using a p-value cut-off point of 0.2 and a backward selection approach using multivariate linear regression for survey weighted data to identify which GP factors were associated with a higher proportion of negative decisions. We computed the variance inflation factors (VIF) and the tolerance values ($1/VIF$) to check for multicollinearity. Due to a failure to satisfy the assumption of normality, we transformed the outcome

variable (taking the natural logarithm) in order to be closer to a Gaussian distribution as checked by histograms, and we dichotomised the numerical predictive variables. All linear regressions were carried out on the transformed values. Finally, after back transformation of the data, we computed the predicted difference in the (geometric) mean proportion of negative decisions for each variable.

We computed the required sample size for the practice review [30] and found that the minimum required sample size was 171, but we invited 569 physicians to participate because of an expected participation rate of between 30 and 40% and the sampling design. For the current study, we expected the average prevalence of negative decisions to be 5% with a SD of 5%, and wanted a precision of 1% around the mean for the 95% confidence interval (95%CI). This required including 197 physicians. The sample size estimated for the practice review met these requirements.

Statistical significance was set at a two-sided p-value of ≤ 0.05 . We performed all statistical analyses with STATA version 12.0 (College Station, USA).

Results

Study population

A total of 268 physicians completed the questionnaire (overall participation rate: 47%; Geneva: 65% [n = 45], other cantons: 45% [n = 223]). As all participating physicians were GPs, we only use this term to define them below.

Table 1 presents the GPs' main sociodemographic characteristics. Overall, they had a mean age of 54 years (SD 10); 67% of GPs were male and 75% practised in urban areas. Compared to other cantons, GPs practising in Geneva (medical assessors) were slightly older, more often male and practised in urban areas more often. With the exclusion of the medical assessors, the GPs appeared to be representative of all GPs practising in Switzerland in terms of mean age (54 vs 53 years in Switzerland) and gender (64 vs 59% men in Switzerland) [31].

Proportion of older drivers with a negative decision

The mean number of assessments carried out by the GPs was 2.0 per week (SD 2.2), the mean number of negative decisions during the last twelve months was 1.55 (SD 2.01), and the estimated mean proportion of older drivers with a negative decision was 2.2% (SD 3.3). Figure 1 shows the distribution of the estimated proportion of negative decisions by physician. The figure shows the presence of five outliers (i.e. with a proportion of negative decisions well above 10%). None of these GPs practised in Geneva. There were no statistically significant differences in the characteristics (gender, age and location of practice) of these GPs compared to those with a proportion of negative decisions $< 10\%$.

Reasons for negative decisions

Table 2 shows the reasons for which GPs decided that older drivers were medically unfit. The main reasons were cognitive (64%) and visual acuity impairments (18%). There were no differences between medical assessors and other GPs (data not shown).

Figure 1: Distribution of the proportion of older drivers with a negative decision across the sample of responding physicians.

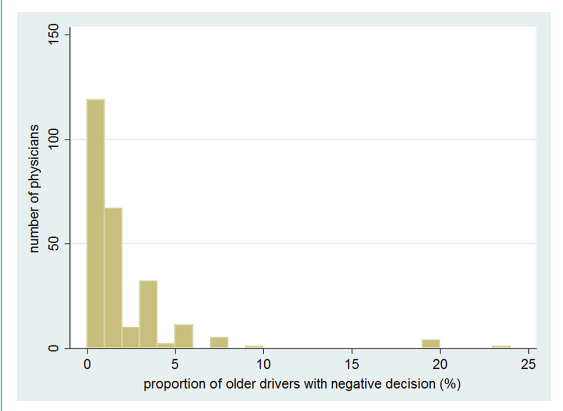


Table 1: Physicians' sociodemographic characteristics, overall and stratified by canton of practice (Vaud, Neuchâtel and Jura compared to Geneva) (n = 268).

Characteristics	Total (n = 268) n* (%)	Vaud, Neuchâtel and Jura (n = 223) n* (%)	Geneva (n = 45) n* (%)	p-value
Gender (n = 266)				0.02
Male	177 (66.5)	142 (63.7)	35 (81.4)	
Female	89 (33.5)	81 (36.3)	8 (18.6)	
Age group (years) (n = 266)				0.32
<45	56 (21.1)	49 (22.2)	7 (15.6)	
45–54	65 (24.4)	57 (25.8)	8 (17.8)	
55–64	97 (36.5)	78 (35.3)	19 (42.2)	
≥ 65	48 (18.0)	37 (16.7)	11 (24.4)	
Location of practice (n = 263)				<0.001
Urban	196 (74.5)	152 (69.7)	44 (97.8)	
Rural	67 (25.5)	66 (30.3)	1 (2.2)	
	mean (SD)	mean (SD)	mean (SD)	
Age (n = 266)	54.3 (9.8)	54.0 (9.3)	57.2 (12.9)	0.04
Number of half-days worked per week (n = 261)	7.7 (2.2)	7.7 (2.1)	8.2 (3.0)	0.03
Number of working years in private practice (n = 264)	18.5 (10.8)	18.2 (10.3)	22.4 (14.7)	0.01

SD = standard deviation * n = number with factor considered

Factors associated with a higher proportion of negative decisions

Table 3 shows the mean proportion of drivers with a negative decision stratified by the physician's socio-demographic characteristics, as well as the predicted difference in the geometric mean proportion for each variable (in univariate and multivariate analyses). In multivariate analysis, negative decisions were statistically significantly less common among medical assessors compared to other GPs, and the proportion of these decisions was higher among female compared to male GPs.

Discussion

Main findings

We found that 2.2% of older drivers were considered medically unfit by our sample of GPs, mainly because of cognitive and visual acuity impairments. We also found that this proportion was slightly lower among medical assessors (1.1%) compared to other GPs (2.3%), and among male (1.9%) compared to female GPs (2.8%).

Comparison with the existing literature

The proportion of older drivers considered to be medically unfit was relatively low, but given that there are 350,000 drivers above 70 in Switzerland, it is expected that several thousand older drivers would be judged medically unfit to drive each year. However, our finding should be interpreted with some caution because the data are prone to reporting bias, as the study was based on the answers to a self-administered questionnaire. In addition, GPs were not asked to specify whether they considered these drivers as being unfit to drive indefinitely, or only for a transitional period. For example, in case of visual impairment due to a cataract, restoration of adequate vision following cataract surgery may, in general, enable fitness to drive. Our findings compare favourably with those from Denmark, where medical assessments are required at the ages of 70, 74, 76, 78, 80, and then once a year [19]. Hansen and coll. found that 1.5% of older drivers did not get their licence renewed after medical assessment (this proportion was even lower [0.6%] before the implementation of medical tests assessing cognitive dysfunction) [19].

Of course, this estimated number of unfit drivers does not take into account those who are considered unfit to drive following direct assessment by specialists (the traffic of-

Table 2: Reasons for negative decisions during drivers' assessments.

Reasons for negative decisions (n = 137)	Number with factor considered	% (95% confidence interval)
Cognitive impairment	88	64.0 (55.8–71.4)
Visual acuity impairment	24	17.6 (12.2–24.7)
Neurological disease (except cognitive impairment) [†]	10	7.2 (4.0–12.7)
Age	5	4.0 (1.8–9.0)
At-risk drinking	4	3.2 (1.3–8.0)
Visual field impairment	4	3.2 (1.3–8.0)
Other [‡]	2	0.8 (0.3–2.3)

* Unspecified neurological disease, polyneuropathy, gait or balance disorder, stroke attack, epilepsy, Parkinson's disease † Use of illicit drugs (n = 1), unsuccessful on-road driving test (n = 1)

Table 3: Mean proportion of drivers with a negative decision, stratified by physicians' socio-demographic characteristics, and predicted difference in geometric mean proportion for each variable (in univariate and multivariate analyses).

Characteristics	Mean proportion of negative decisions % (SD)	Predicted difference in geometric mean proportion (univariate analysis)*	p-value	Predicted difference in geometric mean proportion (multivariate analysis) [†]	Adjusted p-value
Medical specialty			<0.001		<0.001
Medical assessors [‡]	1.1 (1.3)	0		0	
Other GPs [§]	2.3 (3.3)	1.4		1.5	
Gender			<0.001		0.001
Male	1.9 (2.6)	0		0	
Female	2.8 (4.2)	1.1		1.2	
Age group (years)			0.08		
<55	2.6 (4.0)	0.4			
≥55	1.8 (2.4)	0			
Location of practice			0.56		
Urban	2.2 (3.5)	0.2			
Rural	2.0 (2.7)	0			
Number of half-days worked per week			0.04		
≤8	2.4 (3.8)	0.5			
>8	1.8 (1.9)	0			
Number of working years in private practice			0.06		
≤20	2.5 (3.8)	0.6			
>20	1.7 (2.4)	0			

* Univariate linear regressions for survey weighted data; analysis after log transformation of the data † Multivariate linear regression using a backward selection approach for survey weighted data (medical specialty, gender, age group, number of half-days worked per week and number of working years in private practice included in the initial model; medical specialty and gender included in the final model); analysis after log transformation of the data ‡ Canton of Geneva § Cantons of Vaud, Neuchâtel and Jura

office may send older drivers to specialists directly, but this situation rarely occurs) or those who are considered unfit to drive following reports from police, relatives or health professionals. In Switzerland, health professionals may at any time report to the road traffic office any driver who is considered unfit, so that they undergo further evaluation and possible licence revocation. However, they do not have a legal obligation to do so (voluntary procedure). A study carried out in Missouri (USA) showed that approximately 60% of reports were submitted by the police and the road traffic office staff, 20% by physicians and 20% by relatives [1].

The proportion of older drivers with negative decisions was slightly lower among medical assessors compared to other GPs. This finding is somewhat surprising for at least three reasons. Unlike medical assessors, GPs generally assess their own patients and their evaluations could therefore be less “stringent” - they might put the relationship between doctor and patient above the objectivity and impartiality of these assessments for fear of losing their patients in the case of a negative decision. Secondly, GPs might convince their patients to stop driving before the medical assessment is requested [32]. More patients could therefore hand their driver’s licence back without the medical visit. Finally, older drivers living in a dense urban area (canton of Geneva) are probably less reluctant to stop driving spontaneously without any medical reason. Those who are screened could therefore be more likely to be unfit to drive.

This result could be due either to chance, as only 45 medical assessors were included in the study, or to participation bias, as the participation rate was higher in Geneva compared to other cantons (those who answered were maybe more likely to have taken negative decisions in the recent past and to be motivated to answer the questionnaire). Alternatively, these findings might be attributable to the greater expertise and background knowledge among medical assessors compared to other GPs, meaning that they are more likely to accept a balance between mobility and safety [33].

The proportion of older drivers with negative decisions was slightly higher among female compared to male GPs. Several authors have showed that female and male doctors have different styles of care and that female doctors were generally more prone to follow recommendations [34, 35]. In our practice review [30], we also found that, compared to male counterparts, female GPs were more likely to apply the Swiss recommendations for assessing older drivers’ fitness to drive (median number of procedures assessed: 15.5/20 for female GPs vs 14/20 for male GPs; p-value: 0.001 (unpublished data)). We may hypothesise that if older drivers are more extensively screened, they are also more likely to be considered unfit to drive.

We showed that the main reasons for negative decisions were cognitive and visual acuity impairments. This is a relatively logical finding, because these health conditions often occur in the elderly and could impair driving performance [11, 32, 36, 37], although there are only a few data on the causal association between medical conditions and road safety [12, 13].

The fact that at-risk drinking and illicit drug use were less often reported could be linked to the lower prevalence of

these conditions in this age group [38–40]. Alternatively, GPs could be reluctant to screen for them because, for example, they consider *a priori* that they are not prevalent in the elderly, or because of time constraints. Alternatively, patients may not always answer questions about these risk behaviours truthfully.

Our sample of GPs mentioned age *per se* as a reason for some negative decisions (4%), maybe because GPs felt these drivers to be unfit, but without identifying a precise diagnosis explaining the unfitness. However, age alone should not be used to determine drivers’ fitness [12].

More surprisingly, some important health conditions such as daytime sleepiness and psychiatric diseases were never cited by GPs. These conditions could strongly affect fitness to drive in the elderly. In our practice review we showed that 83% of GPs frequently ask for history of psychiatric diseases and 68% screen for daytime sleepiness. Our findings could therefore be linked to some underestimation by GPs of the risk of car crashes associated with these conditions and/or over-reporting of these screening procedures (social desirability bias).

Limitations

We have to keep in mind some limitations when considering our findings. As already stated, despite the fact that we carried out the survey in four different cantons (Geneva, Vaud, Jura and Neuchâtel), they are all located in Western Switzerland (French-speaking part of the country). These GPs are not necessarily representative of all GPs practising in Switzerland. Furthermore, since the survey was based on the answers to a self-administered questionnaire, we cannot exclude bias in self-reporting data (mainly social desirability bias). As we did not carry out direct observations in GPs’ practices, we are not able to assess the extent of this bias. Finally, as we did not record any data on GPs who refused to take part in the study, we cannot exclude the hypothesis of a different profile between those who responded to the questionnaire and those who did not.

Conclusion

Allowing for the above limitations, our results suggest that approximately two out of every 100 evaluated older patients are considered medically unfit to drive each year, mainly because of cognitive and visual acuity impairments. Further research should identify how GPs decide whether older drivers are fit or unfit and assess the extent to which medical screening can contribute to reducing car crashes involving older drivers.

Acknowledgements

We would like to warmly thank all the doctors who participated in the study and Amir Moussa, our research assistant.

Financial disclosure

This project was supported by institutional funding from the Faculty of Medicine, University of Geneva.

Potential competing interests

No potential conflict of interest relevant to this article was reported.

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