Review of medical fitness to drive in Europe

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ABSTRACT

Understanding the impact of medical fitness to drive is important as the driving population ages. This desktop study set out to examine older driver safety from international best evidence on various aspects likely to affect an older person's fitness to drive, including the role of education, driver retraining, self-awareness, and cognitive preconditions. The review also reviewed the influence of medication and the role of the medical practitioner, as well as the effectiveness of mandatory licensing retesting. Key recommendations included the need for a standardised screening process across all Member States in assessing fitness to drive, consistent guidelines to assist medical practitioners in their role of assessing a patient's level of safety, and promotion of materials to help older people make their own decision when to cease driving. A wider use of Medical Assessment Boards across Europe to ensure a consistent process in assessment of fitness to drive would be helpful and the development of an effective and transparent screening protocol based on functional capability is warranted when assessing fitness to drive among older drivers.

KEYWORDS: Driving, Older Drivers, Safety, Fitness, Licensing.

1. BACKGROUND

We live in an era where the population is ageing. Eurostat estimated that the percentage share of those aged 65 years and older compared with the total growth of the population in EU28 increased by approximately 8 percent between 2006 and 2016 (Eurostat 2018). In countries such as the Netherlands, Belgium, and the United Kingdom, more than 60% of the target population live in predominantly urban regions (Eurostat 2016). The UN World Population Ageing Report (UN, 2015) noted that in Europe currently, 14% of the population are aged 80 years or older and is expected to approach 30% by the year 2050.

As shown in Figure 1, Europe and North America currently lead the world in terms of the oldest aged proportions (those 80 years and older), but others (Oceania, Latin America and Asia) are not far behind and expected to catch up in the coming years. Given that fitness to drive is expected to decline as the population ages, it is critical to prepare for this changing demographic in driving and consider what needs to be done to overcome any potential increase in road trauma.

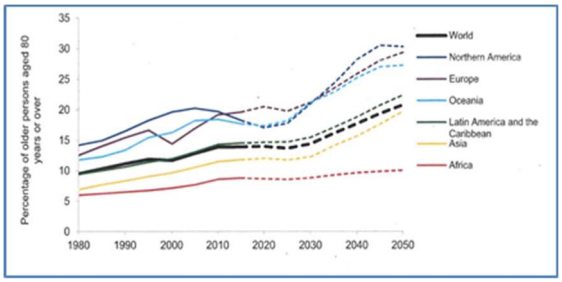

Figure 1: Population aged 80 years or older by region (1980-2050)
(Source: United Nations: World Population Ageing Report 2015

1.1 Objectives

The work reported in this paper was part of a wider study for the European Commission (DG MOVE) looking at best practice approaches to driver training, testing and medical fitness to drive (Helman *et al*, 2017). This part of the study set out to examine from the best international evidence available, which aspects of ageing are likely to affect an older person's fitness to drive. Of particular importance was the safety impact of an ageing society on the driver population, the extent that unfitness to drive is a causational factor for road fatalities and serious injuries, and the identification of which mechanisms are needed to ensure safe mobility in an ageing society.

2. METHOD

The study was essentially a desktop review of best practice across a range of countries in Europe, the USA and in Australasia. Current practice across Europe was also outlined, based on the existing literature (covering the majority of Member States) where possible, and also based on responses to a short online survey (with wide participation from 25 countries in Europe).

Literature from 2000 to 2016 was sourced from international databases such as ATRI, TRID and PUBMED, using a number of pre-determined search inclusion and quality criteria around a series of research questions listed in Table 1. The search

focused on medical fitness to drive for both ageing and medical conditions that potentially put drivers at added risk of a collision. In addition, other literature known to the project team has been collected for inclusion.

Table 1: Research questions used to guide the review

- What published scientific information is available on the role of medications and reduced fitness to drive?
- Are there formal processes and requirements across Member States for assessing older and medically unfit drivers?
- What regulations and guidelines are in use in Europe and elsewhere?
- What is known about self-regulatory behaviour and compensation, and transitioning from driver to non-driver?
- What methods are available to assist self-regulation and transition and are they effective?
- What are the benefits and disbenefits of various types of licensing systems?
- What is the role of medical practitioners in the license review process in Europe?
- What is known of GPs' involvement in referrals and mandatory reporting of at-risk drivers and are these effective?
- What knowledge do GPs have regarding assessing medical fitness to drive and is there a need for guidelines and education and training?
- Do current screening tests predict poor driving ability and crash risk and are they effective?
- Is there evidence of the effectiveness of on-road tests for assessing fitness to drive?
- How medical panels are used, what is common practice, and are they effective?
- What is the role of occupational therapists (OT) and are they utilised effectively?
- Is there a need for centres of expertise for medical assessments?

The total number of articles retrieved from the search and rated by three panelists according to the quality criteria were 123 on fitness to drive (67% accepted), 62 on substance impaired drivers (32% accepted), 35 on commercial drivers' fitness to drive (66% accepted), and 44 papers on varying topics from the TRDI/PUBMED database (73% accepted).The focus of the review was to analyse the impact of an ageing society, of their medical risks (eyesight, cardiovascular, diabetes, drugs etc.) and the likely impact on road safety. It sought to identify which medical conditions could be more prevalent with changes in the driver population and the need for additional medical checks and refresher courses.

Studies on the relationship between medical fitness to drive and ageing, evaluated against both primary and secondary outcome measures over the last 10 years. Given the large scope of this review, a series of research questions were posed for the review, as shown in Table 1 opposite. Using the evidence reviewed a series of good practice approaches were defined, and then discussed at a stakeholder workshop in September 2016, in Brussels. The focus of the workshop was on identifying barriers and enablers to implementation different good practice approaches adopted in European member countries and internationally.

3. RESULTS

3.1 Key Findings

An earlier studied by Vandenberghe (2010) identified 4-key areas of importance for Europe, based on published research up until 2011. These data show that the driver licensing systems within European member states differs considerably with regard to medical fitness to drive a passenger motor vehicle (category B). While the bulk of this information is now several years old, checking from a limited sample of member-states and recent literature suggested that little has changed recently.

The overall effectiveness across the four key areas identified by Vandenberghe of (i) education, (ii) practical driver training, (iii) self-awareness of fitness to drive, and (iv), awareness of pre-conditions for safe driving shown in Table A1 in the Appendix, are still highly relevant categories. These findings have been supplemented with other more recent data and is discussed more fully in Helman *et al* (2016) and summarised in Table A2 in the Appendix. These findings are summarised below.

3.1.1 Education Programs

Overall, the findings from the 6-studies listed reviewed show mixed outcomes: two of these claimed improved driving at intersections and safety attitudes, while three others reported either no driving improvements and/or no crash reductions. The sixth evaluations found an actual increase in crashes for some drivers.

3.1.2 Practical Driver Training Programs

All five programs reviewed reported that practical driving training showed improvements in at least some driving skills and knowledge among older drivers. This was stronger among those tested in on-road programs although the results were not as strong for those tested in simulators. The benefit for those tested for hazard perception were effective for improving their hazard perception abilities. This suggests that such programs may have safety benefits for older drivers, although there is surprisingly little evidence attesting to their effectiveness in identifying and assessing medically at-risk drivers.

3.1.3 Self-Awareness of Fitness to Drive

Of the four studies that assessed a driver's self-awareness of their fitness to drive, only two showed improved driving

performance. The remaining two were not particularly valid tests for awareness but more about driving quality or clinical relationships. There is a widely held assumption that older drivers have a high level of self-regulation and thought to adjust their driving behaviour to match their changing cognitive, sensory and motor capacities. It is likely that this benefit may be greater for those not suffering severe cognitive impairment.

3.1.4 Pre-Conditions for Safer Driving

Two of the three evaluation programs reviewed that sought to improve pre-conditions for driving (physical activity, speed-of-processing and reasoning) showed some driving improvements and/or crash reductions, with the other showing mixed results.

3.2 Other Related Issues of Fitness to Drive

A number of other related issues were also discussed in the Helman *et al* (2016) study and are reported in the following section.

3.2.1 Medication

Prescribed and over-the-counter medications play a key role in the treatment of medical conditions, short-term illness and chronic disease. Their effect and that of multiple medications (polypharmacy – the use of four or more medications) on a person's ability to drive can be variable. Rates of per-capita prescriptions and over-the-counter medications and dietary supplements have increased considerably over the last few decades in many developed countries including Europe. It should be cautioned that an association between drugs and impaired driving does not necessarily imply causation, as other factors may be at play, such as chronic disease, acute emotional or physical stress, and performance bias. Understanding the degree of reduced driving capability and increased risk caused by medication and drug use per se presents a major challenge for road safety in separating the cause of medication influence from the underlying condition.

3.2.2 Medical Practitioner's Role in Reporting At-Risk Older Drivers

Medically at-risk drivers come to the attention of licensing authorities primarily through referrals from a variety of sources, including physicians, law enforcement, and the court system. In most jurisdictions, referrals are also accepted from family, friends, and other concerned citizens. Common reasons for referral of older drivers include getting lost, crashes, 'fender benders', and 'near misses' associated with erratic driving and confusion.

Most medical practitioners (GPs) accept that they have a role to play in reporting those with a relevant and severe medical condition likely to affect a patient's ability to drive, they are concerned about their abilities to make this assessment. Furthermore, most also believe that reporting of unsafe drivers to the driver licensing authority would impact negatively on the doctor–patient relationship, a concern common throughout the literature.

There is clearly a need here for guidelines and additional information to help medical practitioners in making this judgement. The findings shown in Table A2 in the appendix were mixed across member states in terms of providing such information that opens the possibility for a more European-wide program in this area.

3.2.3 Medical Advisory Boards

Medical Advisory Boards (MABs) have been established within some licensing authorities and have the responsibility of ultimately determining fitness to drive and licensure. There are various examples of MAB throughout Europe, the USA and elsewhere, however there are few evaluations regarding the effectiveness of these systems, and therefore little evidence of 'best-practice'. MABs vary in form from adequately managing the safe mobility of at-risk older drivers, to simply offering a form of follow-up assessment when a GP reports someone of concern. The benefit of these boards is that it takes the ultimate responsibility of a person losing their license away from the GP to that of the authority and hence overcome some of the medical practitioner's concerns in the process.

3.2.4 Mandatory license retesting

The requirement for older road users to demonstrate their continuing ability to drive has created much concern and angst worldwide amongst road safety and ageing specialists, transportation and health authorities. Supporters of the practice of periodic mandatory licence retesting for older drivers argue that people in their later years wishing to retain a licence need to demonstrate they are fit and capable of driving without increased risk to other road users. Those who oppose age-based, periodic licence retests, base their claims on the inability of licence tests to discriminate those at risk, and issues of cost-effectiveness, discrimination, equity issues, individual differences in the ageing process, and the consequence of restricting mobility based on a person's age.

There does not appear to be a "gold-standard" approach to these assessments. On-road is commonly used for these assessments but fraught with subjectivity, validity and indeed, danger in taking a potential at-risk driver in normal traffic. Off-road testing has been an attractive alternative, yet the review failed to demonstrate an effective scientifically robust available test to date. This is something worthy of further research.

4. DISCUSSION AND IMPACT

The medical fitness to drive is still an important safety and societal issue that member states need to actively work on. The literature review identified a number of issues around the research questions listed earlier. Calls for a general screening of the whole population by age as a means of identifying at-risk drivers is unlikely to be effective, both from a performance and from a cost-benefit perspective. There is clearly an urgent need to be able to assess fitness to drive among an older person to ensure they and the rest of the population's safety is optimized. Fortunately, older drivers tend to drive shorter distances which minimises their exposure to risk.

Importantly, drivers of all ages are unwilling to voluntary surrender their licence, and more so for the elderly as its value increases due to their reliance on cars as they lose physical abilities and become more frail. Access to private motor vehicles is critical when public transport is either unavailable locally or difficult to access and where they need for access to medical facilities increases with age.

4.1 Discussion of Good Practice

Based on the literature review and the user survey findings, several good practices were identified for medically at-risk and/or older drivers, as detailed below:

1. A European-wide consistent screening process is required to ensure a common approach for assessing at-risk drivers across the Member States. While one could argue that individual states should decide for themselves what level of risk they believe is acceptable, this will not provide optimal safety or consistency across Europe;
2. A validated off-road assessment tool is required to minimise the number of potentially at-risk drivers on the road, to ensure an improvement in safety for themselves the general public;
3. Medical practitioners (GP) are clearly a critical part of the identification of older and medically vulnerable at-risk drivers. Many stressed the lack of and need for guidelines to assist them in their assessment;
4. In addition, GPs commonly seek assistance with this task and education programs for GPs to assist them is warranted;
5. Some older drivers can make rational decisions about their own abilities to continue to drive. Materials to aide their decision in arriving at such a decision would also be very helpful; and finally
6. Some member states currently provide restricted licences to allow those at slight risk to continue to drive where public transport is limited. This practice should be consistent across all member states.

4.2 Expected Impact

From the review, a number of priority issues seemed important for consideration in Europe as listed below:

- The need for a standardised screening process across all Member States in assessing a driver's fitness to drive is warranted, based on international best practice.
- Consistent guidelines for medical practitioners and promotion of materials to support self-regulation towards reduced driving and cessation would further help older people make the decision when to cease driving themselves.
- A wider use of Medical Assessment Boards to ensure the licensing authorities have more of a major say in removing an older person's right to be licensed would also help to take away some of the medical practitioners' concerns of patient blame.
- The development of an effective and transparent screening protocol for use across Europe for testing the functional capabilities of at-risk older drivers is warranted.

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Appendix Table A1

Evaluation studies of older driver training and education programs published 2000-early 2011.

Authors	Nature of participants	Age of key participants	Programme	Effectiveness
1. Education only				
Bédard et al. (2004)*	'Normal' active drivers	55 yrs+	55-Alive/Mature Driving	Ineffective – no driving improvements
Bao & Boyle (2009)	'Normal' active drivers	65 yrs+	55-Alive/Mature Driving	Effective – improved driving at intersections
Nasvadi & Vavrik (2007)*	'Normal' active drivers	55 yrs+	55-Alive/Mature Driving	Ineffective – increased crash rates for some participants
Owsley et al. (2003)*	Visually impaired, crash-involved drivers	60 yrs+	Tailored programme	Effective – self-reported improved safety attitudes, self-regulatory practices
Owsley et al. (2004)*	Visually impaired, crash-involved drivers	60 yrs+	Tailored programme	Ineffective – no crash reductions
Kelsey & Janke (2005)	Drivers with 'unclean' records	70 yrs+	Education publications and/or resources list	Ineffective – no crash, violation reductions (although increased driving, safety knowledge)
2. Practical driver training programmes				
Marottoli et al. (2007b)*	'Normal' active drivers	70 yrs+	55-Alive/Mature Driving on-road training	Effective – improved driving knowledge, performance
Bédard et al. (2008)*	'Normal' active drivers	65 yrs+	55-Alive/Mature Driving on-road training	Effective – improved driving knowledge, performance
Lavalliere et al. (2009)	'Normal' active drivers	?	55-Alive/Mature Driving simulator training	Effective – improved driving performance
Romoser & Fisher (2009)	'Normal' active drivers	70 yrs+	'Active' simulator training, 'passive' education	Effective only for active group – improved simulator and driving performance at intersections
Horswill et al. (2010)	'Normal' active drivers	65 yrs+	Hazard perception training (video)	Effective – improved hazard perception
3. Self-awareness of fitness to drive				
Eby et al. (2003)*	'Normal' active drivers	65 yrs+	Self-awareness knowledge workbook	Effective – self-reported improved awareness; Valid – self-reported difficulties with driving performance
Molnar et al. (2010)	'Normal' active drivers	65 yrs+	Self-awareness and knowledge computer program	Effective – self-reported improved awareness; Valid – self-reported difficulties with driving performance
Scialfa et al. (2010)	'Normal' active drivers	50 yrs+	Roadwise Review	Not valid – no association between test performance and self-reported driving quality, at-fault collisions
Bédard et al. (2011)	'Normal' active drivers	50 yrs+	Roadwise Review	Not valid – no association between test performance and related clinical measures, driving performance
4. Pre-conditions for safer driving				
Marottoli et al. (2007a)*	Drivers with physical impairments	70 yrs+	Daily exercise programme	Effective – better driving performance than a control group
Roenker et al. (2003)*	Visually impaired drivers	48 yrs+	Speed-of-processing or simulator training	Mixed results
Ball et al. (2010)	'Normal' active drivers	65 yrs+	Speed-of-processing, reasoning or memory training	Effective for speed-of-processing, reasoning training – reduced at-fault crash involvement

Note: "'normal' active drivers" were a convenience samples of active older drivers NOT selected on the basis of specified medical or performance criteria

Appendix Table A2

Driver Assessment procedures for some EU Member States (Source: Vandenberghe, 2010, and follow-up survey)

Member States	Age-based test req'd	Age for first retest	Holder legally bound to report ill-health	Medical check req'd for relicence	GP bound to report at-risk driver	GP initiate need for retest	Medical advisor assess req'd	Eye-test req'd for relicence	On-road test req'd for relicence	Conditional (restricted) Licence
Austria	yes	Every 10yrs	no	yes	no	yes	If req'd	yes	Unk.	yes
Belgium	yes	50 (+5/3)	yes	yes	no	yes	If req'd	yes	yes	yes
Czech Republic	yes	50 (+1)	no	yes	yes	yes	If req'd	yes	yes	Unk
Denmark	yes	50 (+5-1)	no	yes	yes	yes	If req'd	yes	Unk.	yes
Estonia	yes	50 (+5)	no	yes	no	yes	If req'd	yes	Unk.	Unk
Finland	yes	50 (+5)	no	yes	yes	yes	If req'd	yes	Unk.	Unk
France	yes	60 (+5/2)	no	yes	no	yes	If req'd	yes	Unk.	Unk
Germany	yes	50 (+5/3)	no	yes	no	yes	Unk.	yes	Unk.	Unk
Great Britain	yes	45 (+5/1)	yes	yes	yes	yes	no	yes	yes	Unk
Greece	yes	65 (+5/3)	no	yes	no	yes	If req'd	yes	Unk.	Unk
Hungary	yes	45 (+3/2)	yes	yes	yes	yes	If req'd	yes	Unk.	yes
Iceland	yes	65 (+5/4/1)	yes	yes	no	yes	police	yes	Unk.	Unk
Ireland	yes	60 (+3/1)	yes	yes	no	yes	Unk.	yes	Unk.	Unk
Latvia	yes	60 (+3)	no	yes	yes	yes	If req'd	yes	Unk.	Unk
Luxembourg	yes	50 (+5/3)	no	yes	no	yes	If req'd	yes	Unk.	Unk
Norway	yes	60 (+5/1)	yes	yes	yes	yes	If req'd	yes	Unk.	Unk
Netherlands	yes	70 (+5)	no	yes	no	yes	If req'd	yes	Unk.	Unk
Poland	yes	55 (+5/2/1)	yes	yes	yes	yes	If req'd	yes	Unk.	Unk
Portugal	yes	40 (+5/3/2)	no	yes	yes	yes	If req'd	yes	Unk.	Unk
Spain	yes	45 (+5/3/2)	no	yes	no	yes	If req'd	yes	Unk.	Unk
Sweden	yes	45 (+10)	no	no	yes	yes	Unk.	yes	Unk.	Unk
Switzerland	yes	45 (+10)	no	yes	no	yes	Unk.	yes	Unk.	Unk