Is driver licensing restriction for age-related medical conditions an effective mechanism to improve driver safety without unduly impairing mobility?

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Abstract:

Background

While medical conditions have been recognised as a minor contributing factor to road traffic crashes, clinicians and driver licencing agencies need mechanisms for promoting safe mobility for those with age-related illnesses which can impact on driving safety. Restrictive licensing has been proposed as a possible intervention for decreasing the risk of crashes associated with medical crashes, whilst not unduly affecting patient mobility.

Objective

To analyse how the term 'restrictive licensing' is defined in the literature, and to determine the effectiveness of this mechanism in improving driver safety.

Design:

A systematic literature review

Methods

A search of the MedLine and TRID databases.

Results

Restrictive licensing is most commonly defined as a geographical, time of day or speed restriction placed on the driver. Personal and vehicle modifications are considered by some to also be a form of restrictive licensing. Existing studies are supportive of the efficacy of restrictive licensing programs, with reduced crash rates for drivers carrying restricted licences compared to controls.

Conclusion:

Restrictive licensing has been shown to be an effective mechanism of increasing driver safety without unduly impacting driver mobility. It has significant potential to have a positive impact on the ability of those with medical conditions to drive safely. Further research is needed to determine the optimum format and policies for advising driver restrictions for age-related disease and disability.

Introduction

While medical conditions have been recognised as having a modest role in road traffic accidents (1) when compared to factors such as wearing a seatbelt and speeding (2), it is increasingly clear that clinicians and driver licencing agencies need to develop strategies for supporting safe mobility for individual drivers with age-related disease and disability (3) . Older drivers as a group present no increased risk to road users in general but are more likely to present with conditions which may impact on fitness to drive (4). Significant potential exists for support and remediation of fitness to drive through general rehabilitation and fitness training (5), as well as more disease specific intervention with conditions such as cataracts (6), sleep apnoea (7), arthritis (8), and stroke (9). A further strategy that has been proposed as a method of reducing the number of crashes associated with medical conditions is restricted licensing. There is a significant literature on the use of restrictions for alcohol misuse and dependence but not yet for physical and cognitive disabilities which increase with age and which may affect fitness to drive.

One of the main advocacy organizations for older people in the USA, the AARP, has advocated adoption of restricted licencing for over twenty years, defining it as “a driver’s license that for one reason or another has a restriction attached to it. To operate a motor vehicle holders of such a license must meet some special requirement or must restrict their driving practices in some well-specified fashion” (10). On a preliminary literature review we found that there were discrepancies among various authors as to the definition of restricted licensing. Therefore we conducted a review on how the term restrictive licensing is defined in the literature for medical conditions other than alcohol misuse and dependence and also reviewed the effectiveness of restrictive licensing as a mechanism to improve driver safety, particularly for older drivers.

Aim

There are two main aims to this review: to analyse how restrictive licensing is defined in the literature, and to determine the effectiveness of the mechanism of restrictive licensing in improving driver safety.

Method

We undertook a literature review of both MedLine and TRID (Transport Research International Documentation). The latter is an integrated database that combines the records from US Transportation Research Board's Transportation Research Information Services Database and the OECD's Joint Transport Research Centre's International Transport Research Documentation Database: TRID provides access to more than one million records of transportation research worldwide. Our search included only articles written in the English language and had no date restriction. We searched MedLine using the terms: "(Restricted AND driver AND licensing) NOT learner". This returned 35 articles, of which 6 were considered relevant. The remaining 29 articles dealt with graduated licensing programs in place for adolescent drivers, which we did not consider. To further expand our literature base we then searched the reference lists in the appropriate articles. We then conducted another MedLine search using the terms "(Restricted AND (driver OR driver's) AND (licensing OR licenses)) NOT learner". This resulted in 42 articles, 7 of which were considered relevant. Of the remaining 35 articles, 15 dealt with graduated licenses, 4 with young driver issues, 3 with interlock devices, 4 with specific medical issues and their effect on driving ability, 4 with the effects of alcohol upon driving ability, and 5 with further education of adult drivers. A search of TRID using the same terms resulted in 110 results, 23 of which were considered relevant. One of these was a research project that had not yet been concluded, so we were left with 22 articles. Excluding those which overlapped, we reviewed a total of 22 papers, of which seven described the nature of the restrictions and five their effectiveness..

Results

Definition of Restricted Licensing

Seven papers described actual driving restrictions in use. The range of definitions used is summarized in Table 1. Braitman et al. split the restrictions into three separate categories – headlight restrictions (not allowed to drive at night), speed restrictions, (not allowed to drive on high speed roads) and geographic restrictions (not allowed to drive 5 miles or more from home) (11). Nasvadi et al. also considered licensing restrictions to be restrictions on speed, time of travel or geographic area of travel (12). Restrictions to licenses in Utah include speed, area and/or time of day limitations (13). Marshall et al. noted that drivers in Saskatchewan may either have a driving restriction (driving during certain hours, at certain speeds or on certain roads), a licensing restriction (requiring a periodic eye examination or having a shorter license renewal time), or both (14). These restrictions are based on a combination of a driving ability assessment, an on-road evaluation and the expected progression of the person's medical condition. Langford et al. split the restricted license categories into personal restrictions (e.g. wearing corrective lenses), vehicle modifications (such as fitting hand-operated controls) and license restrictions (driving within a certain radius of home, in daylight hours etc) (15).

Vernon et al. discuss the 12 medical diagnosis categories, which are used to determine a person's fitness to drive (13). In each category drivers are assessed to determine the severity of disease process and impairment, often times by a physician. This assessment therefore assigns drivers to one of twelve categories, each outlining the various restrictions considered appropriate for safe driving by the licensing agency in Utah. The functional ability level and imposition of restrictions are reconsidered each time the license is renewed.

A review of the effectiveness of restricted licensing for North Carolina's older drivers adopted the term 'restricted licensing' rather than graduated licensing, primarily to avoid confusion with the graduated licensing policies and programs now being targeted to young learner drivers (16). They do explain, however, that the underlying principle remains the same across both populations of drivers: allow driving under conditions that maximise safety while retaining mobility.

- INSERT TABLE 1 HERE -

Effectiveness of restrictive licensing

Five papers discussed the effects of restricted licensing. In Utah, restricted licensing for single condition was associated with less citations and crashes for drivers with diabetes, less citations for those with psychiatric conditions and less crashes for those with respiratory disease (13). For those with multiple conditions, those with restricted licences had less citations and crashes than those with unrestricted licences. A study in Iowa found that the most noteworthy change in driving behaviour resulting from license restrictions was a significant reduction in weekly mileage for drivers with any kind of restriction relative to drivers without restrictions (11). Drivers with license restrictions reduced their weekly mileage by about 40% between the initial and follow-up surveys, whereas weekly mileage for drivers without restrictions changed little.

A significant decrease in the rates of crashes and traffic violations in drivers with license restrictions for medical impairments was noted in a study in Saskatchewan, Canada (14). Although the findings indicated a higher adjusted risk of at-fault crashes, this increased risk attributable to restricted licenses is significantly smaller than that attributable to male sex or urban residence. Furthermore, drivers with restricted licenses had a lower adjusted risk of traffic violations. Traffic violations are a marker of driving behaviour associated with increased risk of crashes. Therefore, it would seem

acceptable to suggest that restricted licenses for medical conditions can lower the risk of crashes and increase general safety on the roads.

Driver license restrictions in British Columbia are correlated with higher pre-restriction rates of causing a crash, and that a 17.4% reduction in crashes per 100 days of license and an overall 11% reduction in at-fault crash risk may be attained by restricting the speed, area of travel, or time of day of driving, or by a combination of these restrictions (12). Older drivers with restricted licenses retained their driver's license for longer than those who were not restricted, leading to the somewhat paradoxical conclusion that license restrictions increase driver mobility in the long term.

An analysis of licencing policies for older drivers in the 50 US states and District of Columbia showed that restricted licensing policies encouraged driving longer trips instead of shorter trips; it also encouraged individuals to continue driving instead of ceasing [Kulikov, 2011 #4559]. In contrast, accelerated renewal periods for driver licencing and medical review were both associated with driver cessation.

Discussion

The goal of strategies to manage medical fitness to drive is to control the impact on public safety posed by drivers with medical problems, presumably so that it is not unacceptably greater than that from the driving population as a whole (13). There are a number of ways in which license restrictions may decrease crash and traffic violation rates for drivers with medical impairments (14). Driving restrictions may limit a driver to an environment for which he or she has the skills required for safe driving, thereby reducing exposure to more complex or higher-risk traffic situations. Driving restrictions may also change driving behaviour by highlighting limitations to the restricted driver or his or her family. Restricted license holders may self-restrict their driving and drive less frequently or under less demanding conditions, thus decreasing their risk for traffic violations or crashes.

It is interesting to note the strong tendency across the papers reviewed to define restrictive licensing in terms of geographical, time of day, or speed restrictions. Over half the papers also considered personal restrictions such as the wearing of corrective lenses to fall under the category of license restrictions. Vehicle modifications and renewal time of license were also mentioned in individual papers. We propose that the term 'license restriction' be reserved for use in the case of restrictions regarding speed, time of day or geographical restrictions, as these restrictions most closely reflect the definition of the word restricted – the license is invalid outside of certain times or past certain speeds or distances. In contrast, the personal and vehicle modifications, whilst possibly posing an inconvenience or expense for the driver, place the driver on par with any other road user at any time if complied with. The decreased license renewal time, whilst certainly a helpful technique to ensure adequate monitoring of possible problem drivers, cannot truly be considered a restriction in itself as the license is fully valid at all times in between renewal periods provided the driver does not require any other restrictions.

Older drivers may suffer from a variety of medical conditions that could affect their fitness to drive. However, the privilege to drive is a key factor in maintaining an elderly person's mobility, independence and quality of life. Restrictive licensing is often times a means of preserving their license for as long as possible, while maintaining a safe environment on the roads for other drivers. Pathways need to be developed for the rational implementation of such license restrictions. For example, the significant reduction (50%) in crash risk for those restricted from driving at night, prompted one researcher to suggest that it may be prudent to screen all older drivers for visual problems under low-light/low-contrast conditions (12). While older drivers essentially introduce their own graduated driving reduction program through self-regulation, by modifying when, where and how they drive (17), the consistent positive results of the studies reviewed in this paper position formal license restriction as a useful supplement to self-restriction.

The weaknesses in our review include the very small relevant literature base from which to gather data. Further research in this area is required in order to fully validate the effectiveness of license restrictions. Two of the studies also outline the lack of exposure data available for their populations (13, 14). The identification of those patients requiring a driving restriction is another factor that poses a problem particularly if relying on self-reporting (13). There is considerable disincentive to report one's medical problems to the driver licensing agency, a visit to the physician or the imposition of driving restrictions being a possibly undesirable outcome. In one of the the Canadian studies an intrinsic weakness is the requirement for mandatory reporting by physicians of patients who are medically unfit to drive as well as problems in the education and resources available to the physicians in order to determine a patient's fitness to drive (14). Compliance rates with driving restrictions are also important to consider when examining the potential weaknesses of restrictive licensing. Three-quarters of older drivers with geographic area restrictions reported driving 5 miles or more from home (11), suggesting potentially less compliance with a geographic area restriction than with headlight or speed restrictions. The authors suggest that perhaps the noncompliant drivers felt it was necessary to make certain trips, such as going to the grocery store or a doctor's appointment, even if it means violating a restriction. Many older drivers in the North Carolina study with license restrictions (i.e., speed, interstate, daylight) did not identify any restrictions other than corrective lenses (16), implying incomplete adherence to their respective restrictions.

A useful analogy for license restriction for medical conditions arises in Queensland, Australia, where a restricted license is defined as "a license to drive a motor vehicle, issued under the Transport Operations (Road Use Management) Act 1995 to give effect to a court order under section 87, that authorises the holder to drive only in stated circumstances directly connected with the person's means of earning a living." This is also known as a work license. In a study of driving behaviour of drink driving offenders issued with a such license (18), 80 to 85 percent holders were not detected drink driving in the 5 years after they were given their 'second chance', and only a small proportion

of drivers were detected for a drink driving offence while holding a restricted license. This would indicate a possible beneficial role that may be played by restrictive licenses in increasing the mobility of individuals who would previously simply be banned from driving. This scenario could be applied to those with certain medical conditions. If successful, it would greatly reduce the financial hardship and social isolation associated with the loss of ability to drive. However, the scope of this study was limited to subsequent drink driving offences, and did not explore offences relating to compliance with other restricted license conditions, such as only driving during approved times on approved days. Therefore we recommend further research regarding the effectiveness of the work license program.

In addition, the clinical reasoning behind the recommendations for restricted licensing needs to be teased out so as to provide an appropriate basis for the educating and advising physicians, therapists, on-road driving assessors and driver licencing agencies. Early work in this aspect reveals a broad range of reasons for recommending licence restrictions (16).

The major function of license restriction programmes is to impose restrictions on driving privileges of individuals whose medical problems may reduce their driving competence. This must be done in a way that maintains the safety of the roads for the rest of the population, while allowing the restricted individual's to maintain independence and mobility. We believe, based on the results of this literature review, that licensing restriction is an area that holds much promise for increasing road safety for older drivers with age-related disease and disability whilst simultaneously improving mobility for many, if it is implemented and policed in an appropriate manner.

References

1. Charlton J, Koppel S, Odell M, Devlin A, Langford J, O'Hare M, et al. Influence of chronic illness on crash involvement of motor vehicle drivers: 2nd edition. Melbourne: Monash University, Accident Research Centre, 2010 300.
2. Evans L. Traffic safety and the driver. New York: Van Nostrand Rheinhold; 1991.
3. Langford J, Braitman K, Charlton J, Eberhard J, O'Neill D, Staplin L, et al. TRB Workshop 2007: Licensing authorities' options for managing older driver safety--practical advice from the researchers. *Traffic Inj Prev*. 2008;9(4):278-81.
4. O'Neill D. Transport, driving and ageing. *Rev Clin Gerontol*. 2015;25(2):147-58.
5. Marottoli RA, Allore H, Araujo KL, Iannone LP, Acampora D, Gottschalk M, et al. A randomized trial of a physical conditioning program to enhance the driving performance of older persons. *J Gen Intern Med*. 2007;22(5):590-7.
6. Monestam E, Wachtmeister L. Impact of cataract surgery on car driving: a population based study in Sweden. *Br J Ophthalmol*. 1997;81(1):16-22.
7. George CF. Reduction in motor vehicle collisions following treatment of sleep apnoea with nasal CPAP. *Thorax*. 2001;56(7):508-12.
8. Jones JG, McCann J, Lassere MN. Driving and arthritis. *Br J Rheumatol*. 1991;30:361-4.
9. George S, Crotty M, Gelinas I, Devos H. Rehabilitation for improving automobile driving after stroke. *Cochrane Database Syst Rev*. 2014;2:CD008357.
10. American Association of Retired Persons. Graduated driver licensing: creating mobility choices. Washington, DC: AARP, 1993.
11. Braitman KA, Chaudhary NK, McCartt AT. Restricted licensing among older drivers in Iowa. *J Safety Res*. 2010;41(6):481-6.
12. Nasvadi GC, Wister A. Do restricted driver's licenses lower crash risk among older drivers? A survival analysis of insurance data from British Columbia. *Gerontologist*. 2009;49(4):474-84.
13. Vernon DD, Diller EM, Cook LJ, Reading JC, Suruda AJ, Dean JM. Evaluating the crash and citation rates of Utah drivers licensed with medical conditions, 1992-1996. *Accid Anal Prev*. 2002;34:237-46.
14. Marshall SC, Spasoff R, Nair R, van Walraven C. Restricted driver licensing for medical impairments: does it work? *Cmaj*. 2002;167(7):747-51.
15. Langford J, Koppel S. Licence restrictions as an under-used strategy in managing older driver safety. *Accid Anal Prev*. 2011;43(1):487-93.
16. Stutts JC, Stewart JR, Van Heusen-Causey S. An evaluation of restricted licensing for North Carolina's older drivers. Final Project Report prepared for the North Carolina Governor's Highway Safety Program. Chapel Hill, NC: University of North Carolina Highway Safety Research Center., 2000.
17. Charlton JL, Oxley J, Fildes B, Oxley P, Newstead S. Self-regulatory behaviours of older drivers. *Annu Proc Assoc Adv Automot Med*. 2003;47:181-94.
18. Steen K, Osmond S, Leal N. Comparison of the subsequent driving behaviour of drink driving offenders with a restricted (work) licence by BAC group. Australasian Road Safety Research, Policing and Education Conference; Perth, Western Australia 2011.
19. Braitman KA, Ferguson SA, Elharam K. Changes in driver fatality rates and vehicle incompatibility concurrent with changes in the passenger vehicle fleet. *Public Health Rep*. 2007;122(3):319-28.
20. Dugan E, Barton KN, Coyle C, Lee CM. US policies to enhance older driver safety: a systematic review of the literature. *J Aging Soc Policy*. 2013;25(4):335-52.

Table 1: The type of restrictions described in existing papers on restricted licences

Author(s)	Location	Time of day restrictions	Speed restrictions	Geographical restrictions	Personal restrictions	Vehicle modifications	Renewal time restriction
Braitman et al. (19)	Iowa	X	X	X			
Nasvadi et al. (12)	British Columbia	X	X	X			
Langford et al. (15)	Victoria, Australia	X		X	X	X	
Marshall et al. (14)	Saskatchewan	X	X	X			X
Vernon et al. (13)	Utah	X	X	X			
Stutts et al. (16)	North Carolina	X	X	X	X		
Dugan et al. (20)	USA	X	X	X	X		