

Multiple Sclerosis and Traffic Medicine: Examining MS as a Cause for Concern in Irish Road Safety

Introduction and Importance

Collectively, the field of traffic medicine aims to employ a multidisciplinary approach to reducing the harm inflicted on the population by road traffic accidents. This approach incorporates all health care professionals and utilises multiple different methodologies to improve road traffic safety and management of road traffic accidents. While the field encompasses management and care of patients following an accident, it is arguably most impactful owing to its emphasis on preventative medicine. With increasing research on the causes underlying road traffic accidents, the field of traffic medicine is positioned to have a substantial impact on reducing the incidence of road traffic accidents through improved traffic safety policies. Interestingly, in the Irish healthcare setting, the impact of Multiple Sclerosis (MS) on road safety has yet to be thoroughly examined. Given that MS can render patients unfit to drive owing to weakness, changes in vision, and cognitive impairment; the liability of MS patients with respect to road safety warrants further investigation.

Multiple sclerosis is a chronic inflammatory disease of unknown aetiology which affects the central nervous system¹. Demyelination and subsequent axon loss results in neurological impairment of a progressive and debilitating nature². Symptoms of MS include visual impairment, fatigue and muscle spasms. Relapse-remitting MS is most common, with 65% of those affected entering the secondary progressive phase³. Relapse-remitting MS is characterized by episodic neurological symptoms which can appear over a period of several days and subsequently stabilize. Ireland has an unusually high incidence of MS, owing to genetic predisposition in carriers of the HLA DRB1*1501-DQB1*0602 alleles, with prevalence as high as 73 per 100,000⁴. To date, it is estimated that there are approximately 9,000 people in Ireland living with MS, with 290 new cases being diagnosed annually⁵.

A recent case in Ireland involving the accountability of MS patient Rosemarie Gallagher who lost control of her vehicle while driving, killing one pedestrian and seriously injuring three others highlights the topical relevance of MS in road safety and traffic medicine in Ireland⁶. Although the acquitted had been diagnosed with MS more than 26 years earlier, she failed to disclose to her GP an earlier incident on the road in which she inexplicably reversed into a car behind her while trying to exit the carpark. She later explained that her leg had spasmed while driving at the time of the accident, calling into question her fitness to drive and her accountability in the aforementioned tragedy.

While it is certainly understandable that a MS patient might have difficulty forgoing the independence which driving affords them, this particular incident highlights a challenge for healthcare professionals in both identifying patients who may be unfit to drive and in educating patients about their responsibility to stay off the roads if they are unfit to drive. This leaves us to decipher what is best practice when screening MS patients for fitness to drive: should MS patients be allowed to self-monitor for suitability to drive, or should healthcare providers intervene before it is too late?

Correlations between Road Traffic Accidents and Multiple Sclerosis

Although the impact of visual or cognitive impairment on fitness to drive in patients with multiple sclerosis is not especially well studied to date, there are a number of emerging studies which have identified useful clinical parameters for identifying MS patients who are at-risk for fitness to drive. A recent study by Classen et al. assessed the visual correlates of fitness to drive in persons with MS, and concluded that persons with MS made more total and critical driving errors, predictive of crashes relative to older healthy volunteer drivers⁷. The authors assessed adjustment to stimuli, vehicle positioning, and wide lane turns, finding that persons with MS made more adjustment to stimuli ($p=0.02$) and gap acceptance errors ($p=0.03$) compared to healthy control subjects⁷. As a result of this seminal study, Classen et al. conclude that visual-cognitive impairments may be a strong indicator of individuals with MS who are at-risk for fitness to drive.

Historically, there has been minimal research into the correlation between road traffic accident frequency in drivers with MS. Two cohort studies in a Danish population of drivers were some of the first studies suggesting a relationship between drivers with MS and increased frequency of road traffic accidents^{8,9}. Although the correlation remained tenuous, with these publications Ling confirmed that drivers with MS were treated more often at a casualty department after road traffic accidents than healthy controls^{8,9}. In these original publications Ling rightly acknowledges the necessity of further investigation in order to justify any change in practice when deeming individuals with MS unfit to drive.

A subsequent study by Brønnum-Hansen et al. concluded that the risk of death from accidents among persons with MS was 37% higher than the general population, however, the authors did not establish any significant correlation between MS and increased incidence of fatal road traffic accidents¹⁰. However, it is important to acknowledge both the safety of individuals of MS on the road, as well as the safety of others who are traveling at the same time.

Based on a systematic review of literature on interventions to evaluate fitness to drive among individuals with chronic conditions including MS, Marino et al. concluded that neither clinical nor neuropsychological screening tests would lead to a reduction in road traffic accidents involving drivers with a chronic disability¹¹. However, the authors concur on the necessity of developing tests to accurately identify high-risk drivers, enabling physicians to provide guidance to their patients as required.

Evidence of screening-based approaches to evaluate fitness to drive in MS

While the aforementioned studies were some of the first to shed light on the paradigm of drivers with MS as a predictive variable in road traffic accidents, Classen et al. and Krasniuk et al. played a pivotal role in transitioning the focus of the field towards quantitative, screening-based approaches with respect to assessing fitness to drive in individuals with MS.

Although clinical screening is perhaps the most logical approach to identifying MS patients who are at-risk for fitness to drive, researchers at Western University recently tested an on-road assessment for fitness to drive¹². Classen et al. compared a control group of healthy drivers to a group of drivers with MS and concluded that the drivers with MS made more driving errors ($p = 0.03$) and failed the on-road assessment more frequently than the healthy drivers, providing further justification for the need to develop a robust screening process for fitness to drive in individuals with MS¹².

Further to this study, the group investigated driving errors that predict on-road outcomes for persons with multiple sclerosis¹³. Krasniuk et al. hypothesized that measuring adjustment-to-stimuli and gap acceptance errors in individuals with MS would enable prediction of a pass/fail outcome on a standardized road assessment¹³. The authors assessed visual ability and visual attention in 37 patients with MS who then participated in an on-road assessment¹³. Indeed, the number of adjustment to stimuli and gap acceptance errors significantly predicted pass/fail outcome of the on-road assessment ($p < 0.0001$).

Most recently, the group conducted a prospective study to examine the on-road assessment of fitness-to-drive in persons with MS with cognitive impairment¹⁴. The findings by Morrow et al., published in *Multiple Sclerosis* recruited MS patients between the ages of 18-59 years, and assessed cognition using the Minimal Assessment of Cognitive Function battery¹⁴. Following an on-road driving assessment, Morrow et al. demonstrated that visual-spatial memory measured using the Brief Visuospatial Memory Test – Revised (BVMTR-IR), predicted on-road driving assessment failure with a sensitivity of 100%¹⁴. The authors found that 22.2% of subjects were unfit to drive, and concluded that impairment on the BVMTR-IR should signal as a red flag to clinicians when assessing fitness to drive in individuals with MS¹⁴. Although only recently published, these findings highlight the potential for successful development and integration of a fitness-to-drive assessment for individuals with MS.

The current stance of Irish Road Safety Guidelines on Fitness to Drive in Multiple Sclerosis

While the aforementioned studies are arguably applicable to any population in which a road safety regulatory body seeks to monitor fitness to drive in individuals with MS, the notable absence of research on screening for fitness to drive in MS patients in Ireland is surprising insofar as Ireland is known to have an unusually high incidence of the disease. Per the 2019 Irish Medical Fitness to Drive Guidelines¹⁵, Multiple Sclerosis falls under the umbrella of Neurological Disorders, is recognized as a potential threat to vehicle control owing to coordination and muscle power. It is interesting to note that neither visual acuity nor cognitive impairment are referenced under this categorization, as most studies pertaining to MS and fitness-to-drive are centred primarily around visual impairment. In the absence of studies specific to road traffic safety and MS in Ireland, one would expect that Irish road safety regulations would be guided by the relevant literature.

Within the Irish Medical Fitness to Drive Guidelines, persons with MS are categorized into two sub-groups¹⁵. Group 1 consists of individuals who are permitted to drive on a 1-3 year license provided that medical assessment confirms that driving performance is not impaired. Group 2 consists of individuals who are not permitted to drive if their condition is progressive or disabling, and is subject to a consultant assessment and annual review. While this classification system offers the merit of leniency when it comes to making an assessment of fitness to drive, insofar as it advises that rehabilitation and specialist on-road adaptations should be taken into consideration, it ultimately calls into question the rigor and consistency with which fitness-to-drive assessments are being made. It is certainly understandable that the current guidelines are subject to clinician assessment, but one questions whether this does not put more pressure on the clinician, who is perhaps less inclined to impair a patient's independence by deeming them unfit to drive.

Is it possible to improve the current guidelines while maintaining this degree of subjectivity in the assessment? While clinician assessment of fitness-to-drive—a somewhat subjective

metric—offers the advantage of preserving patient independence where it is deemed appropriate, this puts increasing pressure on the clinician or healthcare providers to make a favourable assessment for the patient, requires accurate patient self-reporting, and may put others on the road at greater risk. A more binary measure would arguably take any liability off of both the clinician to make the correct assessment and off of the patient to accurately report any episodes of disease progression. A single metric or test by which a pass/fail result can determine fitness-to-drive would perhaps produce a more justifiable outcome in the eyes of both the patient and of the public.

To this end, Raphail et al. recently published a manuscript in which the relationship between MS symptom severity metrics and driving performance was measured using a virtual reality simulator¹⁶. The authors found that more significant impairment on the Multiple Sclerosis Functional Composite (MSFC) were related to increased difficulty maintaining lane positioning and poorer executive functioning¹⁶. Raphail et al. suggest that screening tools such as the MSFC could help clinicians to identify at-risk MS patients for fitness to drive, promoting them to consider comprehensive driving evaluations earlier on, with the intent of preventing more compromising road traffic accidents. Given the demonstrable accuracy of resources such as the MSFC¹⁷ and the on-road assessment of fitness to drive, it is reasonable to suggest that these quantitative measures of fitness to drive should be incorporated into the Irish Medical Fitness to Drive guidelines.

Future Directions

Prior to consideration of revised fitness-to-drive assessment guidelines in Ireland, it would be essential to survey clinician and patient opinion regarding potential advantages or disadvantages of incorporating an increasingly binary assessment of fitness to drive. Nevertheless, the advantages offered by a clear, objective metric would likely outweigh any disadvantages of revising the current Irish Medical Fitness to Drive guidelines for individuals with MS. The limited number of studies examining the relationship between MS and road traffic accidents focus on casualties incurred on the drivers with MS, and do not take into account casualties incurred on other drivers on the road owing to on-road errors of an individual with MS. When considering the scope of traffic medicine, it is important to procure Irish road safety guidelines which take into account the safety of all drivers on the road. In striving to create a more equanimous system, clear, quantitative metrics have proven to be reliable indicators of fitness-to-drive for individuals with MS, and should be considered as a viable alternative moving forwards.

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