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Self-reported vs state-recorded motor vehicle collisions among older community dwelling individuals

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ABSTRACT

Introduction: Motor vehicle collisions (MVCs) continue to place an increased burden on both individuals and health care systems. Self-reported and state-recorded police reports are the most common methods for MVC evaluation in epidemiologic studies, with varying degrees of agreement of information when compared in previous studies. The objective of the current study is to address the differences in MVC reporting and provide a more robust measure of the agreement between self-reported and state-recorded MVCs in a community dwelling population of older adults.
Methods: A three-year prospective study was conducted in a population-based sample of 2000 licensed drivers aged 70 and older. At annual visits, participants were asked to self-report information on any MVC that occurred over the prior year where police were called to the scene. Information on police-reported MVCs was also ascertained from Alabama official state-recorded databases. The kappa coefficient was calculated to determine overall agreement between any self-reported and state-recorded crashes, as well as the raw number of crashes reported. In addition, agreement was stratified by demographics, health status, medication use, functional status (i.e. vision, cognition), and driving habits.
Results: 1747 participants who completed three years of follow up were involved in 225 state-recorded MVCs and 208 self-reported MVCs yielding overall substantial agreement between any self-report and state-recorded MVC (kappa = 0.64). Cumulative number of self-reported and state-recorded MVCs was also compared, with agreement slightly reduced (kappa = 0.55). The clinical characteristic resulting in the greatest variation in agreement with drivers was impaired contrast sensitivity showing better agreement between self-reported and state-recorded MVCs (kappa = 0.9) than those with non-impaired contrast sensitivity (kappa = 0.6).
Conclusion: Study results showed substantial agreement between self-reported and state-recorded MVCs for any MVC involvement among the study population. When examining the reporting of the total number of MVCs over the three year period, agreement was reduced to a moderate level. There was consistency in agreement across MVC risk factors except among individuals with contrast sensitivity. These findings have implications for the design and analytic planning of epidemiologic and clinical research focused on MVCs.

1. Introduction

In 2012, over 2.5 million people were treated in emergency departments due to MVCs which contributed to over 18 billion dollars in medical care expenditures, one million days in hospitals, and 33 billion dollars in lifetime work losses (National Center for Injury Prevention and Control, D.o.U.I.P, 2015; Centers for Disease Control and Prevention, N.C.f.I.P.a.C, 2015). On a per mile basis, MVC related mortality disproportionately affects both younger and older adults (Tefft, 2008). The high mortality rate for younger drivers is attributed to their increased MVC incidence, whereas for older drivers, it is attributed to increased MVC case fatality (Stevens and Dellinger, 2002). It is well established that the risk factors for MVCs differ between younger and older populations (Insurance Institute for Highway Safety, H.L.D.I, 2015). For example, inadequate driving experience and risky behaviors, such as speeding and drunk driving, are responsible for a greater proportion of MVCs among

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younger populations than older (Insurance Institute for Highway Safety, H.L.D.I, 2015). In contrast, physical, medical, and cognitive factors contribute more to MVCs in older adults (Cross et al., 2009; Jagnoor et al., 2014). However, research on risk factors for MVCs among older drivers has yielded inconsistent findings, which may be partly attributed to differences in how information on MVCs has been ascertained (af Wahlberg, 2011).

The most common methods for obtaining information on MVC occurrence are self-report and administrative records (i.e., police accident reports) (Marottoli et al., 1997). Financial, political or logistical constraints may influence the decision to use one method versus another. This is not an inconsequential choice as any lack of agreement may hamper comparisons between studies seeking to identify risk factors. A number of studies have evaluated the agreement between these two methods of ascertainment and reached different conclusions (Marottoli et al., 1997; McGwin et al., 1998; Arthur et al., 2005; Anstey et al., 2009). Marottoli et al. in a study of community dwelling older adults aged 72 years and older and McGwin et al. in a study of a sample of older adults aged 55 years and older compared self-report versus state-record and found moderate agreements (k = 0.40 and 0.45, respectively) (Marottoli et al., 1997; McGwin et al., 1998). Similarly, Anstey et al. reported a poor agreement between two reporting methods in a prospective cohort study of older drivers aged 65–95 years(Anstey et al., 2009). In addition, Arthur et al., detected poor agreement between self-reported and police-documented MVCs in drivers aged 37 years on average (Arthur et al., 2005). Owsley et al. and Ball et al. also reported poor agreements on self-reported and state-recorded road accidents among older drivers aged 55 years and older (Owsley et al., 1991; Ball et al., 1993).

There are a number of possible explanations for the resulting heterogeneity between studies, such as different study populations (e.g.: cognitive status, age), study designs, and reporting methods (McGwin et al., 1998; Arthur et al., 2005; Anstey et al., 2009). For example, drivers may recall MVC events more accurately within one year compared to five years (Marottoli et al., 1997; McGwin et al., 1998). Any lack of agreement between MVC reporting methods is of a particular concern if it is systematic, thereby potentially producing biased results. The current studies aims to account for these potentially systematic differences, while considering clinical and behavioral characteristics that could influence agreement.

To address the limitations found in the previous literature, the objective of the current study is to measure the agreement between self-reported and state-recorded MVCs over a three-year period in a community dwelling population of older adults aged 70 years and older.

2. Methods

2.1. Study design and population

The Institutional Review Board at the University of Alabama at Birmingham approved this study. As described previously, a population of 18,544 community dwelling older drivers who resided in north-central Alabama were contacted to participate in this study (Owsley et al., 2016). People who were 70 years or older, had a current Alabama driver's license, drove in the previous 3 months and spoke English were eligible for inclusion. In total, 2000 drivers were enrolled between October 2008 and August 2011 and were followed-up at 1-year intervals for three subsequent years. Although crash data was obtained for all enrolled study participants, the analysis was limited to those with complete follow-up to most accurately assess overall agreement and MVC frequency agreement.

2.2. Data collection

Following written informed consent, self-reported baseline characteristics including demographics, chronic health conditions, medications, functional status, and driving habits and history were collected by a trained interviewer. Clinical characteristics (e.g.: health conditions, medications, visual impairment) and driving habits were included in this study to account for factors that could modify the participants ability to self-report MVCs. These factors were of particular interest due to their potential to affect recall, amount of driving exposure, or frequency of minor accidents that aren't state-reported. All participants were notified at enrollment that state-recorded MVCs would be collected as part of the study.

Participants were asked about the presence or absence of 15 chronic medical conditions. In addition, participants provided a self-reported measure of health status. The presence of common chronic eye conditions was obtained from a chart review based on a recent eye examination by an ophthalmologist or optometrist. The diagnosis of cataract, glaucoma, diabetic retinopathy, age-related macular degeneration, or intraocular lens of either eye was considered. The use of any prescription medication that the study participant was "currently taking" was assessed at the baseline visit. Participants brought their medications with them so the actual substance name and dosage could be recorded. Each prescription medication was assigned a code from the American Hospital Formulary Service classification system. For the current analysis, self-reported chronic medical conditions were summed and used as a measure of health status; a similar approach was taken for medications.

Visual function assessments were also performed. These tests were selected because of their established relevance for driving safety and were performed under habitual correction (Owsley and McGwin, 2010; Owsley et al., 2001). All tests were administered under binocular viewing. Visual acuity was assessed using the Electronic Visual Acuity system and expressed the log minimum angle resolvable, with normal to good visual acuity defined as 20/40 to 20/20 and poor visual acuity as worse than 20/40 (Beck et al., 2003). Contrast sensitivity was assessed using the Pelli-Robson Contrast Sensitivity Chart and scored by the letter-by-letter method, with greater than or equal to 1.5 as high contrast sensitivity and less than 1.5 as low contrast sensitivity(Elliott et al., 1991; Pelli et al., 1988). The driving visual field was used to assess peripheral vision (Huisingh et al., 2016). The Useful Field of View (UFOV) subtest 2 (Visual Awareness Research Group, Punta Gorda, FL) and Trails B test were used to assess visual processing speed under divided attention (Edwards et al., 2006; Reitan, 1955). Impaired UFOV performed was defined as moderate impairment (scores 150–350 milliseconds (ms)) and severe impairment (scores >350 ms) (Ball et al., 2006). Performance on Trails B was defined as scores $\geq$2.47 min (Ball et al., 2006; Goode et al., 1998). Cognitive status was measured using the Mini-Mental State Examination (MMSE) with cognitive impairment defined as a score of $\leq$23 (Folstein et al., 1975).

The Driving Habits Questionnaire (DHQ) was used to collect information on driving exposure (miles, days, trips, and places driven in a typical week, and estimated yearly mileage driven) (Owsley et al., 1999). At each follow-up visit, the DHQ was also used to ask participants to report if they were involved in any MVC in the past 12 months where they were the driver, whether they were at-fault, the month and year of the MVC and whether the police were called to the scene. For the current analysis, only MVCs where police were called to the scene were considered. Examiners were unaware of the crash histories of study participants. In addition, information regarding police-reported MVCs was obtained from the Alabama Department of Public Safety (AL DPS). Only those MVCs that occurred between each participant's enrollment date