Driving Ability and Transportation Needs of Older Drivers Treated in an Emergency Department

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Key Findings

- Despite having medical conditions associated with increased crash risk, many older drivers over estimated their driving ability.
- Some older drivers may require further functional assessment upon discharge from an emergency department before resuming their normal driving activity.

Abstract

The number of older Canadians is growing rapidly and many will continue to drive to meet their transportation needs. Most older drivers are safe drivers; however, with advancing age, some develop medical conditions and associated impairment that may affect their driving ability. Often these medical conditions are first recognized when they seek emergency care. In this cross-sectional study, we collected data on a sample of 92 older drivers (57 males and 35 females) aged ≥ 70 years, who were treated in an urban emergency department (ED) for acute illness or injuries. We asked about their perceived driving ability, driving habits, and transportation needs. About one third of respondents had never taken public transit in the past year. Most drove for grocery shopping, visiting family and friends, and medical appointments. Sixty eight drivers also agreed to take tests for cognitive ability, visual acuity and reaction time. All 68 drivers passed vision screening and no drivers showed severe cognitive impairment. However, ten drivers (10/68, 14.7%) failed the Trail Making Test B test and 14 drivers (14/68, 20.6%) had slow reaction time according to a ruler drop test. Medical chart review revealed that close to 40 percent were taking sedating medications that could impair driving and 20 percent had a discharge diagnosis of a medical condition that could potentially affect their driving. In conclusion, many ED older drivers depend on driving to meet their mobility needs. Screening tests and medical chart review suggest that some of these drivers may have conditions that could affect their ability to drive safely.

Keywords

Older drivers, Driving ability, Transportation needs.

Introduction

The most recent Canadian census revealed that the older Canadian population is growing at a faster rate than anticipated (Statistics Canada, 2014). Since older adults are living in their own homes for longer and are staying more active, mobility is important for their quality of life. Many will continue to depend on their own vehicles to meet their mobility needs. Driving however is a complex task requiring a combination of perceptual, cognitive and motor skills. A capable driver must be able to see and hear clearly (perception functioning), interpret the meaning to choose a correct course of action (cognitive functioning), and then execute the action appropriately (motor skills). These skills form the basis of fitness to drive assessment (Devos et al., 2011; Mathias & Lucas, 2009; Reger et al., 2004). As people age, many will experience some decline in the visual, cognitive and/or psychomotor skills that are required to operate a motor vehicle effectively and safely. When functional declines reach a critical point, the individual is deemed unfit to drive. Unfit drivers are found in all age groups but are more common in the older population. This may explains the increased crash risk in some older drivers (Marshall, 2008; Charlton et al. 2004; Vaa, 2003). Many

have predicted a large increase in the number of older drivers on the roads as our population continues to age (Meuleners, Harding, Lee, & Legge, 2006; NHTSA, 2008; Sivak & Schoettle, 2012; Statistics Canada, 2010) and it is not unreasonable to suggest that the number of medically unfit drivers will also increase significantly.

The large majority of older drivers are safe drivers and have a low per capita crash rate (Langford, Bohensky, Koppel, & Newstead, 2008b; Lyman, Ferguson, Braver, & Williams, 2002). However, when driving exposure is taken into account, the crash rate (per distance travelled) of drivers aged 70 and above rises steadily and exceeds that of drivers aged below 24 (Langford, Koppel, McCarthy, & Srinivasan, 2008c; Ryan, Legge, & Rosman, 1998). Langford and colleagues (2006, 2008c) noted that the high collision rate per distance travelled seen in older drivers may be explained by "low mileage bias", wherein people of all ages who drive less tend to have more crashes per distance travelled (Langford, Methorst, & Hakamies-Blomqvist, 2006; Langford, Koppel, McCarthy, & Srinivasan, 2008c).

Many older drivers with declining ability will voluntarily limit their road exposure and avoid difficult driving situations, but there is a subset of drivers who do not recognize their reduced driving abilities and do not limit their driving appropriately. This was demonstrated in some studies which showed that a substantial number of older drivers continue driving despite significant cognitive impairment (Carr, Jackson, & Alquire, 1990; Odenheimer, 1993). Older drivers generally tend to reduce their overall amount of driving and modify their driving by avoiding various driving situations such as driving in bad weather or at night. These changes in driving patterns, referred to as self-regulation of driving, are regarded as a strategy for older drivers to continue to drive safely despite functional decline. However the effectiveness of self-regulation of driving in lowering crash rates has yet to be demonstrated (Man-Son-Hing, Marshall, Molnar, & Wilson, 2007). Part of the reason for this inconclusive evidence of effectiveness is that self-awareness of functional decline is often not the main reason for self-regulation of driving (Meng & Siren, 2015). Some drivers who modify their driving behaviours not because of the self-regulation but rather a change in lifestyles or driving preferences (Molnar et al., 2013). Further, some at risk drivers lack insight into the warning signs of cognitive impairment or declining health and may overestimate their driving skills and many would not report problems to their physicians (Carr et al., 1990; Odenheimer, 1993). When drivers overestimate their driving ability, it undermines the ability of self-regulation strategies to reduce crash risk (Horswill, Sullivan, Lurie-Beck, & Smith, 2013). Horswill and colleagues (2013) found that many older drivers have poor judgment regarding their ability to perceive driving hazards.

Another reason that some at risk drivers are reluctant to reduce their driving is related to their transportation needs. The lack of reliable and acceptable alternative modes of transportation can be a barrier of self restriction and driving cessation for many older drivers. This is especially true for older drivers with declining physical strength or with

physical impairment that precludes them from walking or taking public transit (Adler & Rottunda, 2006). Fear of losing independence is another reason that some medically at risk drivers continue to drive.

Some older drivers do lose confidence in their ability to drive and tend to avoid difficult situations such as nighttime driving (Baldock, Mathias, McLean, & Berndt, 2006; Betz & Lowenstein, 2010) and some simply stop driving completely. It is important to differentiate general reduction in driving (i.e. fewer trips or shorter distance travelled) from avoidance of certain driving situations (Meng & Siren, 2015; Molnar et al., 2013). Reduction in driving can be a consequence of reduced need for mobility, whereas avoidance of specific driving situations appears to be motivated by negative feelings such as feeling of discomfort or stress when driving in those situations (Hakamies-Blomqvist & Wahlström, 1998; Molnar et al., 2013) and probably not due to self-awareness of functional decline (Meng & Siren, 2015).

Some older drivers have difficulty knowing whether they should continue driving or not. Alonso and colleagues (2017) examined the perception of certain health conditions on driving performance in a group of older drivers in Spain (Alonso, Esteban, Useche, & Serge, 2017). Most participants were not aware that certain common health conditions, such as diabetes, joint pain, or hearing problems, could negatively impact their driving performance. In a study based on interviews and self reporting of 150 older patients (60-95 years of age) from acute care and rehabilitation wards, Kelly and colleagues (1999) concluded that a high proportion (29%) of current older drivers should not be driving at all (6 out of 21 current drivers) and that close to 44 percent of patients who believed that they were eligible to drive were actually under driving restrictions (Kelly, Warke, & Steele, 1999). Despite a very small sample size, the study by Kelly et al. (1999) does highlight that some at risk older drivers may be overly confident in their driving ability and do not feel the need to avoid difficult driving situations. Most commonly, these situations include rush hour driving, parallel parking, driving at night in the rain, and making left-turns across oncoming traffic (right turns in right-hand driving countries).

To keep the public safe and to protect the at-risk drivers themselves, more stringent screening for medically unfit drivers may be helpful. Excessive screening, however, can increase healthcare burden and also act as a barrier to the preservation of independence for older adults. Currently, the provincial government of British Columbia (BC) requires drivers over the age of 80 to be assessed for fitness to drive by a physician every 2 years. No formal assessments are needed for drivers under the age of 80 unless they have been reported to the licensing authority as potentially unfit to drive (for example because of poorly controlled seizures). Although age-based assessments have not been proven to be effective in reducing crash risk (Langford, Fitzharris, Koppel, & Newstead, 2004), many licensing authorities continue to conduct regular age-based assessment using tests that have little or no validity or capability to separate unfit drivers from competent drivers (Fildes, 2008). Futhermore,

it is not known how many older drivers actually self-identify as unfit drivers and have stopped driving on their own.

The gold standard for determining fitness to drive is on-road driving performance (Dickerson, Meuel, Ridenour, & Cooper, 2014). Physicians often have knowledge of their patients' medical history and functional limitation, but even so, recognition of medically unfit drivers can be difficult wihout on-road assessment. Previous research, including a survey of BC physicians conducted by our team, has shown that many medical professionals lack training and knowledge of assessing and reporting unfit drivers (Brubacher et al., 2018). In a study comparing physician judgement with on-road test outcomes, Meuser and colleagues (2016) found only a moderate agreement between the two assessments. Of drivers rated by physicians as "likely capable", 27 percent failed the road test (Meuser, Berg-Weger, Carr, Shi, & Stewart, 2016). Conversely, of those rated as "unclear" or "not capable", 62 percent passed the road test. Similarly, Fox and colleagues (1997) found that physician prediction of a patient's driving ability was not associated with patient's on-road performance. In that study, 37 percent of dementia patients were judged as safe to drive by on-road assessment, suggesting that the diagnosis of dementia alone may not be sufficient to recommend driving cessation (Fox, Bowden, Bashford, & Smith, 1997). Currently, many existing guidelines for assessing fitness to drive are not evidence-based (Salmi, Leproust, Helmer, & Lagarde, 2013) and other researchers concluded that no single screening test should be used alone to determine driving fitness based on age (Langford, 2008a). A systematic review of studies on the validity of in-office fitness to drive assessments concluded that the clinical tests employed in these studies were not consistently related to measures of driving performance (Marino et al., 2013) or that they had poor predictive value of true unfit drivers (Bedard, Weaver, Darzins & Porter, 2008; Anstey, Wood, Lord & Walker, 2005) even though there were statistically significant association between test and crash risk. There is still no consensus on the most appropriate in-office screening tools for detecting medically unfit drivers (Carr & Ott, 2010).

Despite these limitations, a wide variety of tools are still being used by driver rehabilitation specialists for determining fitness to drive (Dickerson, 2014). A Delphi study by Rapoport et al. 2014 found that the strongest predictors of physician decision in reporting drivers with mild cognitive impairtment and mild dementia were caregiver (family) concern and abnormal performance on the clock drawing test (Rapoport et al., 2014). The authors recommended that all uncertain cases be referred for on-road assessment. Another cognitive test assessing divided attention or cognitive flexibility, the Trail Making Test Part B (TMTB) developed by Reitan (1958), has also been used widely to identify at risk drivers (Classen et al., 2008; Stutts, Stewart, & Martell, 1998). Studies of community dwelling older adults found that results of TMTB were significantly correlated with on-road assessment of driving performance (Wood, Anstey, Kerr, Lacherez, & Lord, 2008), and with recent crash involvement (Edwards et al., 2008). In Canada, TMTB is also recommended in the guidelines from the Canadian

Medical Association and the Canadian Council of Motor Transport Administrators as one of the cogntive assessments. In their review of tools predicting fitness to drive in older adults, Dickerson et al. (2014) concluded that no single screening tool should be used in isolation to make decision on whether or not one should stop driving. Dickerson and colleagues (2014) further commented that their findings did not mean that driver fitness screening tools should not be used at all, but merely that careful consideration of why and when these tools are used is important.

Reviews conducted by Marshall (2008), Vaa (2003), and Charlton et al. (2004) concluded that many medical conditions do affect one's driving abilities though some evidence remained inclusive. These reviews suggested that conditions such as vision impairment (e.g. untreated cataracts), cardiovascular diseases, musculoskeletal disorders, cerebrovascular disease/traumatic brain injury and hearing impairment may be associated with a slight increase in crash risk, whereas alcohol dependence, epilepsy, diabetes mellitus, schizophrenia, depression, dementia, medications that affect central nervous system and untreated sleep apnoea may have a moderate to high relative risk of crashing. In an updated review by Charlton and colleagues in 2010 find that there was however no consistent and clinically convincing evidence to link some of the cardiovascular diseases to the risk of crashing (Charlton et al., 2010). Using medical diagnosis alone to determine driving fitness in older drivers is problematic because many older drivers will have multiple conditions with varying degrees of severity. Given the accessibility of family physicians and their capacity to evaluate a range of medical conditions and social supports, primary care is a logical first point of contact in the process of evaluating fitness to drive. However, based on current evidence, it is unclear whether physician assessment in the primary care setting provides an accurate and timely prediction of driving safety, especially when there are no obvious signs of driving impairment. In addition, family physicians may not report potentially unfit drivers to the licensing authorities due to fear of damaging doctor-patient rapport. On the other hand, with advancing age, older adults are likely to develop medical conditions and associated impairments that eventually affect their driving ability. Often these medical conditions are first recognized in the emergency departments (EDs) when patients present with an acute illness or injury from, for example, a fall or driving incidence. In addition, some patients with chronic conditions do not have a primary care physician but seek care in the EDs.

In summary, older drivers who live in their own home are most likely to have access to their own vehicles and are generally safe drivers due to self regulation. However, as these conditions progress, driving cessation may be inevitable. Often these critical stages are first recognized when older patients present at the EDs with injuries or with acute manifestation of a severe underlying medical condition. The objectives of this study are to (1) examine older drivers' awareness of their driving ability, (2) estimate the number of older drivers who may have cognitive decline or conditions that could affect their ability to drive

safely, and (3) explore their attitudes towards using public transportation from the perspective of ED older patients.

Methods

This was a cross-sectional study of 92 older drivers aged >70 who were treated in the Vancouver General Hospital Emergency Department (ED), an urban tertiary centre in Vancouver, Canada, between August and September 2017. During times when research assistants were available, we systematically sampled all patients aged > 70 years who registered for treatment. This study was approved by the University of British Columbia Research Ethics Board and by the Vancouver Coastal Health Research Institute.

We recruited patients aged >70 years who live in their own homes and were current drivers. In this study, we defined current drivers as those who hold a valid BC driver's license and reported that they have driven at least once in the past 4 weeks. Patients who came from a nursing facility, were unable to communicate in English effectively, or were unable to be interviewed due to pain or illness were excluded.

We collected data from 3 sources: 1) structured questionnaire interview, 2) medical records and 3) functional screening tests: cognitive screening, reaction time test, and test of visual acuity. The interview asked questions about driving habits, the common purpose(s) of driving trips, awareness of any prescribed medications that could negatively influence driving ability, difficulty driving in certain situations, and opinion regarding alternative forms of transportation. We also obtained patients' consent to review their ED medical record to identify potentially impairing medications and/or medical conditions that may impair driving ability according to the literature (Vaa, 2003, McGwin, Sims, Pulley & Roseman 2000). Specifically, we looked for ED discharge diagnoses such as alcohol dependence, epilepsy, diabetes mellitus, schizophrenia, dementia, cardiovasular diseases, neurological disorders, impaired vision, and sedating medications such as analgesics, antipsychotics, anxiolytics and benozodiazepines. The functional assessment, which included tests of vision, reaction time and cognitive function, was conducted at the end of the interview. Cognitive status was assessed with Trail Making Test B (TMTB) and the Mini-Mental State Examination (MMSE). We chose TMTB test because it measures executive functioning required for driving and has been shown to correlate with driving performance and crash risk in older drivers (Classen et al. 2008, Stutts et al. 1998). The cut-offs of 180 seconds or 3 errors TMTB were commonly used in previous studies by Classen et al. (2008) and Stutts et al. (1998). We chose a score ≤17 for MMSE (indicating severe cognitive impairment) as a cut-off in this study because higher cut-offs are poorly correlated with on-road performance, especially when the MMSE is used in isolation (Crizzle, Classen, Bédard, Lanford, & Winter, 2012). We used the Snellen Eye Test for visual acuity and the timed ruler drop to assess reaction time (Eby, Molnar, Shope, & Dellinger, 2007; Wilson & Pinner, 2013: Dickerson 2014).

For safety reasons, patients who were found to be potentially unsafe to drive were advised to discuss their driving with their family physicians. If patients did not have a family physician or were unwilling to follow up with their family physician, we referred them to the emergency department medical staff for further evaluation.

Statistical Analysis

In this study we divided participants into two age groups: drivers aged 70-79 and drivers aged > 80 because drivers aged 80 or over are required to undergo medical assessment of their fitness to drive in BC. We hypothesized that there would be differences in self-awareness of driving ability, and in driving behaviours between these two age groups . We used cross tabulation to describe the characteristics of participating drivers and their driving abilities. Chi Square test or Fisher's exact test for proportions was used to explore differences in driving abilities, driving habits, medical conditions and transportation needs between the two age groups.

Results

A total of 132 older driver patients met the inclusion criteria and 92 (70% response rate; 57 males and 35 females) agreed to participate as shown in Figure 1. The age and sex distributions of the 40 patients who declined to participate were similar to those of participants. The most common reason for declining to participate was being too tired to answer questions, followed by fear of losing their driver license. The average age of participants was 79.1 (SD=6.4) ranging from 70 to 95 years old with 54.3 percent (50/92) in the younger group (aged 70-79) and 45.7 percent (42/92) in the older group (aged >80) as shown in Table 1. The great majority of participants (n=86, 93.5%) own a vehicle and 55 (59.8%) drove daily or almost daily. The main reasons they drove in past year were grocery shopping (87.0%), visiting relatives or friends (71.7%) and medical appointments (45.7%). There were no statistical differences in the common reasons for driving between the two age groups, although a slightly higher proportion of older age group said grocery shopping was the main reason they drove in past year while slightly more younger age group drivers drove for medical appointments. Overall, most respondents (69/92, 75%) perceived themselves as good to excellent drivers, although 14 (15.2%) had a crash in the past year. A higher proportion of drivers aged 70-79 years considered themselves as "*good to excellent*" drivers (86.0% vs 61.9% of drivers ≥ 80 years, *p*=0.008).

Overall, 26 drivers (28.3%) had considered giving up driving but few of them had discussed their driving with family members (10/26, 38%) or with their family doctor (2/26, 7.7%). As expected, a higher proportion of drivers aged ≥ 80 considered giving up driving (40.5% vs 18.5% for drivers aged 70-79, *p*=0.017). Over a third of drivers (36/92, 39.1%) planned to continue driving until they died or were unable to drive, and the percentage of drivers with this response was similar in both age groups. Many drivers (38%) avoided three or more difficult driving conditions
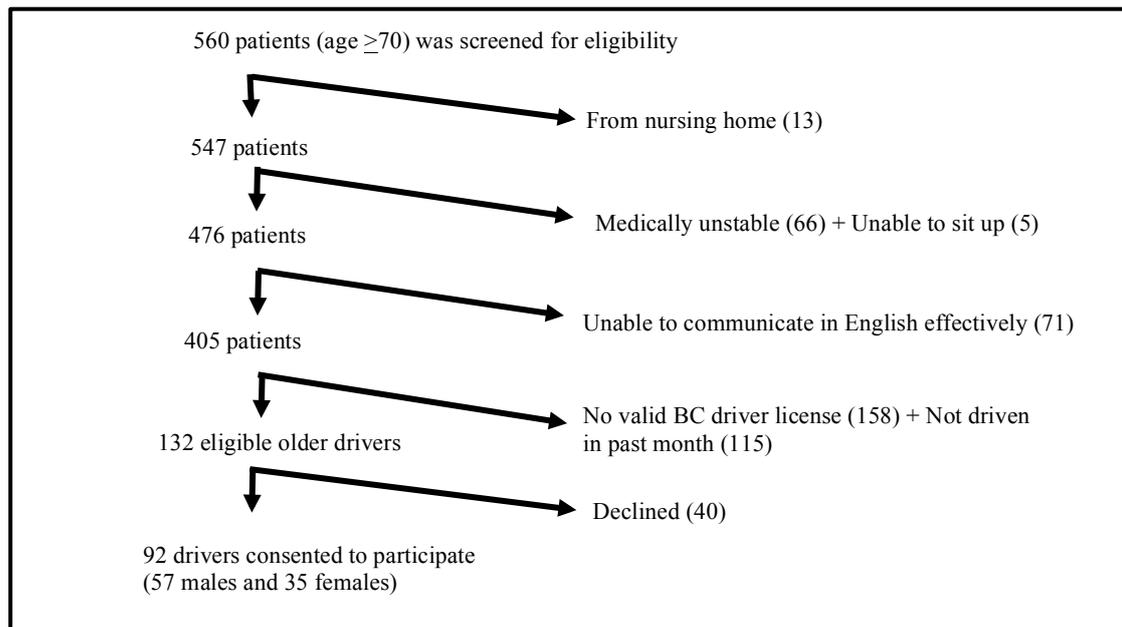
Figure 1. Number of older patients included and excluded

Table 1. Characteristics of participating older drivers

	Total (N=92) n (%)	Age 70–79 (N=50) n (%)	Age ≥ 80 (N=42) n (%)	p-value
Male	57 (62.0%)	31 (62.0%)	26 (62.0%)	0.993
Own vehicle	86 (93.5%)	46 (92.0%)	40 (95.2%)	0.398
Drove daily in past month	55 (59.8%)	31 (62.0%)	24 (57.1%)	0.636
Most common reasons for driving:				
Grocery shopping	80 (87.0%)	41 (82.0%)	39 (92.9%)	0.124
Visiting relatives/friends	66 (71.7%)	37 (74.0%)	29 (69.0%)	0.599
Medical appointment	42 (45.7%)	25 (50.0%)	17 (40.5%)	0.361
Perceived good to excellent driving skills	69 (75.0%)	43 (86.0%)	26 (61.9%)	**0.008**
Considered giving up driving	26 (28.3%)	9 (18.0%)	17 (40.5%)	**0.017**
Considered continuing driving till unable/death[a]	36 (39.1%)	20 (40.0%)	16 (38.1%)	0.852
Taken public transit in past year	61 (66.3%)	34 (68.0%)	27 (64.3%)	0.707
Preferred public transportation than driving	28 (30.4%)	14 (28.0%)	14 (33.3%)	0.580
Self reported impairing medication uses[b]	15 (16.3%)	10 (20.0%)	5 (11.9%)	0.295
Prescribed impairing medications in last 30 days	39 (42.4%)	21 (42.0%)	18 (42.9%)	0.934
Discharge diagnoses that potentially affect driving skills[c]	19 (20.7%)	10 (20.0%)	9 (21.4%)	0.866
Avoiding three or more difficult driving conditions[d]	35 (38.0%)	19 (38.0%)	16 (38.1%)	0.993

[a] Participants were asked how many more years they will drive.
[b] Self reported medication uses for sleep, anxiety and/or depression.
[c] Discharge diagnoses included cardiac diseases, syncope and anxiety.
[d] Difficult driving conditions included night time driving, rainny or snowy days, high traffic and highway.

Table 2. Results of cognitive function and reaction time tests

	Total n/N (%)	Age 70 – 79 n/N (%)	Age ≥ 80 n/N (%)	p-value
Drivers agreed to screening	68/92 (73.9%)	34/50 (68.0%)	34/42 (81.0%)	0.159
Failed TMTB[a]	10/68 (14.7%)	5/34 (14.7%)	5/34 (14.7%)	0.999
Slow reaction time[b]	14/68 (20.6%)	5/34 (14.7%)	9/34 (26.5%)	0.369
Failed TMTB or reaction time	21/68 (30.9%)	9/34 (26.5%)	12/34 (35.3%)	0.431
Failed both tests	3/68 (4.41%)	1/34 (2.9%)	2/34 (5.9%)	0.999

[a]TMTB=Trail Making Test B

[b] Ruler Drop Reaction Time test

including night time driving, driving in heavy traffic, highway driving, and driving in bad weather.

When asked about public transportation, 61 drivers (66.3%) had taken public transit in the past year. Most (82/92, 89%) knew about special transportation services available for seniors (provided by local transit systems and volunteer driver programs) but only 11/82 (13.4%) had used those services in the past year. Of all the drivers interviewed, only 28 (30.4%) preferred public transportation over driving. For those who preferred driving, many cited convenience as the main reason for their preference. For those who preferred public transportation to driving, only 3 drivers cited safety concern and stress free travel as the reasons. Others indicated difficulty in finding parking in the city, environment (climate changes) and social responsibility, and ease of accessing transit as reasons for their preference. Overall, the responses were similar in the two age groups.

Fifteen drivers (15/92, 16.3%) self-reported using potentially impairing medications such as sleep aids and antidepressants. Slightly more drivers aged 70-79 reported using these medications (20% vs 11.9% drivers aged >80, p=0.295) though the difference was not statistically significant. Medical chart review showed that 19 drivers (20.7%) were diagnosed at ED discharge with medical conditions (including cardiac diseases, syncope/collapse and anxiety attack) which have been shown previously to be associated with higher crash risk (although the severity of the medical condition was generally not described). In addition, on review of recent prescriptions, we found that 42.4 percent (39/92) of all drivers had been prescribed at least one sedating medication in the past 30 days whereas only 16.3 percent patients self-reported taking these types of medications.

Sixty eight drivers (73.9%) agreed to take the functional screening tests. Overall there were no statistically significant differences between the two age groups in all functional screening tests as shown in Table 2. No drivers scored below 17 which indicates severe cognitive impairment in MMSE test. All drivers passed the visual acuity test with their corrective eyeglasses. However, 10 drivers (10/68 14.7%) had poor scores on the TMTB test (requiring >180 seconds or had more than 3 errors). Fourteen drivers (20.6%) had a reaction time over 0.248 second indicating reaction time

deficiency in the ruler drop test; a slightly higher proportion of drivers with reaction time deficiency was found in the older age group (26.5% aged > 80 vs 14.7% aged 70-79, p=0.369) though the difference was not statistically significant.

Among these 68 drivers who were screened for functional tests, 54 drivers (31 aged 70-79 and 23 aged >80) self-rated as *good to excellent* drivers. However, among these self rated good-excellent drivers, 29 percent (9/31) drivers aged 70-79 and 21.7 percent (5/23) drivers aged >80 had poor scores on either the Trail Making Test B or on the Ruler Drop Reaction Time test, indicating that some of drivers may have over estimated their driving ability. In particular for the cognitive test, a non-statistically significant higher proportion of young older drivers (aged 70-79) had performed below the cut-offs in Trail Making Test B comparing to old older drivers (aged >80 (16.1% vs 8.7%, p=0.685). For the 21 drivers who performed below the cut-offs in TMTB or reaction time, 5 (24%) had a crash last year and 11 (52%) avoided driving in more than 3 difficult conditions, whereas among the 47 drivers who passed both the TMTB and reaction time tests, 5 (11%) had a crash in the last year and and 15 (32%) avoided driving in more than 3 difficult conditions.

Discussion

Similar to findings from other studies on aging and driving, this study found that driving was the first choice of mode of transportation among the older drivers. However, aging is often associated with the onset of chronic medical conditions that may affect ability to drive. The medical chart reviews showed that at least 20 percent of our sample of older drivers visiting an emergency department had discharge diagnoses which are sometimes reported to be associated with higher crash risk. Overall, 16 percent of drivers in our sample reported using impairing medications, and 42.2 percent drivers had been prescribed sedating medications in the past 30 days. Our findings suggest that ED physicians and nurses should be aware of the driver status of their older patients and, if needed, should provide them with guidance on their driving ability .

We found that a high proportion of participants in our sample had slow reaction time and/or performed below cut-offs

in Trail Making Test B. The interpretation of these results requires caution. Although patients were tested at bedside with a privacy barrier (such as curtain), the emergency department is a busy and sometimes distracting environment (with noise and the presence of medical staff). In addition, most patients in the emergency department are there for acute medical conditions or injuries which might affect their performance. Nevertheless, previous researchers have found that the ED environment has a minimal effect on the Trail Making Test B test and suggested that this can be used to screen drivers in the ED setting (Betz and Fisher, 2009). The high proportion of drivers who performed below the cut-offs in the TMTB and/or reaction time tests suggests that the emergency department may be a suitable place to identify (for referral) older drivers with cognitive impairment or slowed reaction time which could potentially put them at increased risk of motor vehicle crashes.

Most older drivers drive because they need to, in particularly for grocery shopping. To reduce reliance on driving for older people, city planners can consider designing more pedestrian friendly communities with higher density of groceries and general stores. However this may not be sufficient because many older adults lack the strength to carry groceries while walking home even while taking public transit home. Home delivery programs should be promoted to help older people get food and household supplies. For medical appointment, less than half of the participants preferred driving. This could be related to the time required for the appointment. Comments from study participants highlight the need for better parking options in clinics or medical facilities for older drivers who must drive themselves.

 Similar to other studies, many older ED drivers in this study report that they avoid driving in difficult situations such as at night, during bad weather condition, or in heavy traffic. Better lighting and line markings on roads may be helpful for older drivers if they need to drive at night or during rainy seasons. In addition, approximately 11 percent of all participants were unaware of the special transportation programs for seniors and people with mobility challenges. Decision makers should promote awareness of these special transportation programs.

Limitations

There are some limitations in this study. First, this sample was recruited during daytime hours in an urban trauma centre and our results may not be generalised to older patients who visit the emergency department during the evening or at night, or to those who live in rural communities. We also excluded patients who were unable to participate because of critical illness or severe cognitive dysfunction. These patients may differ from our participants in terms of driving fitness and baseline health, and those differences could influence their driving patterns. Although this sample was recruited based on the availability of research assistants (RA)s, we screened and approached all eligible patients whenever RAs were available on a 4-hour shift. We believe that the results of this study are generalisable to older drivers with less severe

illness treated in an urban emergency department during daytime hours. Second, this study relied on participants' self-reported information which may or may not accurately reflect their true driving behaviours. Third, our findings that a high proportion of older drivers performed below the cut-offs in the TMTB and/or had slow reaction time may not indicate that all of these drivers are unfit to drive. No bedside or office-based screening test is reliably able to detect driving ability in an individual patient, although there is some evidence that the TMTB test correlates with on-road driving performance and with crash risk (Dobbs & Shergill, 2013; Bedard et al., 2008; Langford, 2008). Furthermore, the functional deficiency of study participants who failed the tests could be temporary due to the medical conditions that caused the ED visit. It is also possible that drivers who refused functional testing have different driving abilities than those who participated in this part of the study. We note, however, that the driving patterns and demographic information of drivers who agreed to functional assessment were very similar to that of participants who refused functional assessment.

Conclusions

In this sample of older emergency department patients who were current drivers, we found that the driving abilities and driving needs were similar between the young older (aged 70-79) and the old older (aged ≥80) drivers although the younger age group drivers have not had a formal medical assessment for driving fitness. In this study, we found that close to one third older drivers had never taken public transit and about 60 percent drove daily in past month. Most drivers (75%) perceived themselves as good to excellent drivers and only 38 percent of all drivers said they would avoid driving in more than 3 difficult driving conditions. Functional screening tests indicated that some drivers might have cognitive impairment and slowed reflexes which may impair their ability to drive safely in some situations. Findings from this study may help increase ED physicians' awareness of driving fitness of older adult patients.

Acknowledgements

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