

Canadian Research Strategy for Older Drivers: The CanDRIVE Program

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Abstract

Compared with other age groups, people over the age of 65 years have one of the highest rates of motor vehicle crashes per mile driven. This increased risk is not due to age in itself, but to the increasing prevalence of health-related conditions that can affect driving ability. A societal challenge is to balance this risk with the independent mobility and autonomy that driving provides. With increasing calls from governments, non-governmental agencies and the media for research related to the older driver, the Canadian Institutes of Health Research, Institute of Aging, approved funding in March 2002 for the formation of CanDRIVE. CanDRIVE is a national inter-disciplinary collaborative network of researchers dedicated to the identification and analysis of health-related issues pertaining to the safe operation of motor vehicles by older persons. This paper describes the research framework guiding the activities of the CanDRIVE research program.

Key words

Driving
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Introduction

Persons over 65 years of age are the fastest growing segment of the Canadian population.¹ This has resulted in a rapid increase in the number of older persons holding driver's licenses. Compared to other age groups, those over 65 have one of the highest motor vehicle crash rates per mile driven.²⁻⁴ The reason for this increased risk is not due to age in itself, but to the increasing prevalence of health conditions that can affect driving ability in the older age groups such as visual impairment,^{5,6} seizure,^{7,8} syncope,⁹ sleep apnea,¹⁰ cardiovascular¹¹ and cerebrovascular¹²⁻²⁸ disease (stroke and brain injury) and cognitive impairment.²⁹⁻³⁵ Balanced against this increased risk is the fact driving is often imperative for independent mobility, especially in rural communities.³⁶ The ability to drive is an expression of autonomy and independence, and contributes to important quality-of-life aspects including sense of well-being³⁷ and maintenance of family and social ties.³⁸⁻⁴⁰ Governments, national and international non-governmental agencies and the media have expressed concerns regarding the increased risk of crashes in individual older drivers. Policies specifically developed for the older driver exist in many jurisdictions at provincial and state levels in North America⁴¹ as well as in European countries.⁴² However, these policies tend to be inconsistent with each other, leading to calls for research to establish safe, yet fair and evidence-based legislation for

older drivers.⁴² Both the Canadian Council of Motor Transport Administrators⁴³ and the U.S.-based National Highway Traffic Safety Administration⁴⁴ have identified the need for research regarding older driver-related issues including the development of “valid and reliable screening and assessment methods based on medical conditions, collision records and functional ability.”⁴⁴ Until recently, research resulted in broad generalizations regarding fitness to drive based on diagnosis alone.^{13, 45-49} However, due to the differing severity and varying effects of health-related conditions on the functional abilities of different persons, the research trend has shifted towards the individualized assessment of older drivers. The ultimate goal of this research is to produce an evidence-based set of clinical practice guidelines that can be applied to specific patients. Unfortunately, this goal is far from attainment.⁴⁴ Major shortcomings of published research studies on fitness to drive among older persons include:

- a. Few studies have actually examined driving records post-driving assessment.^{13,47,50-52} Rather, most studies have concentrated on comparing controls to patients on test assessment batteries⁴⁹ and on “on-road” assessment.^{24,25,53-55} However, these are surrogate—and possibly invalid—measures when assessing fitness to drive. The main outcome of interest should be the subsequent driving record of the disabled driver. Crash and traffic violations are the events of most concern to society, and should be the primary outcomes used to assess driving ability.^{10,56-58}
- b. The literature identifying the factors associated with involvement in motor vehicle crashes has been subject to recall and verification bias. In these studies,^{52,59-61} identification of crash involvement was identified retrospectively, then multiple characteristics of the subjects were measured. Therefore, the putative risk factors were not measured at the time of the crash (a form of verification bias), and the identification of crashes relied on subject/family recall (recall bias).
- c. Many studies identified factors associated with crashes which are not feasible to measure in usual care settings (e.g. Useful Field of View [UFOV]⁶²).

In March of 2002, the Canadian Institutes of Health Research (CIHR), Institute of Aging, approved funding (\$1.25 million over five years) for the formation of CanDRIVE, a national interdisciplinary network of researchers dedicated to the identification and analysis of health-related issues pertaining to the safe operation of motor vehicles by older persons. This paper describes the development and content of the research framework which guides the activities of the CanDRIVE program.

Developmental process of the CanDRIVE research strategy

When CanDRIVE was established, there were many Canadian researchers who were interested in health-related issues relevant to the older driver but, on a national level, there was little co-ordinated effort. The CIHR grant stipulates the six authors of this paper use the monies for infrastructure support (e.g. establishment of a co-ordinating office, development of communications materials, provision of a bursary program to provide salary support for students and young investigators) with funding for specific research projects to be obtained from other sources (including CIHR).

The major CanDRIVE program objectives are:

- 1) the development and implementation into standard clinical practice of a methodologically sound, empirically-based, easy-to-use clinical decision rule (screening tool) that will allow clinicians to identify older drivers who are unsafe to continue operating a motor vehicle or who need to undergo further in-depth testing of their ability to drive;

2) to examine the psychosocial, cultural, linguistic, societal, legal, health care resources and political aspects of ensuring the safety of older drivers, their passengers, pedestrians and other road users; and

3) to facilitate the exchange of information and the formation of productive collaborative efforts and partnerships amongst people and organizations interested in issues related to driving in older persons, including interested members of the general public.

In order to start the process of further refining the research framework that will guide the activities of the CanDRIVE program, a national investigator retreat was held in January 2003. Key stakeholders—including persons from academia, government, non-governmental agencies, private industry and seniors' groups—were invited (see www.CanDRIVE.ca for the list of attendees). In addition to refining the CanDRIVE research framework, the participants used a small group format to discuss key aspects of the framework, including studies related to the identification of risk factors for crashes, the psychosocial aspects of driving, legal/policy/legislative ramifications of systematically testing the driving ability of older persons and other general issues. These topics are described briefly here.

Framework development

Recognizing that individual CanDRIVE research studies need linkage in the context of the overall process of older driver assessment, a flow diagram was developed to categorize individual CanDRIVE research studies into a comprehensive conceptual framework (Figure 1). Consistent with the national collaborative scope of CanDRIVE, the majority of studies outlined in Figure 1 are presently being conducted by investigators residing in multiple parts of Canada. The flow diagram establishes that older persons do not require special assessment of their ability to drive unless they develop medical, psychological or functional conditions which potentially impact their ability to safely operate a motor vehicle. Some older drivers, whether they do or do not develop these conditions, limit the mileage and/or situations in which they drive. Most often these self-restrictive behaviours are appropriate and necessary to reduce their crash risk. However, often due to a lack of confidence, some persons (most often females) may cease driving prematurely despite objective assessment suggesting they are competent to do so. A line of research being pursued by investigators in CanDRIVE is to determine the factors associated with self-restriction/cessation and examining testing interventions to prolong the driving careers of persons who stop prematurely. Once it is deemed an individual older driver requires assessment, he/she can either be screened at the primary care level or referred directly for specialized comprehensive testing. During the screening phase, studies to determine the factors that predict future crash involvement are at the core of the CanDRIVE program. A large prospective cohort study is envisioned to develop a clinical decision rule (screening tool) to help practitioners determine who is unsafe to drive or needs to have further comprehensive testing.

With little evidence that performance in comprehensive testing programs such as neuropsychological testing, simulator protocols and on-road assessments are predictive of future crashes, a priority of the CanDRIVE program is to determine if such linkages exist. If so, future studies in the field will be easier to perform, as they will only need to use these surrogate outcome measures without having to follow participants to the ultimate outcome of a crash.

Once older drivers are deemed unsafe to drive, there may be different interventions such as technological innovations (e.g. automated collision warning devices), re-training programs and restricted licensing programs (graduated de-licensing), which may prolong their driving careers. The aim of the CanDRIVE investigators is to study the types and efficacy of these interventions.

For those who must stop driving, the consequences of driving cessation and the efficacy of interventions to reduce its negative aspects will be explored. Finally, for older persons who are safe to continue driving, the efficacy of education programs to keep them safe (e.g. 55 Alive⁶³) will be tested.

An aspect not easily captured by the flow chart is the interconnectedness of the different elements of research into older drivers. For example, we emphasize the need for a co-ordinated approach between assessment (screening and specialized testing) and support (organization of alternative forms of transportation and retraining programs for older drivers). This approach encourages a comprehensive research program which recognizes the importance of both driver screening and remediation.

Identification of risk factors for crashes

The participants of this group envisioned a series of steps to develop a clinical decision rule suitable for use in primary care clinicians' offices. The rule would help them identify older persons with medical or functional deficits who are unsafe to operate a motor vehicle or those who need to undergo more specialized testing of their driving ability. The series of studies recommended include:

Phase 1. Needs assessment

With the use of survey and focus group methodology, the relevant attitudes, practices and issues of older drivers and their families (e.g. acceptability of specific test items and screening in general) and clinicians (e.g. perceived need, acceptable test characteristics, practice variation) are to be identified.

Phase 2. Identification of risk factors

This was envisioned as a two-part process:

- a. A systematic review of literature including distracting factors such as cellular telephone use.
- b. A case-control study with prospective identification of cases and controls. This study would examine demographic and clinical factors of prospectively identified, consecutive older drivers who have been involved in motor vehicle crashes that were serious enough to require evaluation in emergency rooms. This would include many factors that have not been measured or identified in previous studies, such as functional ability and neurobehavioral control. These factors would then be compared with those of age and sex-matched controls who were evaluated in emergency rooms for other reasons.

Phase 3. Prospective derivation studies

Using the potentially clinically useful risk factors identified in Phases 1 and 2, a prospective multi-centre cohort study will be conducted to measure and periodically re-measure these risk factors in study participants. They will then be followed to relevant clinical endpoints including crashes, traffic violations and cessation of driving.

Phase 4. Prospective validation study

A second cohort of participants will be assembled and prospectively followed to determine the validity of the clinical decision rule.

For Phase 3 of the process, it was deemed two pilot studies were needed before embarking on the large definitive prospective cohort study. The first pilot (n = 100 participants) would be a single centre study focused on process issues which may prove to be barriers to conduct of the definitive prospective cohort study. This includes the establishment of data linkage between clinical data and driving record (as collected by the provincial ministries of transportation and local police), finalizing acceptable consent procedures consistent with Canadian privacy laws, exploring

recruitment and retention issues with regards to non-participation and drop-outs, and exploring means of most reliably assessing driving exposure (mileage driven).

The second pilot study (n = ~400) was envisioned to be a small-scale, multi-centre version of the definitive prospective cohort study. Issues to be addressed in this study include: further information on recruitment yield and drop-out rate; the finalizing of the clinical measures/independent variables which are most likely to have the potential to contribute to the clinical decision rule; streamlining protocol procedures; and the establishment of the most appropriate sampling frame (e.g. convenience sample recruited from established seniors' groups versus random population sampling).

Psychosocial research priorities

After discussion of the background work done in the area of the psychosocial ramifications of driving restriction/cessation in older persons, priorities for this research theme were deemed to be maintaining quality of life by keeping competent drivers on the road and developing interventions and alternatives for older persons who can no longer drive. The determination of the factors leading to older driver self-restriction/cessation was also deemed a priority research area. Potential interventions that flowed from this research include:

- 1) interventions to fine-tune the skill and increase the confidence of competent drivers who believe they are not competent;
- 2) interventions to enhance the skill of borderline drivers who are not currently competent;
- 3) interventions to help those who lose their licenses; and
- 4) development of alternative means of transportation.

The last priority identified within this theme was the psychosocial issue directly related to development and implementation of the clinical decision rule such as:

- 1) physicians' needs assessment including the characteristics of an acceptable and clinically feasible decision rule (e.g. maximum time to administer, acceptability of the use of props);
- 2) impact on the physician-patient relationship of discussion of fitness to drive; and
- 3) ramifications for caregivers of driving cessation.

Legal/policy/legislative research priorities

An important issue identified was the need for the establishment of collaborative links with key legislative and regulatory stakeholders, as well as seniors' advocacy groups. It was recognized that in order for the clinical decision rule to be widely implemented, these groups must be given a chance to provide their input into its development. The following research projects were deemed to be priorities for this theme:

- a) survey of primary care physician knowledge, attitudes and practices related to the older driver;
- b) the determination of the maximum level of acceptable crash risk from different stakeholder perspectives, given that different age groups have different crash rates (teenage males having the highest), and that there is likely a baseline rate of crashes in society that is unavoidable;
- c) consensus development on the key components of a comprehensive driving assessment, given the lack of standardization of these programs across the country; and
- d) survey of provincial and national medical, occupational therapy and neuropsychological associations.

These organizations would be surveyed to determine whether they have formal guidelines for their members regarding the assessment of older drivers, and if so, the methods used to develop the guidelines, how often they are updated and the perceived usefulness of these guidelines.

General recommendations

With the recognition that the development of a scientifically valid and reliable clinical decision rule to assess the driving fitness of older persons with medical, cognitive and functional impairments is not in itself a guarantee of its widespread clinical use, it was suggested members of CanDRIVE develop partnerships with key stakeholders including seniors' groups, research organizations and governmental and non-governmental agencies. It was felt the input of these stakeholders into the direction and priorities of CanDRIVE would enhance the relevance of CanDRIVE's research products to the context of Canada's social, political, cultural and linguistic environment.

There was general consensus that care must be taken if industry sponsorship is used to support the CanDRIVE program. It was felt the presence of such funding could possibly compromise the perceived independence and credibility of the program, especially amongst potential participants of CanDRIVE related research studies. Acceptance of such funding could also be perceived as placing CanDRIVE members in a conflict of interest position, possibly adversely affecting the perceived validity of their research projects. There was also general consensus that it would be appropriate and acceptable to pursue industry funding for activities not directly related to the specific CanDRIVE research studies including salary support for key investigators, but only under the following conditions, including:

- 1) prewritten agreements be established with industry supporters asserting the independence of the CanDRIVE investigators to pursue and publish their research findings;
- 2) preference for industry associations providing funding rather than individual companies;
- 3) exploration of combined CIHR/industry funding opportunities; and
- 4) reporting of industry funding should be explicitly stated in any relevant publications.

CanDRIVE activities to date

Members of the CanDRIVE program have been active in developing partnerships with key stakeholders including seniors' groups, research organizations and governmental and non-governmental agencies (Table 1). All organizations, including seniors' advocacy groups, have recognized the pertinence and importance of the CanDRIVE research program. Input from these organizations continues to shape the CanDRIVE research agenda.

Since the inception of CanDRIVE, its research members have embarked upon the program of research studies shown in Figure 1, of which four have received peer-reviewed funding. In particular, recruitment for the first pilot study of the large prospective cohort study is underway with the sample population being recruited from the Ottawa Chapter of the Federal Superannuates National Association, an association of retired civil servants whose council has expressed interest in supporting driving research.

Through its bursary program, CanDRIVE has also provided salary support for two PhD, two Masters, and several summer students working directly under the supervision of CanDRIVE members (Table 2).

In an attempt to participate in policy matters, two CanDRIVE members belong to the Medical Advisory Committee of the Ontario Ministry of Transportation. CanDRIVE members also are frequently invited to speak or participate in local, provincial and national meetings pertaining to issues related to the older driver. In particular, as associate members, CanDRIVE representatives are routinely asked to participate in policy discussions at pertinent Canadian Council of Motor Transport Administrators (the policy-making umbrella organization of the 13 provincial and territorial ministries of transportation and Transport Canada) meetings.

In order to influence clinical practice, CanDRIVE has supported the development and evaluation of *The Driving and Dementia Toolkit*,⁶⁴ a resource manual designed to guide physicians through the assessment of older drivers with dementia. Members have also participated in numerous local, provincial and national workshops and presentations for practising physicians.

Recognizing the long-term sustainability of the CanDRIVE research program is dependent on the receipt of continued funding support, efforts have been made to link with governmental and industry-based funding organizations.

Envisioned future CanDRIVE activities include the formation of international partnerships, the attraction of new members, and ensuring adequate opportunities for the training of the next generation of older driver researchers.

Conclusion

The CanDRIVE research program is a comprehensive, interdisciplinary national research program taking a co-ordinated, fully inclusive approach to conducting research pertaining to the safety of older drivers.

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