DriveABLE Assessment Centers Inc.

25

Daniella Semotok

The DriveABLE Assessment Program began by targeting the vulnerable driver population of older adults. DriveABLE targets all ages that may have cognitive impairments as a result of medical conditions or medications. By combining technology and research, the DriveABLE Assessment program aims to aid those who suffer from medical conditions, often brought on by aging which influences driving competence. The program is exemplar in the way it targets a wide variety of medical conditions, and its comprehensive approach of including physicians as the basis of referrals and implementing assessment programs that allow for older drivers to continue driving. DriveABLE provides service, software, and hardware solutions for commercial fleets, governments, insurers, and the medical community to help determine if medical conditions have affected one's driving competence and ability, also described as "driver risk assessment" (J. Brown, personal communication, 2018).

25.1 Background

25.1.1 Description of Consumers

The target population for the DriveABLE Assessment Program are drivers who suffer from a medical condition that can affect their driving competence. Such medical conditions can include cardiovascular and cerebrovascular disease, stroke, dementia, long-standing diabetes, neurological disorders, sleep disturbance, head injury, and psychiatric disorders, in addition to certain medications (DriveABLE, n.d.). Although the DriveABLE Assessment program is essentially for an individual of any age with a medical condition which can interfere with driving, a high proportion of individuals referred to DriveABLE are over the age of 65. The high proportion of older drivers is because of the strong association between age and having one or more medical conditions that can affect driving abilities. As mentioned earlier, there are a high proportion of older adult collision fatalities and injuries as well as a number of individuals driving who have medical conditions which can affect their driving ability. Nevertheless, the demographic characteristics of the target population vary because a medical condition may affect an individual regardless of age or status. What does make this population specific is that they are road users and have a medical condition that puts them at-risk for being unsafe to drive.

D. Semotok (✉)
Toronto District School Board, Oakville, ON, Canada
e-mail: daniella.semotok@tdsb.on.ca

R. Volpe (ed.), *Casebook of Traumatic Injury Prevention*,
https://doi.org/10.1007/978-3-030-27419-1_25

25.1.2 History and Development of DriveABLE

The DriveABLE Assessment Centre was originally started as a research endeavor to assess fitness to drive of an individual whose competence to drive is questionable due to the onset or progression of a medical condition. Because scientifically justifiable assessments were not available, a research program was initiated in 1991 by Dr. Allen Dobbs, who was the Director of the Neurocognitive Research Unit within the Northern Alberta Geriatric Program. Dr. Dobbs had an established interest in cognitive impairment in association with executing daily activities. This research commenced with a scientific approach, unlike other previous research in this area. The approach used was to first establish the driving errors of healthy drivers, in order to have a starting point for determining driving errors due to medical impairments (A. Dobbs, personal communication, 2004). The reasoning behind this is that normal, healthy drivers often make mistakes while driving. Thus, persons with medical disabilities should not be penalized for making driving errors typical of the general driving population. However, the errors made by cognitively impaired and unsafe drivers are likely to be different from those made by healthy drivers. That knowledge was thought to be basic to being able to identify medically impaired drivers and protect the healthy competent drivers from being inappropriately evaluated as unsafe and unfit to operate a vehicle. The researchers believed that a defensible driving evaluation must be able to justify with scientific evidence why specific errors are taken as competence indicators. Although errors made by healthy drivers are not justified through this process, it is the necessary beginning point in identifying driving errors signaling the driver is medically impaired. The medically impaired criterion could be assigned when the driver made driving errors that are beyond those of healthy drivers.

The next step in this process was to develop a road course that would reveal the driving errors specific to cognitively impaired, unsafe road users. Scientific data derived from the research was used to identify where on the road course the competence-defining driving errors occurred. The attributes of those locations (number of lanes, speed, controlled/uncontrolled intersection, visual sight lines, and clutter, etc.) were then analyzed to identify the road-course attributes needed to reveal the critical driving errors. These road course attributes were defined in a way that effective road courses could be replicated in multiple locations (DriveABLE, 2003a).

The first study conducted by Dr. Dobbs and his researchers was to determine the driving errors of healthy drivers and those of cognitively impaired drivers. Through a comparison of these driving errors, the goal was to identify the driving mistakes that differentiate the medically impaired drivers. The healthy driver samples consisted of a group of young drivers aged 30–40 years old and an older group of drivers aged 65 and over. This research study also included a sample of drivers who were cognitively impaired. In the first study nearly all of the drivers suffered from dementia but were licensed and currently driving. This group was established as the "unsafe driving" group, because the literature showed high crash rates among persons with dementia. All participants completed visual, motor, balance, mental testing by the Rehabilitation Medicine department of an Edmonton Hospital, and a domain approach defined set of neuropsychological tests administered by the Neuropsychology department of that hospital. The Rehabilitation Medicine testing was designed by occupational therapists. The neuropsychology testing was developed by selecting tests from different domains of mental abilities relevant for driving. The participants in the study also were engaged in a number of research tests that were selected or designed by the research team. Instead of following the domain approach, these tasks recognized the complexity of the driving task. The selected tasks were complex and required the concurrent use of mental abilities from different domains or shifting among domains (A. Dobbs, personal communication, 2004).

After the in-office testing, all participants were assessed through the use of a carefully planned road evaluation. All driving errors were

recorded using the provincial licensing standards and criteria. Using the provincial standards, 28% of the healthy drivers failed the road test. This confirmed the research team's suspicions that not all driving errors are competence defining errors. Some are just bad-habit errors of competent drivers (A. Dobbs, personal communication, 2004).

The errors committed by the three groups were compared to identify the type, frequency, and severity that are associated with cognitively impaired unsafe drivers and those that are the driving errors of healthy competent drivers. The results of this study provided the researchers with a base of knowledge regarding the driving errors of unsafe drivers suffering from medical impairments (DriveABLE, 2003a).

The next step in this process was to discover the road course attributes necessary to reveal the driving errors that are associated with declines in driving competence due to a medical condition. Scientific data derived from the research was used to define the critical driving errors. The attributes of the road course associated with high frequencies of these critical errors were studied. Based on the findings, criteria were developed for laying out a road course that would have elements known to reveal competence-defining errors. In addition, the road course criteria had to be developed in a way that they could be used to replicate effective road courses in multiple locations (DriveABLE, 2003a; A. Dobbs, personal communication, 2004).

In addition to producing a road course assessment, the team developed a cognitive evaluation. This process was also based on scientific data and was representative of driving performance. The approach focused on assessing the cognitive abilities that are associated with driving that require different domains and abilities. This was executed as an in-office evaluation and is computer presented and scored. The computer testing is presented in a touch-screen fashion and is easy to use, regardless of computer experience. There were over 500 participants who assisted in testing the in-office evaluation (DriveABLE, 2003a).

Validation research for the computer presented cognitive assessment test and the road test was also conducted using a sample of over 400 participants. This sample included individuals with varying medical conditions resulting in cognitive decline, and with a wide age range. The results of the study showed that the criteria that had been developed for the road test were valid. As well, the computer screen test was an excellent predictor for actual driving performance. The researchers found that there was 95% accuracy in identifying impaired drivers in comparison to safe drivers (A. Dobbs, personal communication, 2004). It has been noted that DriveABLE has utilized the largest sample that has ever been tested for cognitive ability, physical capabilities, and driving patterns in any other study worldwide (DriveABLE, n.d.; A. Dobbs, personal communication, 2004).

25.2 Resources

25.2.1 Collaborators During the Developmental Research

There were a number of individuals who assisted during the developmental research. The research team from the Neurocognitive Research Program, first of the Edmonton General Hospital and later the Neurocognitive Research Unit of the Glenrose Rehabilitation Hospital consisted of the following members: Allen Dobbs, PhD Director and Research Psychologist, Donald Schopflocher PhD Biostatistician, Robert Heller PhD Cognitive Psychologist, Bonnie Dobbs PhD Gerontologist, and Barbara Carstensen RN, BSc the Research Coordinator. As well, Medical, Rehabilitation Medicine, Neuropsychological evaluation expertise, and Hospital Administration support was provided by personnel from the Edmonton General Hospital and the Glenrose Rehabilitation Hospital. This included the following individuals: Peter McCracken, MD, FRCPC (Chief of Geriatric Medicine, Chair of the Division of Geriatric Medicine), Jean Triscott, MD, CCFP, FAAFP (Family physician, head of the Memory Clinic), Ivan Kiss, PhD Neuropsychologist (Neurocognitive Research Unit and Neuropsychology Department), Denise Walters, Executive Director, Edmonton

General Hospital, Nancy Renolds, Vice President, Special Initiatives, Edmonton General Hospital, Debora Cartwright, OT, Head Rehabilitation Medicine, Edmonton General Hospital, Linda Barrett, Director of Northern Alberta Geriatric Program, and Sandra Chaley, OT (A. Dobbs, personal communication, 2004). In addition, the Alberta Government provided assistance during the development of the program: Catarina Versaeval, Executive Director, Seniors Directorate, Ministry Responsible for Seniors; convened government group, and Representatives from Alberta Transportation, Solicitor General, Alberta Health and Wellness. There were many other individuals who took part in the collaboration process of the research. Supplementary support was provided by Alberta Motor Association (CAA Alberta), driving evaluators during the developmental and validation phases, the nursing staff from the Memory Clinic, neuropsychology test administrators, rehabilitation medicine assessors, and research assistants for the in-office test development and validation and closed course driving evaluation,

The resources for the DriveABLE program fall into two categories: Initial support for the research phase and the post research phase when DriveABLE was founded and began delivering driving assessments (A. Dobbs, personal communication, 2004).

25.2.2 Initial Support for the Research

25.2.2.1 Financial Support

The grant funding for the research phase was provided by Alberta Mental Health Research Fund ($80,000), Alberta Health Services Research Innovation Fund ($302,397), Alberta Heritage Foundation for Medical Research ($40,000), Alzheimer Society of Canada ($99,905), and the Canadian Aging Research Network (Network of Centers of Excellence Program: $246,165; A. Dobbs, personal communication, 2004). As well, the following provided in-kind funding and support: Department of Psychology at the University of Alberta, Edmonton General Hospital, Glenrose Rehabilitation Hospital, and the Alberta Motor Association. Additionally, the National Research Council IRAP commercialization grant ($23,800) and the Alberta Heritage Foundation for Medical Research Technology Commercialization Phase II ($150,000) and Phase III ($500,000) funds have been awarded to enhance the evaluation and quality assurance software and to further the development and expansion of DriveABLE Assessment Centers.

25.2.2.2 Supporters of the Research

Physicians such as Peter McCracken and Jean Triscott as well as other physicians were instrumental in requesting the development of a driving assessment program. These physicians, along with 50 community physicians and the Alberta Transportation Driver Records, provided the referrals for the research project (A. Dobbs, personal communication, 2004). Letters of support were also provided by The Alberta Council on Aging, Alberta Motor Association (CAA Alberta), Chair, Medical Advisory Board of Alberta Transportation, and the Northern Alberta Regional Geriatric Program, Capital Health Authority (A. Dobbs, personal communication, 2004).

25.2.3 Post-Research: The Founding of DriveABLE Assessment Centers Inc.

In 1998 when the research process was complete, there was overwhelming support toward the development of an assessment process based on the research results and means of delivering that assessment. This was recognition of need for taking the research information to the next level in creating an assessment process (A. Dobbs, personal communication, 2004). The unique situation of DriveABLE is that it is a program which stemmed out of a validated and scientific research process. The University of Alberta encouraged the development, and thus, DriveABLE was established as a spin-off company from the University (DriveABLE, n.d.).

The establishment of DriveABLE required equipment, software development, and training of personnel. The end result was a DriveABLE

center which conducted computer-based competency tests in addition to road tests for drivers whose abilities were questionable. The DriveABLE centers that were in operation were licensed to use the DriveABLE system, and receive equipment, software, training, and road course setup from the company. In 2004, DriveABLE had 20 Assessment Centers in Canada, five in Florida, and New York and Colorado also have licensed centers (A. Dobbs, personal communication, 2004).

25.2.4 Support for the DriveABLE Assessment

Encouragement for the DriveABLE Assessment Centers was provided by many organizations. These include: Regional Chairs Committee, Alberta Health Regions; Alberta Council on Aging; John Eberhard, PhD, Senior Research Psychologist and Chair, Transportation Research Board Older Driver Program, National Highway Traffic Safety Administration, US Department of Transportation; John Arnold, Chief Scientist, National Research Council; Palliser Health Authority, Alberta; Lakeland Regional Health Authority, Alberta; Provincial Health Authorities of Alberta, College of Physicians and Surgeons, Alberta; Alberta Medical Association, Minister of Health and Wellness, Alberta Health and Wellness, Minister of Transportation, Alberta Transportation, Florida Atlantic University, Boca Raton, Senior Resource Alliance, Area Agency on Aging, Orlando, Florida, and the Parker Jewish Geriatric Institute, New York (A. Dobbs, personal communication, 2004). The number of supporters continues to grow as DriveABLE continually expands throughout Canada and the United States.

25.3 Implementation

25.3.1 Effective Practices

DriveABLE centers use the same evaluation process, which has two components: a computer-based cognitive assessment and a road evaluation. The purpose of the in-office testing is to increase the safety of the evaluation by identifying the most dangerous drivers without the need for a road test (DriveABLE, n.d.). If the road test is necessary, it is administered by specialized driving evaluators who have received training from DriveABLE. As well, the vehicle that is used for the road evaluation is equipped with dual-brake for additional safety.

The computer-based cognitive assessment is referred to the DriveABLE Cognitive Assessment Tool (DCAT). The DCAT consists of six tasks that measure cognitive processes that are essential for safe driving and predict on-road performance. Thus, the aim is to identify—through hardware and software—medically at-risk drivers (DriveABLE, 2016a). Specifically, this tool uses a "plug-and-play system" that comprises a touch screen and a three-button base (DriveABLE, 2016a). It accurately measures the following aspects of driving: motor speed and control, speed of attentional shifting, span of attentional field, coordination of mental abilities, identification of driving situations, and spatial judgment and decision making (J. Brown, personal communication, 2018; DriveABLE 2016a). Refer to Box 25.1 for a detailed description of the six tasks (J. Brown, personal communication, 2018).

Box 25.1 Tasks of the DriveABLE Cognitive Assessment Tool (DCAT)

1. Reaction time: Client is asked to hold down a button until a shape appears on the screen, then reach up and touch it as quickly as possible.
2. Attentional field: Client is asked to make a decision about shapes in a box seen in the middle of the screen while trying to identify the location of a dot somewhere around the periphery of the box. This task measures possible narrowing or deficit areas in the peripheral field
3. Spatial judgment: A series of lines run up and down the screen, and the client is asked to move a box safely through

(continued)

(continued)

the lines at the first opportunity. This is representative of judgment being made at intersections which happens to be one of the largest areas of concern with cognitively impaired drivers

4. Attentional shifting: This measures the clients' ability to react to cued and miscued information being presented and the speed of processing or delays. The client is asked to touch a button on the side where a number sign (#) appears in a box. Cues include: central, where an arrow points to a box and peripheral, where one of the boxes lights up
5. Executive decision making: This task looks at how a client can store memory while still performing tasks. In the baseline, the client is simply asked to track X's as they appear in boxes. In the second level, the client is asked to touch the box where the X just appeared. This task has a number of relevant measures for driving, including disengagement, focus, working memory, and executive decision making
6. Identification of hazardous situations: The client watches a driving scene and chooses the best of four answers presented after the scene. The client has limited time to make the decision, which is similar to real life driving, where you must make the best decision possible in the quickest time

The DriveABLE road course is referred to as the DriveABLE On-Road Evaluation (DORE). This is a scientifically developed on-road evaluation that tests specifically for decline in cognitive skills. Unlike other road tests, the DORE tests for cognitive impairment—not bad-habit errors that are common among experienced drivers (DriveABLE, 2016a). It compares the driving errors of healthy drivers against drivers that are otherwise cognitively impaired. It set out to evaluate driving characteristics which are specific to drivers with cognitive impairments. No penalties are given for errors which would be characteristic of normal, healthy drivers.

The results are discussed with the driver, as well as sent to the physician involved (typically a family physician), and to driver licensing bureaus in some locations and depending on the referring physician's directive. The DriveABLE assessor often asks that a family member remain present during the explanation of the process. This is to ensure that another individual, besides the person being assessed, is present to understand the process that is occurring.

25.3.2 Actors in the Decision Making

The purpose of DriveABLE Assessment Centers is to be a widely available injury prevention program for individuals of all ages who suffer from a medical condition which can impair driving ability (DriveABLE, n.d.). Physicians value this program because of the scientific basis on which it was developed and also because it allows them to refer an individual to be assessed, rather than make that judgment decision on their own (A. Dobbs, personal communication, 2004). In many ways the DriveABLE program helps to protect the physician-patient relationship. This can occur when a patient's license is revoked, and there may be strong implications on the relationship between the patient and the physician (DriveABLE, 2003a).

Referrals for DriveABLE are accepted from Physicians, Licensing Authorities, and Insurance Agencies and from family members and friends of the driver in question. When an individual is referred from a family member or friend, it is asked that a physician be notified and be involved in the decision-making process (DriveABLE, n.d.). A driving evaluation is often needed when medical conditions result in impairments that negatively affect driving. Some of the identified "red flag" medical conditions are as follows (DriveABLE, 2003a):

- Cardiovascular disease, if associated with cerebral ischemia
- Cerebrovascular disease

- Head trauma, including traumatic brain injury
- Chronic respiratory diseases
- Cognitive impairments and dementia
- Psychiatric disease, including schizophrenia, personality disorder, and chronic alcohol abuse
- Certain medications, including anti-depressants and anti-histamines
- Neurological diseases, including multiple sclerosis and Parkinson's disease

25.3.3 Execution

DriveABLE currently receives no government funding and is currently a for-profit business (J. Brown, personal communication, 2018). However, there is reimbursement available for clients.

In Ontario, the Ministry of Transportation (MTO) has licensed sites. The MTO requires mandatory reporting by physicians when they come across any "red-flag" medical conditions or individuals who have any driving-related cognitive difficulties (J. Brown, personal communication, 2018). If a physician was not to report this to the MTO, they would be found liable and fined (J. Brown, personal communication, 2018). Once reported to the MTO, there is a review of the individual, and subsequently, they are sent to the appropriate testing, which may be DriveABLE. If it is DriveABLE, the client is responsible for paying for the testing, which is approximately $700.00 (J. Brown, personal communication, 2018). After being evaluated, those results are sent back to MTO and a board of MTO medical officers review the results and determine any next steps. At this point, the MTO is who determines how long individuals are cleared to drive or have to be retested or reviewed—not DriveABLE (J. Brown, personal communication, 2018).

Conversely, in British Columbia and Alberta, DriveABLE is no longer used as a primary tool. Instead, if a doctor was to refer someone to a DriveABLE licensed site, the results would go to the doctor. Moreover, in Manitoba, DriveABLE is provided through public insurance, who also pays for testing. The provincial driving licensing organizations are not involved in this process (J. Brown, personal communication, 2018).

In the United States, the system is different because Medicare and Medicate pay for the testing. DriveABLE does offer the physicians reimbursement codes for providing and implementing assessments, which has proved to result in a large growth in the United States because of this incentive and lack of burden on individuals (J. Brown, personal communication, 2018). Unfortunately, medical authorities in Canada have yet to find a way to implement DriveABLE into their provincial health plans as it is not seen as a necessary aspect (J. Brown, personal communication, 2018).

25.3.4 Ongoing Evaluation

DriveABLE has been involved in performing ongoing evaluation in several ways:

25.3.4.1 Equal Testing for Urban and Rural Road Users

There was an ongoing evaluation conducted for determining equal fairness of the DriveABLE assessment process for both urban and rural drivers. In order to assess this, DriveABLE compared the outcome of the evaluation for urban and rural drivers who had been to DriveABLE for an assessment. The sample of rural and urban drivers was closely matched on diagnosis, age, sex, and their score on a test regarding cognitive abilities (MMSE). After the individuals in the sample completed the DriveABLE assessment, the results were evaluated. The findings showed that there was essentially no difference in the pass and fail rates of the matched rural and urban samples. Thus, the evidence indicates that there is scientific confirmation that the procedures are equally fair for both urban and rural drivers who are assessed by DriveABLE.

25.3.4.2 Standardization and Quality Assurance Procedures

DriveABLE is involved in ensuring standardization and quality assurance in three ways (DriveABLE, 2003b):

1. Setup and training for DriveABLE Assessment Centers
   (a) All individuals involved in administering the DriveABLE in-office assessment and road evaluation are certified after receiving personalized, on-site training from DriveABLE personnel.
   (b) The design of the road course is also critical to ensuring standardization. Each road course is set out by DriveABLE personnel based on specified elements. Although it is true that no two road courses are completely alike, the elements that are sought after for the design of the course are those that have been shown by research to disclose driving errors.
2. Final standardization of the road course is also achieved across DriveABLE licensed centers by calibrating the fail criterion to match the difficulty of the road course. As well, the competence screen assessment is the same at all locations, and the outcomes are sent to the main DriveABLE location in Edmonton for scoring.
3. Quality assurance is monitored in several ways:
   (a) Authenticating the known relationship among cognitive assessment tasks at each site over time.
   (b) Re-confirmation of calibration for standardization of the road test at scheduled times.
   (c) Assessing road test evaluators by validating that expected errors occur in specific areas which the research identified as being associated with specific types of driving errors.
   (d) Also, there are evaluations of road test examiners scoring results by comparing his or her rating of driving with scores given for the driver errors.

DriveABLE takes pride in their level of standardization and ongoing monitoring and evaluation. It is felt that with a high level of standardization, physicians and driver licensing agencies should feel confident in their assessment practices (A. Dobbs, personal communication, 2004). In addition, DriveABLE is currently updating the software they use to provide more automated quality assurance procedures (DriveABLE, n.d.).

The DriveABLE program has made efforts to have a variety of meetings with physicians in different provinces regarding the usability of the DriveABLE report forms. Suggestions and feedback made by physicians and reviewing officers within licensing authorities have been taken into consideration, and forms have been modified into the most usable way (A. Dobbs, personal communication, 2004).

A survey was also conducted by DriveABLE with 117 people and their caregivers who had completed the driving assessment process. This sample represented individuals who were asked to stop driving due to an unsafe level of errors from the DriveABLE evaluation. The survey found that 27% of these individuals continued to drive, with their caregivers reporting incidences of a crash or close call by these drivers (A. Dobbs, personal communication, 2004).

25.4 Outcome

The outcome of DriveABLE licensing has been overwhelmingly positive. One way of defining the success of DriveABLE is by its acceptance throughout Canada, as well as the United States (A. Dobbs, personal communication, 2004). In recent years, DriveABLE Head Office has stopped providing assessment services. Instead, DriveABLE provides the technology and training to licensed and certified organizations in order to create licensed assessment providers. This is for a variety of reasons, most notably that each province, state, or country can have different rules pertaining to driver fitness, and it would be inefficient for DriveABLE to have multiple centers all over North America when such variables exist. Licensed assessment providers are available across Canada, across the United States of America, and in Auckland, New Zealand. For a complete list of current licensed sites, visit https://driveable.com/index.php/get-an-assessment/licensed-sites (DriveABLE, 2016b).

Because of its scientific basis, DriveABLE was selected by Jansan-Ortho as the criterion in a multi-center study of the effects of RR on the driving competence of treated Alzheimer patients. Several other research projects in Canada and elsewhere have adopted the DriveABLE Assessment process as their driving competence criterion in studies of stroke, the value of rehabilitation using simulators, and other topics. In partnership with the Ontario Safety League, there are assessment sites in Toronto, Brampton, Barrie, Hamilton, Kitchener, St. Catharine's, Owen Sound, Oakville, Sudbury, Waterloo, and Whitby (DriveABLE, 2016b). Centers also are located in British Columbia, Alberta, New Brunswick, Quebec, Nova Scotia, Yukon, and Saskatchewan, and in 25 states (US) as well as Puerto Rico (DriveABLE, 2016b).

25.4.1 Florida

Florida has been encountering a unique situation where a large segment of its population is 65 years of age and older. More specifically, of these older adults, almost one half will be 75 and older (Florida Department of Transportation, 2004). In addition, there are added elder drivers killed or injured in traffic collisions in Florida than in any other state. According to The Road Information Project, 268 older drivers in Florida were killed in 2001 (The Road Information Program [TRIP], 2003). The Florida Department of Highway Safety and Motor Vehicles (DHSMV) selected DriveABLE as their criterion in a multi-center research project to evaluate brief driver screening procedures. The Florida DHSMV subsequently selected DriveABLE as the driver evaluation process to be used in their Safety Resource Centers. There are currently eight locations across Florida in Boca Raton, Brooksville, Clearwater, Fort Myers, Pompano Beach, Sunrise, Stuart, and Tallahassee (DriveABLE, 2016b).

Along with this program, Florida has employed the Elder Roadway User Program, a safe driving initiative committed to keeping older drivers safe on the roads. This specific program focuses on improving roadways in order to compensate for the natural effects of aging, primarily visual acuity and allowing additional time for decision making. The Elder Roadway User Program has been established since 1992 and is continuously committed to making roadway designs that assist older drivers. The proposed solution incorporates a complex system approach to accommodate older drivers by focusing on the physical environment and the internal states. In order to effectively implement the road design changes, the improvements were separated into two categories:

25.4.1.1 Short-Term Improvements

These were improvements which could be conducted by maintenance forces or specialty contracts in a short amount of time. These improvements began immediately and were completed throughout the state of Florida.

- Reflective Pavement Markers:
  - The Reflective Pavement Markers provide increased delineation for the intended road being traveled during dark or rainy conditions. The Department of Transportation requires 40-ft spacing on all areas of the State Highway System. As well, there is RPM spacing of 20 ft for areas where there are sharp curves.
- Wider Pavement Markings:
  - The reason for providing wider pavement markings is to clearly delineate the roadway while driving at night. Pavement markings are required to be 6-in. wide, for all state roads.
- The Use of Advance Street Name Signs:
  - Advance street name signs provide the older driver with additional time for decision making. At the initial stage advance street name signs were installed at major intersections; however, now they are installed wherever needed.
- Improved Pedestrian Features at Intersections:
  - The improvements made at pedestrian crossings are essential to safe mobility. Often the alterations made to roadways affect pedestrian crossings. For example, adding roadway lanes affects pedestrians by increasing

the distance that must be traveled safely across an intersection. Due to the fact that pedestrian crossings are used frequently by older adults, it is imperative to ensure that there are varying walking speeds and to increase the number of refuge islands.

- Increase Emphasis on Effective Traffic Control Through Work Zones:
  - A work zone is one of the most hazardous areas an older driver can experience. There are several practices which have been implemented to ensure safe traveling through work zone areas. These improvements include temporary reflective pavement markers to increase the delineation of the road, advance warning signs of an upcoming work zone area, and well-maintained signs and barricades for effective visibility.

25.4.1.2 Long-Term Improvements

The goal of the long-term improvements is to enhance the traffic control device visibility, in addition to providing advance notice and visibility along roadways.

- New lettering and sign sizes for stop, yield and all standard warning signs throughout the state.
  - A 20/70 vision was selected as the design acuity. This was chosen because it is the minimum corrected visual acuity allowed in Florida for attaining a driver's license. This improvement had been altered from a 20/40 vision which was the previous standard.
- Installing more advance notice signs for stop signs and lane assignment signs for freeway entrance ramps.
  - These signs help reduce last minute decisions made by drivers. The advance lane assignment signs provide additional reaction time for lane changes just before an intersection or entrance ramp. The advance lane assignment signs should be used on six-lane approaches to intersections to delineate the turn/through lanes and on all approaches to freeway entrances where a left turn is required.
- Enhanced pavement markings and sign sheeting to provide increased visibility.
  - These pavement markings are used in accordance with advance notice signs. Lane assignment pavement arrows and messages are used in association to improve effectiveness of advance notice signs. These are to be installed as far back from the intersection or ramp as possible.
- Improved intersection design elements:
  - Given that older adults are most frequently involved in intersection crashes compared to other age groups, it has been an important task to simplify intersection operation. There are two types of intersection improvements that have been made:
- Offset left turn lane:
  - There is a high involvement of left turn crashes among older adults. This is because visual and cognitive abilities begin to diminish with age. Difficulty is found with judging speed of oncoming vehicles and choosing appropriate gaps in which it is safe to travel. The implementation of offset left turn lanes hopes to accommodate for safer travel through intersections.
- Offset right turn lane:
  - The purpose of an offset right turn lane is to enhance visibility. Moving the turn lane farther to the right will provide a larger separation between the turn lane and the through lanes.

It has been an efficient approach to implement the roadway design alterations in both a short-term and long-term process. Through this process there have been gradual roadway improvements which have had the opportunity to be evaluated through effectiveness studies (Traffic Engineering Manual, 1999).

25.4.2 Additional Acknowledgements

Dr. Dobbs was awarded The Claude P. Beaubien Award of Research Excellence by the Alzheimer Society of Canada's Research Panel for the

research underlying the DriveABLE assessment (A. Dobbs, personal communication, 2004; DriveABLE, n.d.). In 1998 Dr. Dobbs was selected as an Alberta Innovator of the Year for the development of DriveABLE Assessment Centers Inc. (A. Dobbs, personal communication, 2004; DriveABLE, n.d.).

25.4.3 Newer Projects

There are several new projects that DriveABLE is conducting (A. Dobbs, personal communication, 2004; DriveABLE, 2004):

- Funding has been received for a project entitled: "Driving competence in patients with ophthalmic conditions." The goal is to determine the appropriateness of the DriveABLE procedures, or extensions needed, for evaluating drivers with three common visual conditions of older drivers: (1) primary open angle glaucoma of varying visual field deficit severity, (2) proliferative diabetic retinopathy (PDR) requiring pan retinal laser photocoagulation treatment (PRP) in one or both eyes, and (3) clinically significant macular edema (CSME) requiring focal laser photocoagulation treatment in one or both eyes.
- Funding has been received for a project entitled: "Development of a roadside protocol for law enforcement officers to identify drivers who may be medically impaired."
- Funding has been received for a project entitled: "The development of a physician screen for identification of medically-at-risk drivers." The goal is to further validate and possibly extend a short, physician friendly screening tool for physicians to use when making decisions about which patients need to be evaluated for driving competence.
- Funding has been received for a project entitled: "Development and assessment of psycho educational group interventions": (1) for individuals with Alzheimer disease who have lost their driving privileges, and (2) for their primary caregivers.

DriveABLE concerns itself with four major industries:

1. **Neurology**. DriveABLE aims to help patients help themselves by allowing clients take a hands-on approach to going in the right direction about their driving capabilities.
2. **Student transportation**. DriveABLE aims to keep the community safe by promoting assessments for school bus drivers to measure potential declines in driving ability.
3. **Healthcare**. DriveABLE aims to promote physicians to check driving ability during healthcare checkups.
4. **Fleet**. DriveABLE provides a product that allows for screening for success. This allows companies that hire drivers to pre-screen new employees to determine cognitive driving ability.

25.5 Conclusion

DriveABLE is an injury prevention program that deals with the complex, yet sensitive, issues surrounding mental ability and driver competence. DriveABLE has received tremendous positive response for the development of a driving evaluation procedure that is grounded in a strong research base, spanning countries. Injury prevention for older adult drivers needs to be thought of in terms of the whole context or situation. The concerns relating to older adult drivers are clearly multifaceted and require a combination of strategies which concentrate on different areas. With the implementation of the exemplar program of DriveABLE, these concerns can be helped and roads as well as drivers can be safer.

Acknowledgments The author would like to express sincere appreciation to the key informants for this case study: Allen R. Dobbs of the DriveABLE Assessment Centers Inc. in Edmonton, AB, Canada and Mark C. Wilson of the Florida Department of Transportation in Tallahassee, FL, USA—whose consultation made this project possible.

BRIO Model: DriveABLE Assessment Program

Group Served: Older driver; Individuals with cognitive/medical conditions.

Goal: Combining technology and research to provide a driver risk assessment program that determines driving competence as a result of medical conditions.

Background	Resources	Implementation	Outcome
Clients are typically over the age of 65 and have one or more medical conditions that can affect or have affected driving abilities. The program was developed by Dr. Allen Dobbs after empirical studies that identified both healthy driver behavior and cognitively impaired driver behavior A road course assessment and a cognitive evaluation was produced	During development, the Alberta Government provided assistance, as well as other supporters DriveABLE had assessment centers across Canada and the United States In recent years, DriveABLE has stopped providing assessment services—instead provides technology and training to licensed and certified organizations, creating licensed assessment providers	Clients with medical conditions or on certain medications are referred to DriveABLE sites through physicians, licensing organizations, or family/friends All centers use the same evaluation process involving a computer-based cognitive assessment (DCAT) and a road evaluation (DORE) DCAT involves tasks that measure aspects of driving, including attention, spatial judgment, and reaction time DORE is scientifically developed for on-road evaluations that test for cognitive impairment, by comparing results against healthy driver habits	Licensed centers exist across Canada—in seven provinces and one territory, the United States—in 25 states and Puerto Rico, and in Auckland, New Zealand Dr. Dobbs was awarded "The Claude P. Beaubien Award of Research Excellence" by the Alzheimer Society of Canada for research underlying DriveABLE assessment Dr. Dobbs was selected as Alberta Innovator of the Year in 1998 for the development of DriveABLE assessment centers Now, DriveABLE concerns itself with neurology, student transportation, healthcare, and fleet—providing products for a variety of aspects of cognitive and driving ability assessment

Life Space Model: DriveABLE Assessment Program

Sociocultural: civilization/community	Interpersonal: primary and secondary relationships	Physical environments: where we live	Internal states: biochemical/genetic and means of coping
Advocacy for a valid and scientific assessment Multi-disciplinary approach which involves researchers, physicians, occupational therapists, government agencies, insurance companies as well as others Use of community services to bring awareness to medical conditions which can interfere with driving	Involving family members, caregivers, and physicians as part of the referral process Protects the physician/patient relationship because physician no longer has to make a judgment decision	Use of on-road evaluation to identify unsafe driving. Road course is designed to reveal errors made by drivers who are unsafe, while allowing healthy drivers to pass Equal testing for urban and rural road users	Assessing unsafe driving due to the onset of a medical condition such as Alzheimer's disease, neurological disease, heart disease, head injury, stroke, diabetes, and other conditions affecting mental ability Use of computer-based tests which assess mental and motor skills relevant to driving Support group studies underway to help the individual and their family members deal with the stress of no longer being able to drive

References

DriveABLE. (n.d.). *Home*. Retrieved from http://www.driveable.com

DriveABLE. (2003a). *Research-based assessments for medically at-risk drivers*.

DriveABLE. (2003b). *Standardization and quality assurance procedures*.

DriveABLE Assessment Centers. (2004). Retrieved June 14, 2004, from http://www.driveable.com

DriveABLE. (2016a). *Industries*. Retrieved January 20, 2018, from www.driveable.com

DriveABLE. (2016b). *Licensed sites*. Retrieved February 19, 2018, from https://driveable.com/index.php/get-an-assessment/licensed-sites

Florida Department of Transportation. (1999). *Traffic engineering manual. Florida's elder road user program*.

Florida Department of Transportation. (2004). *Traffic Operations Office: elder roadway user program*. Retrieved May, 2004, from http://www.dot.state.fl.us/trafficoperations/elderoad.htm

The Road Information Program. (2003). *Designing roadways to accommodate the increasingly mobile older driver: A plan to allow older Americans to maintain their independence*. Washington, DC: Author.