Longer Life Foundation – Final Report 09/29/08
Project Title: Fitness-to-Drive in Older Adults with Neurological Illness
Investigator: David B. Carr, M.D.
Grant period: 10/1/08-9/30/08

Applicant's Summary:

Stroke is the third-leading cause of death in the United States, and a major cause of serious long-term disability. Each year, there are about 500,000 first-time new strokes, and three-quarters of all strokes occur in people over the age of 65. In adults, stroke can impair vision, cognition, motor skills, and speech. The result can be a loss of functional independence. With medical advances and proper rehabilitation, many stroke survivors are able to regain function. Often, the activity of driving is not resumed after stroke. Without the ability to drive safely and independently, stroke survivors may become a burden to their families, are at increase risk of depression, and may require a move to assisted living or a nursing home setting.

In order to return the patient to active driving, many physicians utilize rehabilitation driving assessments, typically performed by occupational therapists. These evaluations usually include performance-based road tests in actual traffic, which have inherent safety risks, are time consuming, and expensive. Thus, there is a need to identify which stroke survivors are able to resume driving safely, as well as a way to most readily and efficiently identify these individuals.

Objectives:

1. The primary objective of this study is to determine whether stroke patients that return to active driving maintain their current level of care (e.g. independent living) when compared to patients that are not able to resume driving privileges. We believe that patients that are unable to return to driving will have a higher rate of transfer to a more structured environment (e.g. assisted living and/or nursing home) and/or have an increase in depressive features.
2. The secondary objective of this proposal is to determine whether tests of clinical skills (vision, motor, cognition) in stroke patients are predictive of safe driving. We hypothesize that a combination of specific tests will predict who will pass a standardized road exam and/or have a motor vehicle crash.

We have completed our first year of driving evaluations, and to fully test these hypotheses, will have an additional year of testing, which will provide a total of 100 subjects upon completion of both years. We also will follow-up the participants who were evaluated in year-one of the study, to determine whether they have maintained their independence by assessing their current level of care, the presence of any depressive features, and by determining crash risk.

Information from this pilot study should assist with determining which participants with stroke are able to return to driving and prospectively maintain independence at home. The data generated from this pilot study will ultimately assist toward establishing appropriate evaluation guidelines for physicians, occupational therapists, and state licensing departments that are faced with making a decision regarding safe driving. If health care professionals are able to make decisions regarding an individual's ability to resume driving without the need to perform a performance-based road test, this will reduce expense, increase safety, and allow for an increase in availability of testing for more stroke patients.

Assisting stroke patients with their ability to drive should assist in maintaining their independence over a longer period of time, reduce family burden, decrease the incidence of depression, and delay a move to a more expensive setting such as assisted living and/or the nursing home.

Progress Report

Project Initiation: The first few months of funding from this project (9/07-12/07) were spent in project start-up including; hiring a project coordinator, training clinical staff, purchasing equipment, finalizing space, creating forms and questionnaires for the participants and informants, revising the Washington University Road Test (WURT), completing IRB approvals, and pilot testing the evaluation process. Since this was a new clinic effort at The Rehabilitation Institute of St. Louis (TRISL), it also required networking and close collaboration across many administrative levels. Telephone screening of participants (to determine if eligibility criteria was met) began in December 2007, with actual participant evaluations commencing on January 15, 2008. Subject recruitment has progressed without difficulty. Our driving research team has provided lectures at stroke conferences and participated in key meetings on the medical campus of Washington University with professionals that care for older adults with neurologic impairments. We have also contacted physicians by email and by letter, informing them of the study. In addition, TRISL therapists have provided many stroke referrals to our program. We typically were scheduled four weeks in advance for our driving evaluations. The fact that we are providing these comprehensive driving evaluations without any expense to the participant and family (out-of-pocket fees for driving evaluations are about $350 in the St. Louis area), enhances our ability to recruit and to obtain referrals from colleagues.

Recruitment to date:
Each participant was screened as to whether eligbility criteria was met via telephone. As of September 28, 2008, 66 potential participants were screened. Seventeen were excluded for participation in our study for the following reasons: three for fear of being reported to the Department of Motor Vehicles; one did not meet the age criteria; two had severe visual impairment; one refused stating he/she did not need to be evaluated; five did not have a valid driver's license; two had active seizures; one due to recurrent cancellations (five times); one physician refused referral; and one family declined.

Currently we have completed 49 driving evaluations of participants with a history of stroke and have entered 41 into our database. The demographic characterstics of this sample are as follows: 60.3$\pm$13.2 age in years, 41% Male, 37% African American, 14.0$\pm$3.2 years of education, average 42.0$\pm$12.8 years of driving, and drive an average of 6.3 $\pm$1.1 days per week. Informants that provided information on the participants included spouses (41%), adult children (27%) and friends/relatives (31%).

In our protocol we utilized the Functional Activity Questionnaire (FAQ) which is completed separately by informants and participants. This questionaire is a well-known and validated tool in the geriatric literature which measures impairments in activities of daily living and abnormal driving behaviors. The questionaire has been successfully completed by participants and informants, and the range of scores has been wide (0-27), with an average score of 3.5$\pm$6.1 (higher scores indicate more functional impairment). Informants have been able to report abnormal driving behaviors that could indicate at-risk driving by the participants prior to the assessment. Thus far, informants have documented a range of 0 to 8 unsafe driving behaviors in our participants, with an average of 1.3$\pm$2.1 behaviors.

The Missouri State Highway Patrol currently utilizes two measures for testing y novice drivers and those referred for fitness-to-drive evaluations (e.g. drivers with dementia or stroke). The two measures are road sign recognition tests and written examinations that test traffic safety knowledge. Our driving clinic has also created a written test that features common driving scenarios and situations that require decision-making and intact judgment. To date, our participants only have been able to name correctly 9.3± 1.9 road signs (out of 12), and obtain an average score of 9.9± 2.1 out of 13 questions on our written examination. This data will be compared to on-road performance as our sample size increases. These tests have been easy to administer, take minimal time by the examiner, and have some face validity and/or be potentially acceptable to the older adult as a proxy for safe driving.

We have adopted important off-road tests that not only tap into these key functional abilities, but also are often utilized by occupational therapists in driving clinic settings and by the American Medical Association (AMA) for physicians in the office setting. To date, the majority of our off-road tests have been acceptable to our participants and feasible to administer. All of these tests have exhibited a wide range of scores and significant portions have fallen into areas that have been associated with driving impairment. Far Visual Acuity both eyes (20/25 ± 8.1), Contrast Sensitivity (1.75± .20 LogMARs), Brake Reaction Time right foot (.93 ±1.23 secs), Rapid Pace Walk (8.4± 2.3secs), Short Blessed Test (4.8±4.7), Trails A (60.9±45.2 secs), Clock Drawing Test (6.0±1.3), Digits Forward (7.3±2.0), Digits Backward (5.1±2.5), and Maze Test.

As part of this study, we are revising the Washington University Road Test (WURT), and during the initial stages it has undergone several revisions in an attempt to make the assessment more functional, usable, and generalizable to other clinics. Our participants thus far have failed the road test (WURT) on 13 out of 40 occasions, representing 32.5% of the sample to date. If this percentage continues, this should more than satisfy our power calculation assumptions to create a model that can predict our qualitative outcome measures for stroke patients. As a measure of inter-rater reliabilty, 50% of our evaluations were scored by two instructors, one that is blinded to the test result. So far, these evaluators have reached a 95% concordance in classification on the qualitative scoring of the WURT (pass/fail). In addition, there will be a quantitative measure (which quantifies the number/type of errors made on the road) to be included at a later date. The Missouri Statewide Traffic Accident Recording (STARS) crash data has just been made available to us and will be incorporated into the database during the second year of the study. Our current sample size is too small to provide any preliminary data on a fitness-to-drive model for our stroke patients, which would utilize a logistic regression approach based on our qualitative outcomes (e.g. pass/fail on the road test and crash/no crash based on data from the STARS system).

The findings to date indicate that our chosen testing measures are acceptable, feasible, and provide a good dispersion of scores across ranges of neurological impairment for our stroke patients. Recruiting is on schedule to test another 50 subjects during the second year of funding. We do not anticipate difficulties with recruitment and can increase visibility in other institutions outside Washington University if needed. We will also begin our follow up of our first year clients as to their level of independence and functioning, care needs, depression, and crash risk. Our clinical tests have potential applicability to identify those neurologically impaired individuals that should no longer be operating a motor vehicle, as well as those who are safe to continue or resume driving. The potential cost savings of not having to obtain an on-road test would be a potential cost savings to these patients and families, and the public safety benefit from saved lives and prevention of injuries could be substantial.

Abstracts Submitted and Accepted
An abstract was submitted and accepted to the Gerontological Society of American (GSA) national meeting in November, 2008 as part of a driving symposium from our St. Louis driving consortium. This consortium represents faculty from Washington University at St. Louis, University of Missouri-St. Louis (UMSL), Jefferson-Barracks VA, and St. Louis University. We also had another abstract submitted and accepted to the national American Occupational Therapy Association meeting in March 2009. A manuscript will be in progress once we have completed recruitment of our 100 stroke participants.

Future Funding
This pilot data will be used to submit a major funding initiative to the Automobile Association of America Foundation for Traffic Safety (AAAFTS) and to pursue funding through NIA or the NINDS to determine whether our driving interventions result in a delay in institutionalization for our stroke patients and/or whether our stroke patients who pass the driving evaluation pose an acceptable crash risk to society.