

## Needs

To address such a sensitive problem, functional screening for older drivers must build upon a research base which indisputably links differences on individual tests and test batteries to differences on safety-relevant performance criteria, including — but by no means limited to — accident occurrences. Surrogate measures such as brake and/or steering response latencies in emergency maneuver situations, gap acceptance for turning movements at intersections and other high conflict scenarios, and a variety of maneuver decisions under real-world task loading levels and time pressures define additional criteria which may serve as important discriminators in licensing qualifications assessments.

To establish the empirical validity of functional screening indices, access to large data sets of accident records subject to fine-grained analysis is needed, as a start. Even given this information, and assuming sufficient resources to permit the careful measurement of functional capabilities for appropriate samples of drivers, the events just prior to an accident — including operator actions (or inaction), as well as vehicle movements — may not be described with enough specificity to allow meaningful correlation with screening results. Clearly, any expectation of linking observed differences in functional capability to accident likelihood without understanding the role of situational factors which define the performance context is naive.

As one possibility, studies providing for the simultaneous (video) recording of highway events and driver (vehicle control) behaviors, with individuals who have undergone extensive functional testing, could help pinpoint *which functions in which contexts* are most safety-critical, and what magnitudes of deficits must be experienced before problem behaviors become significantly more likely.

Aside from the obvious need for empirical validity in the subsequent implementation of functional screening measures for licensing decisions, the face validity of such tests also merits careful consideration. Older drivers' self-awareness of declining vision, together with the high face validity of vision testing to safe driving performance, makes license restrictions on this basis socially acceptable; deficits in perceptual, cognitive, or attentional functions more often go unnoticed by an individual, and the relationship of, say, a deficit on a laboratory measure of divided attention capability to traffic safety may also be less apparent. Elderly motorists who are confronted with the loss of dignity as well as mobility that results when driving privileges are restricted or revoked will arguably be more likely to accept and comply with policies based on face valid testing procedures.

It may be noted that emerging, sophisticated but economical simulation technologies, including low-cost

PC-based multimedia testing and training systems, offer the possibility of rigorous and standardized functional screening using the (dynamic) presentation of familiar elements of the driving scene. An approach to licensing assessment that fully exploits current technology in this area could address the need for face validity, while necessarily incorporating the crucial contextual variables mentioned earlier.

## Actions

The logical focus of activities to advance driver screening for functional capability is at the state level, through research initiatives and pilot programs which can be undertaken in a given jurisdiction without the need for new legislation. When the most valid protocols and procedures are thus identified, a mandate for uniform practice may be established. Specifically, the goal of developing functional screening techniques to reliably identify the most at-risk drivers, without bias and without explicit reference to an individual's chronological age, could be advanced by:

- Fostering a broad awareness of task analysis outcomes indicating driver perceptual, cognitive, and physical requirements in specific problem situations, prioritized through accident analyses.
- Obtaining additional, real-time data describing problems in drivers' behavioral responses to specific highway events, where differences in vehicle control effectiveness can be explained in terms of differences in one or more functional capabilities.
- Validating functional screening results through correlation with accident databases where incident analysis has coded contributing driver factors in sufficient detail to permit determination of "most causative action" (or event).
- Establishing consistent accident reporting, analysis, and coding procedures across jurisdictions.
- Incorporating isolated functional testing protocols into a unified program which presents meaningful test stimuli embedded in everyday driving scenes and situations, and employs familiar vehicle control responses as required under actual operating conditions.

## MEDICAL EVALUATION

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Physicians are faced with the responsibility of medically evaluating an older driver population that has experienced rapid growth and a higher crash rate per mile driven. On top of this, older persons are more likely to have a single infirmity or multiple chronic

illnesses and exhibit considerable variation in age-related physiologic changes. These age-related changes, part of the normal aging process, are characterized by a decrease in visual perception, cognition, and psychomotor function, skills which are essential for the driving task.

### **Problem**

Currently, there is no specific way to reliably distinguish between safe and unsafe older drivers, those who pose an undue risk to themselves and others. This task of identifying high risk drivers is especially difficult because most states do not require mandatory reporting by physicians of individuals with medical conditions which may potentially interfere with safe driving. We must depend on state reporting systems to identify drivers in need of further medical examination.

Drivers evaluated medically are brought to the attention of licensing agencies in a number of ways. These drivers may respond positively to questions concerning a history of seizures, diabetes or alcohol-related problems at the time of initial licensing or at drivers license renewal. They may also relate other medical illnesses which may adversely affect driving. Driver license examiners and police officers may request evaluations of individuals in apparently poor physical condition or drivers involved in vehicular crashes where medical illnesses may have been contributory causes. In addition, accounts of medical problems may be submitted by physicians, concerned family or neighbors which may trigger the issuance of appropriate medical documents. Reports from the courts of adjudications of incompetence or involuntary commitments for the treatment of alcoholism and/or drug addiction may also prompt a medical evaluation. Additional cases may be referred by agencies that provide services to people with blindness or other disabilities.

With regards to the medical evaluation itself, we must rely on a comprehensive, multidisciplinary approach utilizing primary care physicians, those treating the elderly on a routine basis, along with other health care and rehabilitative specialists. These health care professionals have the task of identifying illnesses and/or normal physiologic changes related to the aging process that may interfere with safe driving. The information gathered is forwarded to state licensing agencies who with the aid of Medical Advisory Boards make the final licensing decisions.

The physician through a comprehensive history, physical examination and indicated laboratory tests is responsible for identifying medical conditions that may impair driving performance. Many physicians are

hesitant, however, to assume this role due to a lack of validated, reliable instruments or guidelines outlining the appropriate medical procedures for determining driver capability. Licensing agencies may facilitate this undertaking by providing physicians with copies of state guidelines, statutes and all relevant driver history data on each driver being evaluated, including driving records and concerns about crashes where medical illnesses have been cited. Physicians can use this information to aid in the formulation of opinions regarding the driving capabilities of the medically impaired.

Physicians can utilize their history taking skills to obtain information on functional status, the ability to carry out the activities of daily living in the presence of age-related physiologic changes and ailments. Information on driving habits, including if the individual drives, self-imposed restrictions, crash or near-crash experiences and the type of vehicle driven must also be obtained.

One must keep in mind that the gross determination of functional ability may overlook potentially milder impairments which would interfere with safe driving. Examples of these subtle impairments that might not be detected by instruments developed to assess activities of daily living include reaction time and tracking.

The physical exam needs to assess the degree of age-related physiologic changes and the presence of disorders common in the elderly which may impair safe driving. Included among these are decreased hearing and vision (cataracts, senile macular degeneration, open-angle glaucoma and diabetic retinopathy), reduced reaction time, cardiac disease (arrhythmias, atherosclerotic and ischemic heart disease), pulmonary disease, diabetes mellitus, neurologic diseases (stroke, syncope, seizures, neuropathies, Alzheimer's disease and Parkinson's disease), sleep apnea, arthritis, alcohol use and polypharmacy (Reuben 1991). Routine vision screening including static visual acuity and confrontational visual field examination should be obtained as part of the physical examination, with more extensive evaluation by vision specialists if indicated.

Potentially treatable and disabling problems cannot be dismissed as normal aspects of aging. Physicians have the duty and obligation to treat these impairments, to reverse or minimize the impact of disease and ultimately lessen their effects on driving performance. Along these lines, physicians must periodically assess the course of disabling disorders and attempt to minimize their progression as well as the total number of medications prescribed with their resultant side effects.

Clinicians may experience some difficulty in assessing the degree of functional impairment present when relying on their training using the medical model.

This is especially true when physicians must determine overall functional ability in the presence of multiple, interacting medical conditions with variable expression.

### Needs

Validated, reliable diagnostic procedures and tools are needed to assist physicians in diagnosing the extent of functional impairments present which may impact on driving ability. These instruments will enable physicians to concentrate on functional ability, not the degree of physiologic derangement present. The states of Maine and Utah (1992) through their physician guides have attempted to stress functional ability, regardless of medical impairment, as the key to determining driving limitations and follow-up intervals.

The physician's input in the areas of unexpected medical events and changing medical conditions which may have profound effects on driving is crucial. For example, it is important to know the likelihood of recurrence of an epileptic seizure or syncopal episode as well as the severity and frequency of arthritic flare-ups. Wallace and Retchin (1992) also point out the importance of looking for potentially irritating signs and symptoms including urinary incontinence, dermatitis and leg stiffness brought on by immobility which may distract a driver's attention. The clinician can also provide valuable information about the need for follow-up and follow-up intervals in cases of potentially progressive disorders.

Physicians play an especially critical role in helping identify and in evaluating drivers with dementia. Their input is extremely important as those individuals with significant cognitive and perceptual impairments are often unable to judge their limitations and the need to alter driving practices, unlike most older drivers who tend to modify their driving habits in the face of potentially impairing conditions.

A detailed procedural approach for diagnosing and treating the more common diseases in the elderly is beyond the scope of this paper. This can be easily found in any of the fine textbooks on geriatric medicine. An attempt at outlining the major steps in the diagnosis and treatment of the more common diseases would run the risk, due to space constraints, of failing to stress the presence of multi-system pathology and their resultant effects on driving performance.

Further evaluation by occupational therapists skilled in driving evaluations is advisable to complete the assessment in individuals with significant medical impairments and in determining the need for adaptive equipment or driving restrictions in borderline cases.

Testing may vary from site to site but can include examination of strength, range of motion, tone, coordination, vision (visual acuity, traffic color recognition, field of vision, night vision, glare recovery, depth perception and perceptual processing time), reaction time, cognition (sign recognition, attention/concentration, memory, planning and organizational skills), performance on a driving simulator (threat recognition, night driving and crash avoidance) and an on-the-road driving exam. These tests also have the added benefit of identifying impairments that may respond to training.

In the majority of states, the clinical information submitted by the physician to the licensing agency is reviewed with the assistance of a Medical Advisory Board that provides medical expertise to the licensing authority. Further clarification of the driver's functional status and driving skills may be obtained by the Medical Advisory Board through consultations with specialists, from the results of written tests, sign recognition tests and road tests administered by the driver licensing agency. The final driver's licensure decision is left up to the licensing agency.

### Action

Physicians bear the major responsibility in assisting licensing agencies in assessing driving risk. It seems appropriate to ask doctors to assume this role because of their medical training in the identification and treatment of disease states. This duty becomes especially formidable, however, when you consider that a driver's functional status is only loosely related at best to any 'physiologic derangement' present and that very few physicians have received any training to prepare them for this role. Clinicians need guidance and data that relates disease states to functional ability.

To assist physicians with this role:

1. Further studies are needed to determine the impact of disease states on driving ability.
2. Continued research is needed in the development of tools to assist the physician in the accurate determination of the extent of functional disability associated with various diseases and to reliably assess functional ability with changes in disease severity.
3. Physicians must be made aware of the latest research findings and the lack of studies outlining the driving risk associated with various disease entities.
4. Driver licensing agencies must furnish physicians with complete, understandable reports of current driver

status including reports detailing potential medical concerns.

5. Family members must be sought to provide valuable information on functional ability and to serve as allies when appropriate measures must be taken to prevent driving in the high risk elderly.

## References

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## VISION SCREENING

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### Problem

#### 1. Failing visual-attentional abilities of older drivers.

Most perceptual-motor skills deteriorate with age, and the complex visual-attentional and oculo-motor functions do so at a faster rate and begin at an earlier age than the sensory-peripheral and static functions, such as static foveal acuity. This has been shown for dynamic visual acuity, dynamic contrast sensitivity, and effective visual field. Associated with the age-related average decrease in performance is the increase in individual differences.

#### 2. Elderlies' lack of awareness of their reduced ability.

Because the deterioration is typically gradual, visual impairments are often not detected in the process of daily living activities, but only through clinical and functional assessments (e.g., glaucoma and scotomas, respectively).

3. *Need of license to retain independence and mobility.* Based on self-report surveys people who lose their license and stop driving tend to reduce their activity levels in terms of visiting friends and relatives, shopping, going 'out', and going to church.

4. *Cost of vision re-assessment, and lack of agreement on appropriate standards.* Licensing agencies are reluctant to introduce any new vision screening criteria that would prolong the test duration to beyond one minute. Static foveal acuity under optimal illumination is currently the accepted standard. There is also no consensus in the research community on (a) the best alternative or additional test(s), (b) the pass/fail standard for these test(s), and (c) recommended action for those who fail the test(s). Consequently it is still legally irresponsible for a DMV to change the vision licensing standards.

### Needs

The problems described give rise to three major needs.

1. *Public education of older driver's low involvement in crashes, importance of license for mobility, and the elderlies' self limiting behaviors.* Despite their relative dearth, older drivers' accidents are very salient in the media - which tends to highlight the age factor. Possibly because they drive slower, their driving behavior may also be annoyingly conspicuous to much of the motoring public. However, it would be interesting to assess public awareness of the actual low frequency of older driver crashes, the criticality of driving to mobility, and the need for tolerance, because there but for the grace of a few years, go.

2. *Education of older drivers on detecting vision problems and compensating driving strategies.* Many of the drivers who voluntarily limit their driving exposure (or stop altogether), do so because they detect their own limitations. But it is possible to introduce some quick gross 'tests' that can serve people as 'rule of the thumb' indicators of their visual ability. For example, it is easy to determine the snellen equivalent of 20/40 for the distance from which license plate numbers should be readable; and self test for horizontal visual field.

3. *More conclusive research on the potentially relevant visual functions, performance requirements for each, and implications for license restrictions.* Intensive research underway now includes evaluations of Useful Field of View (UFOV), Contrast Sensitivity, Low-Contrast Acuity, Dynamic acuity, and Dynamic contrast sensitivity. The UFOV is most significant because it taps both visual-sensory skills as well as oculomotor and attentional skills. Older drivers in particular should be evaluated on the combination of the latter two skills, since these tend to deteriorate most rapidly.

Since vision alone cannot — even theoretically account for a high proportion of accidents — the