

confident they still possess the skills for this type of performance test. Unfortunately, this is a service for which the fee is not covered by Medicare. This then places a financial burden on the elderly driver.

### **Actions**

1. Develop nation-wide uniform physician reporting requirements.
2. Fund a feasibility study to determine the efficacy of contracting driver performance testing of older drivers to Driver Rehabilitation Specialists. Driver Rehabilitation Specialists acting as agents of the State should also be free of the threat of lawsuit as are the current driver licensing personnel.
3. Research needs to continue in the development of easily administered dynamic visual acuity testing apparatus and driving test standards. As an interim measure, visual acuity and visual field tests should be performed on all drivers over a pre-determined aged each time a license is renewed.

### **SCREENING OF DRIVERS' FUNCTIONAL CAPABILITIES**

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#### **Problem**

Estimates of the variance in accident involvement accounted for by *operator inattention* or *information processing deficiency* range from 40 up to 70 percent. In other words, an individual's "functional capability" may be as important a predictor of accident risk as roadway, traffic, and weather conditions combined *plus* performance on other, traditional measures of driver capability such as the battery of vision tests used in most states. As policies for restriction of licensure evolve in various jurisdictions across the U.S., they should fairly reflect the most safety-relevant aspects of driver performance. The processes underlying timely and appropriate vehicle control actions, particularly in imminent-conflict situations, must therefore be a central element in future screening programs. As elaborated below, these processes may be conveniently grouped under the headings of *perceptual*, *cognitive*, and *psychomotor* response functions.

Driving, of course, is at times a highly complex task where vehicle control decisions must be reached and acted upon within a severely constrained timeframe. Both the speed of response and correct response

selection are critical for effective performance; thus, it is important to address the antecedent processes involving working memory, divided attention, selective attention, and pre-attentional mental activities. As one example, the unprecedented strength of relationship of "useful field of view" deficits to elevated rates of intersection accident occurrence indicates the importance of maintaining a stable, criterion level of performance on a centrally-located visual processing task while simultaneously being able to rapidly and accurately perceive targets which appear unexpectedly outside of the foveal viewing area.

Increasing age, particularly for "old-old" drivers in the 75+ group, is strongly associated with functional deficits for a wide array of key perceptual, cognitive, and psychomotor capabilities. The useful-field-of-view measure, noted above, is but one index of performance that shows a systematic decline with advancing age. Older drivers, on average, are slower to locate and to extract the most relevant cues from traffic control devices or from the behavior of other motorists when viewing a visually-cluttered roadway scene. Visual distraction is more of a problem with this group, especially in unfamiliar environments. An overall slowing of perceptual and cognitive functions leads to disproportionate increases in many types of performance errors at faster driving speeds for older versus younger persons. When nothing unexpected occurs, older drivers demonstrate a reaction time that is only marginally slower than their younger counterparts; in an emergency situation, however, the first — and every subsequent — maneuver required of a driver to avoid a collision will take progressively longer for older persons to perform. In short, the likelihood of significant functional decrements with increasing age is high, and older motorists represent the fastest-growing segment of the driving population in the U.S.

While the deficits in functional capability demonstrated by a particular older person may be appalling to those who share the roadway, many other motorists in this age cohort will be functionally equivalent to the mean performance levels of drivers in their early middle-age years. This is a crucial finding: *on average* older drivers will experience a serious deficit in one or more functions needed for safe and effective vehicle control, but the variability in performance also rises dramatically with age. It will therefore not only promote the overall goal of highway safety, but also can help to avoid potentially discriminatory, age-based regulatory policies, to develop and validate screening processes that identify individuals whose functional impairment(s) place them at significantly higher risk of accident involvement.

## 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