

On-Road Evaluation of Driver Capability: A Medical Record Review of the Adaptive Driving Program

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1. Introduction

Evaluating Driver Capability

Driving evaluators enumerate driving errors to gauge performance. Driver Rehabilitation Specialists test if medical issues are the cause.

Physician's Perspective

- Mandatory Physician Reporting Laws place a strain on the patient-physician relationship
- Physicians often feel unprepared to address driving skills

Driver Rehabilitation Perspective

The variability of multiple factors often complicate evaluations

- | | |
|--------------------------------|--------------------|
| Driving maneuver | Pedestrians |
| Posted traffic signals & signs | Speed of Travel |
| Presence of other road users | Weather conditions |
| Road obstacles | Road quality |

2. Key Objectives

Assess driver capability based on record of assisted-driving events during on-road evaluation, which indicate problems with:

- Independent Vehicle Operation, and
- Safe Driving Decisions.

Analyze results of the enumerated driving errors list to show

- Tally & Criticality of various driving errors
- Limit of assisted-driving events to assess driver capability deficits

3. Chart Review

*Medical record review approved by University of Pittsburgh institutional review board

Inclusion of Medical Records

All clients who completed intake for the Adaptive Driving Program beginning in 2009. Tracked all records until cases were finalized.

Digitization Protocol

Recorded all chart entries in raw form. No personal identifiers were collected. Data entry performed by a single coder.

Content Analysis

Created enumerated list of all driving errors. Flagged all assisted-driving events as:
Implied – stated assistance or cues in report
Potential – possible assistance or cues in the absence of explicit statement of occurrence

Secondary analysis compared implied vs. potential errors to the outcome of on-road evaluation (“did pass” or “did not pass”).

4. Study Results

Client Demographics

The Adaptive Driving Program included medical-impaired drivers across the age span.

Cognitive	Spinal Cord Injury	48%	35.5%	14%	2.5%	82.8%	17.2%
Brain Injury	Multiple Sclerosis	Pass	Modify	Train	Fail	Did Pass	Did Not Pass
Stroke	Amputee	Represented Disabilities		Baseline Outcomes		Case Conclusions	

Enumerated List of Driving Errors

Assisted-driving events were documented in

- 14% of the 58 cases where clients did pass on-road evaluation
- 18 of 20 cases where clients did not pass on-road evaluation

The outcome of “did not pass” related to a recommendation for training or failure



A-Steering & Braking Assistance B-Verbal Cues Assistance

Figure 1A&B: A-Independent Vehicle Operation, B-Safe Driving Decisions

Driving errors were grouped by environment (Road Crossing vs. Road Segment) and maneuver (Tracking, Merge, Lane Change, Turn, Intersection).

Table 1. Sample Enumerated List of Road Segment Errors

Class	Total	Frequency	Errors	Context	Potential CUE	ASSIST
Tracking	101	31	too close to side of lane ---CUE	steering	X	
		15	oriented to keep hand on spinner knob ---CUE	steering	X	
		12	tends to drive under speed limit	speed control	X	
		10	would exceed speeding limit	speed control	X	X
		5	required assistance at times---ASSIST	steering	X	X
		5	poor lane position	highway driving	X	
		3	speed variable throughout session	speed control	X	
		3	simultaneously gas and brake (pedal strike errors)	speed control	X	
		3	oriented to proper vehicle spacing ---CUE	steering	X	
		2	unsafe hand positioning	steering	X	
		2	vehicle spacing not tested	steering	X	
		2	too slow, caused traffic to pass on right	highway driving	X	
		2	poor speed matching to flow of traffic	highway driving	X	
		1	slow to react to lane position errors	steering	X	X
		1	unaware of lane departure	steering	X	
1	dismissive of steering problem	steering	X			
1	became nervous	highway driving	X			
1	not tested	highway driving	X			
1	just nervous	decision making	X			
Merge	8	5	need to work on entry and exit	highway driving	X	X
		2	overriding for merge of lane change	steering	X	
		1	necessary stop on exit for merge	highway driving	X	
		1	lane change by mirrors only	rt and left turn	X	
Lane Change	12	2	lane change without checking for traffic	rt and left turn	X	
		1	questionable check for traffic during lane changes	steering	X	
		1	switched turn lanes unsafely	rt and left turn	X	X
		1	help with appropriate lane selection ---CUE	rt and left turn	X	
1	required assistance for lane change ---ASSIST	highway driving	X	X		

Criticality of Assistance Related to Outcomes

Assisted-driving events were documented in

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- 18 of 20 cases where clients did not pass on-road evaluation

The outcome of “did not pass” related to a recommendation for training or failure

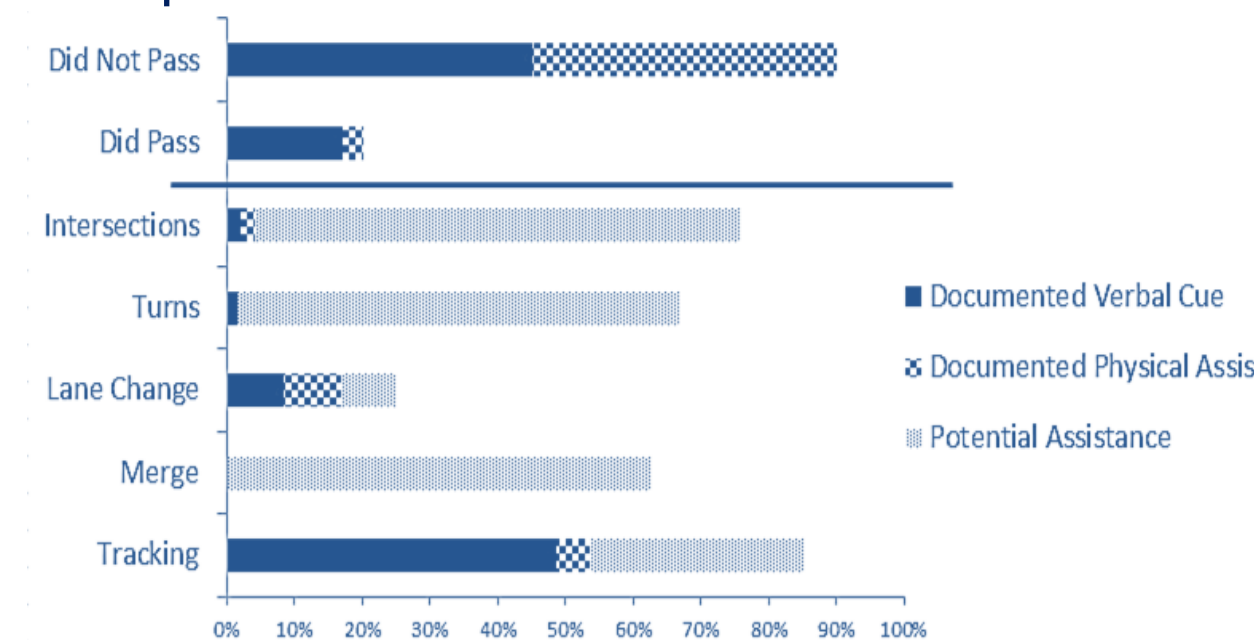


Figure 2. Assistance Linked to Error Classes and Outcomes

5. Discussion

Limitations

Few implied events of assistance related to road crossing errors. Uncertain whether findings indicate:

- Documentation accuracy declines at road crossings, or
- Driving errors over road segments are more significant.

Criticality vs. Frequency

Given the low rate of documented assisted-driving events, potential assistance could possibly take place with 60-80% of driving errors

- Assisted-driving events have specificity of 93.3%
- Explicit mention of assistance related to very few of the total enumerated list of driving errors

The mapping of assisted-driving events to outcomes of on-road evaluation supports automated documentation of the critical events as proposed in the NAViSection methodology (Beyene et al, 2011).

Relation to Past Studies

Most errors needing assistance occurred with tracking/lane keeping. This finding supports prior studies linking seniors to errors with remaining “centered” in a lane.

- On-the-road evaluation (Hoggarth et al, 2011)
- Driving simulation (Longhitano, 2012)

Key Implications:

❖ Criticality of assisted-driving events during on-road evaluation (occurred with 90% of clients who did not pass) supports the use of in-vehicle technology to detect & document steering, braking, and verbal cue assistance

❖ Increased use of evidence to compliment client counseling and education may promote greater harmony among health care/driving rehabilitation professionals and current or potential drivers.

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