

Adaptive Driving


Foundations and Frontiers

State of the Science Symposium
Walter Reed National Military Medical Center
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Preview


- PhD Comics 2 Minute Thesis Contest! Video



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Foundations and Frontiers

- Need for Driver Rehabilitation
- Scope of Services
- Driver Licensing Policy
- Challenges to Service Provider
- Vehicle Modifications
- In-Vehicle Technologies
- Advanced Driving Assessment
- A New Standard for Driver Licensing



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Foundations: Need for Driver Rehabilitation

- Prevalence of Disability
- Roadway collisions
- Workplace injury
- Chronic disease
- Transportation Independence
- End of Institutionalization
- Growth of our Aging Population
- Criticality of Mobility and Participation for Economics



Research Note

December 1997

National Center for Health Statistics (NCHS) estimates, based on a 1990 survey, that approximately 211,000 persons with disabilities used some type of adaptive equipment...

...the number of vehicles with adaptive equipment will continue to increase, as a larger proportion of the population begins to age and as access to employment, travel, and recreation continues to improve for persons with disabilities as a result of the ADA.

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05-10-04

Driver Rehabilitation: A Growing Niche

In the decade leading up to 2001, the number of older licensed drivers increased 32% to approximately 19.1 million. In contrast, during this period the number of licensed drivers overall only increased by 13%.²

2. National Highway Traffic Safety Association. (2003). *Safety facts 2002: Older population*. Washington, DC: Author. (DOT HS No. 809611)

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Foundations: Need for Driver Rehabilitation



- Home
- News
- Travel
- Money
- Sports
- Life
- Tech

News » Nation » Cessars » Troops at Risk » Lotteries

Older, dangerous drivers a growing problem

Updated 8/22/12 2:21 PM | Comments (0) 304 | Recommend (0) 166 | Email | Print



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LOCAL

Spotlight On Senior Drivers After Crash Involving 100-Year-Old Outside South LA School

August 30, 2012 7:01 PM

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Foundations: Need for Driver Rehabilitation

STRIPES CENTRAL

Erratic driving an increasing problem among returning combat veterans

By DEREK TURNER
Published January 11, 2012

Los Angeles Times

LOCAL U.S. WORLD BUSINESS SPORTS ENTERTAINMENT HEALTH

JRRD
Journal of Rehabilitation Research & Development

Troops back from deployment more likely to cause car accidents
April 24, 2012 | By Jerry Hirsch, Los Angeles Times

Volume 48 Number 8, 2011
Pages 913 - 926

7 Prevalence and characteristics of driving difficulties in Operation Iraqi Freedom/Operation Enduring Freedom combat returnees

Foundations: Scope of Services

Intake with the prescription of a family physician or specialist

- All ages
- Driver experience
- Vehicle type
- Life roles
- All medical conditions
- Cognitive
- Sensory
- Physical/ Motor
- Medications

Total Client Base by Age

Age Group	Count
CVA/Stroke	19
TBI	8
Amputation	6
SCI	4
Diabetic Neuropathy	3

8 Determined by 2009 Medical Record Review of Adaptive Driving Program (PITT)

Foundations: Scope of Services

N=122

On-the-Road Evaluation

- Pass (58) → Continue to Drive (102)
- Need Training (61) → Continue to Drive (102) and Driver Cessation (22)
- Fail (3) → Driver Cessation (22)

9 4 Types of Clients: Adapted Vehicle Vs Standard Vehicle
Novice Driver Vs Experienced Driver

Foundations: Scope of Services

- Intake with the prescription of a family physician or specialist
- All ages
 - All medical conditions

Current activities in service of veterans

VAPHS GRECC Newsletter



Geriatric Driving Safety Clinic

The GRECC Geriatric Driving Safety Clinic has received a steady number of referrals from VA primary care providers since the clinic began evaluating patients earlier this year. The clinic was originally scheduled for once each month, but clinic days were increased to twice a month beginning in March 2009 because of the number of consults. As of July 2009, 29 patients have been fully evaluated and the clinic is currently fully scheduled through October.

Some of the noteworthy findings thus far are the following:

- 81% showed decreased executive function
- 85% had vision issues that could affect driving
- 57% had medical issues affecting driving safety
- 47% showed decreased cognitive processing speed

As a result of the assessments, 13% of the veterans who attended the clinic were scheduled for on-road testing.

See Appendix D of VHA HANDBOOK 1173.16 to obtain full listing of currently Driver Rehabilitation Programs (providing on-road driving) by the VA


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Foundations: Scope of Services

- Intake with the prescription of a family physician or specialist
- All ages
 - All medical conditions

Current activities in service of veterans

Auto anxiety: Some returning veterans struggle with driving








See Appendix D of VHA HANDBOOK 1173.16 to obtain full listing of currently Driver Rehabilitation Programs (providing on-road driving) by the VA

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Foundations: Driver Licensing Policy

- ▼ New Drivers
 - Graduate Driver Licensing
- ▶ Experienced Drivers
 - Mandatory Physician Reporting
 - Age-Based Renewal
 - Age-Based Random Sampling

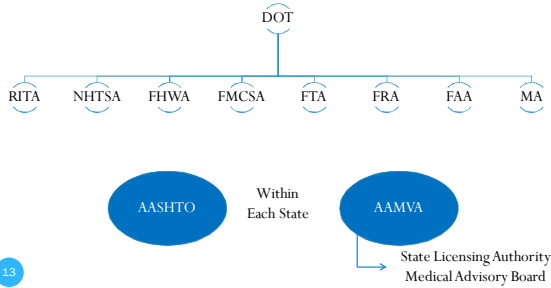


IS IT HARDER TO GET A LICENSE THAN A JOB? I GOT MINE IN ~ 6 WEEKS! LOOK AT THE STEPS NOW!	Take Driver's Ed	Physical Exam & Knowledge Test	Get Insurance Coverage	Certificate of Practice Completion	Take Road Test
	 30 hrs			 50 hrs	 >6 mos

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Foundations: Driver Licensing Policy

- Job-related Driving – additional concerns, different pathways



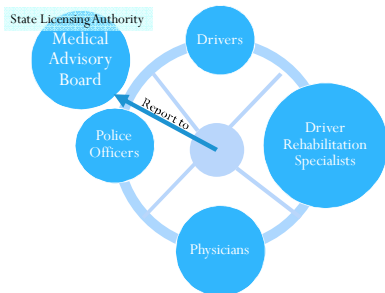
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Foundations: Challenges to Service Provider

- Mandatory Physician Reporting
 - Immunity vs Anonymity
 - Patient-Physician Relationship
- Client Dismissiveness
 - Face validity of process
 - Disposition to Healthcare
- Assessment Ambiguity
 - Client's view and understanding
 - Causality of medical-impairment
- Prognosis vs. Current Need
 - Expiration date of resolution
 - Modification for future health status

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Foundations: Challenges to Service Provider



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From Foundations to Frontiers

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Frontiers: Vehicle Modifications

- Primary Controls
 - Steering
 - Braking & Gas
 - Ignition/Gear Shifting/Parking Brake
- Secondary Controls
 - Turn Signals/Wipers/Headlights
 - Air Conditioning/Radio
 - Windows/Hood/Trunk/Gas Tank
 - Horn/Hazard flashers

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Frontiers: Vehicle Modifications

- Driver Seating
 - Entry/Egress
 - Posture
 - Securement
- Infotainment Systems?
- More???

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Frontiers: Advanced Driving Assessment

Example of Senior Driver Ombudsman Service

Training for:

- Law Enforcement
- Licensing Authority
- Health Professionals
- Senior Drivers



Senior Ombudsman Program



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Frontiers: Advanced Driving Assessment

Example of Purnima Kuria and Paul Cooper
Driver Rehabilitation Program

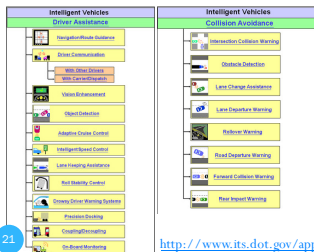
- Person-Aware
- Context-Aware
- Complimenting
- Supplementing



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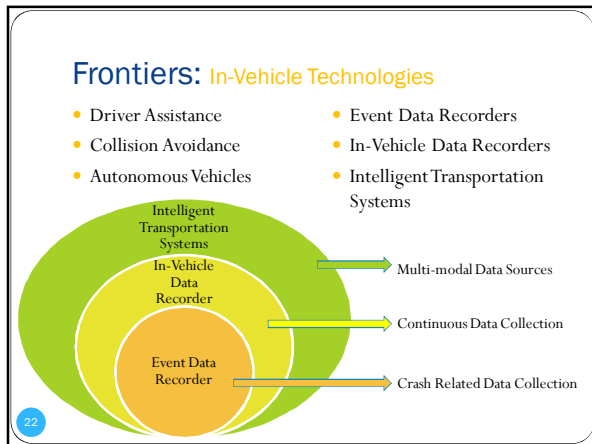
Frontiers: In-Vehicle Technologies

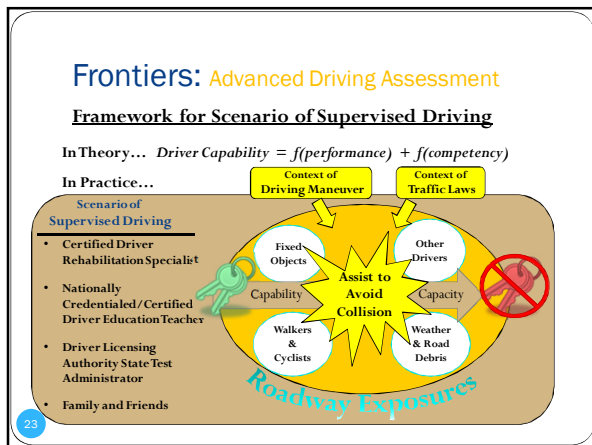
- Driver Assistance
- Collision Avoidance
- Autonomous Vehicles
- Event Data Recorders
- In-Vehicle Data Recorders
- Intelligent Transportation Systems

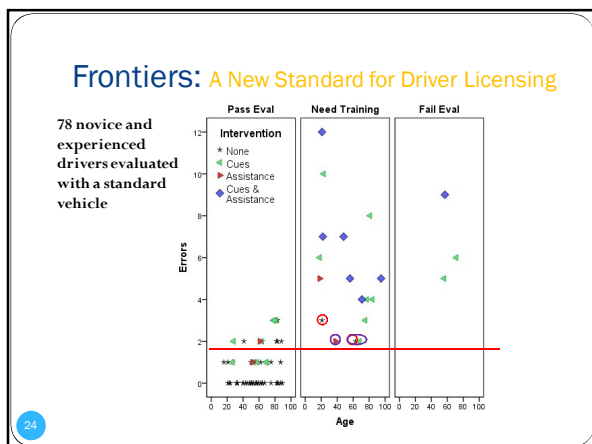


http://www.its.dot.gov/application_areas.htm

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Frontiers: A New Standard for Driver Licensing

	Overall (N=121)		Excluding Vehicle Modifications (N=78)		Excluding Vehicle Modifications (N=78)	
	Driving	not driving	driving	not driving	driving	not driving
unassisted	65	5	47	1	55	2
assisted (cued, assisted, or both)	35	16	16	14	8	13
sensitivity	65.0		74.6		87.3	
specificity	76.2		93.3		86.7	
error	58.8		32.1		26.0	
positive pred. val.	92.9		97.9		96.5	
negative pred. val.	31.4		46.7		61.9	

unassisted
 ≤ 2 errors
> 2 errors

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Frontiers: A New Standard for Driver Licensing

NAViSection Design Progression

Automated Detection

Maximal Attention to Client

Yellow means slow down!!

Steering Assistance Driving Cues Braking Assistance

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Frontiers: A New Standard for Driver Licensing

NAViSection Design Components – at the interface of an evaluator and an intelligent vehicle

- A. Steering Wheel Magnets
- B. Wireless Steering Wheel Contact Sensor
- C. Evaluator Brake Switch and Web Cam
- D. CDRS Event Logger
- E. Data Acquisition and Receiver Unit
- F. Event Recording and Witness Logger Program
- G. DriveCap In-Vehicle Data Recorder

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Frontiers: A New Standard for Driver Licensing

NAViSection System Installation

Updates:
Wireless network of phones added to test accelerometers for vehicle movement and steering wheel movement

OBDII replaced by Rear Speed Radar

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Frontiers: A New Standard for Driver Licensing

NAViSection System Evaluation – Automatic vs. Manual Log

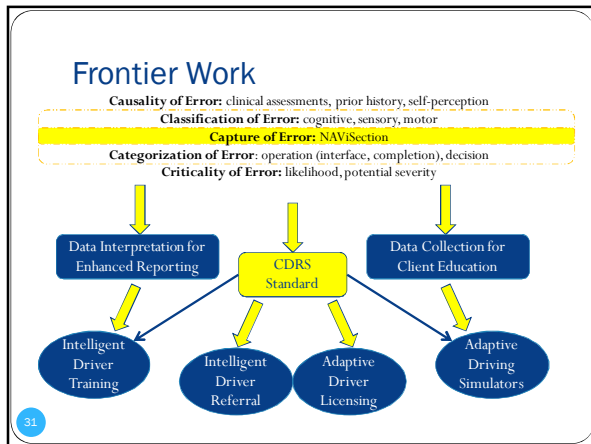
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Frontiers: Advanced Driving Assessment

NAViSection Benchmarking – the difference in Supervised Driving

	Records Brake Duration	Generates Summary Report	Records GPS Coordinates	Allows for Evaluator Interaction	Manual On-Road Data Logging
NAViSection	✓	✓	✓	✓	✓
Vericom Brake Reaction Timer	✓	✓			
Solutions thru Software Road Scholar	✓	✓	✓		✓
Naturalistic Driving Data DrivingDiagnostics	✓	✓	✓		✓
Advantech Computer Assisted Oversight for Driving Tests	✓	✓	✓		✓
AutoHabits	✓	✓	✓		

30 Other FLEET MGMT tools include SmartDrive and DriveCam for example



Acknowledgements

- Medical Record Review Study
 - Amy Lane
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 - Dr. Thomas Songer
 - Dr. Katherine Seelman

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You may ask questions,
but I may point you to a book
or the stack of literature on my desk

Nahom Beyene – nmb32@pitt.edu

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TIME FOR ACTION
DECADE OF ACTION FOR ROAD SAFETY 2011-2020

NAV SECTION

Identify * Interpret * Inform

Adaptive Driving Program

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SATH
SOCIETY FOR ACCESSIBLE TRAVEL & HOSPITALITY

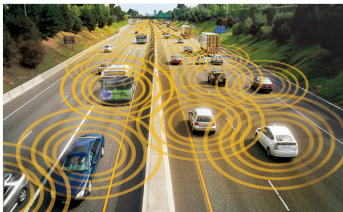
Jessica Cox was born without arms but that did not stop her from fulfilling her dreams of becoming a black belt, scuba diver, first ever armless pilot!

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IEEE Says That 75% Of Vehicles Will Be Autonomous By 2040

Richard Read | 1,058 views | Sep 19, 2012



Department of Transportation vehicle-to-vehicle (V2V) program

[Institute of Electrical and Electronics Engineers \(IEEE\)](#) boldly announced that its members had "selected autonomous vehicles as the most promising form of intelligent transportation, anticipating that they will account for up to 75 percent of cars on the road by the year 2040".

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“Can more sophisticated biometrics & testing combined with more sophisticated vehicles and roadways lead to extended and flexible licensing for the elderly and enhance safety of elderly drivers at the same time?”

Martin Wachs
Rand Corporation & University of California

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