



## A Department of Transportation (DOT) Focused Educational and Biometric Screening Program and Its Effects on Commercial Driving Medical Exam Outcomes at Denver Public Works: A Quality Improvement Study

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# Commercial Drivers in the US

- 13<sup>th</sup> largest employment category in the US
- 5.9 million CMV drivers in 2016
  - 3.7 million interstate
  - 2.2 million intrastate



# Health and Lifestyle Risks in Commercial Motor Vehicle Operators (CMVOs)

- Obesity
- Obstructive Sleep Apnea
- Hypertension
- Diabetes mellitus
- Premature CVD
- Hyperlipidemia
- Physical Inactivity
- Improper Diet
- Stress
- Isolation

# US Commercial Vehicles Accident Statistics



The scene of a June 2009 accident near Miami, Okla., in which 10 people died. Investigators said the 76-year-old driver of the semi, which plowed into stopped and slowed traffic, had probably fallen asleep. Oklahoma Highway Patrol

- 4,079 fatal large truck or bus crashes in 2016
- 97,000 non-fatal injury crashes from a large truck or bus in 2015
- 10-30% all MVA's due to sleepy drivers
- Treatment of OSA reduces MVA risk

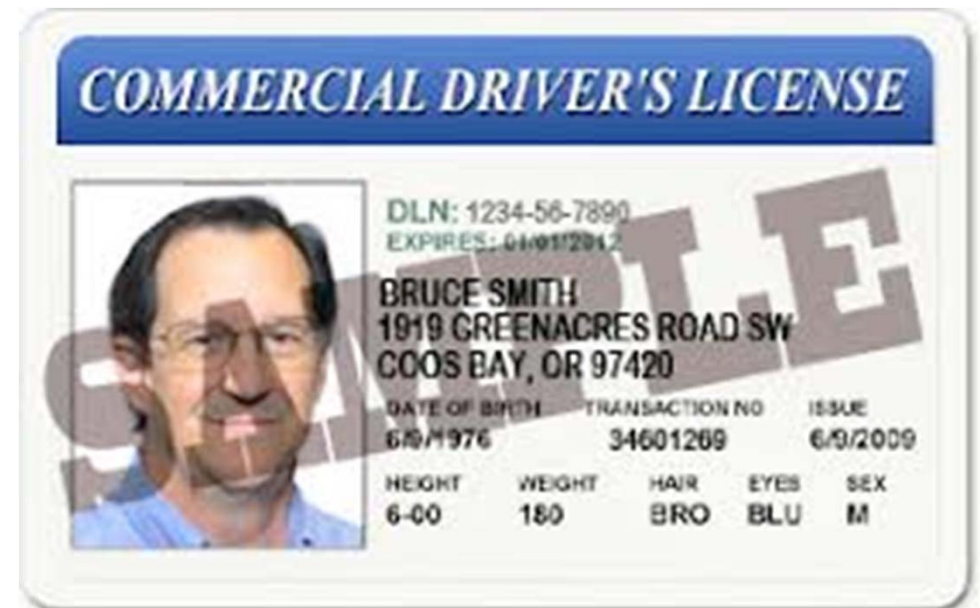
# Commercial Drive Exam Process

- History
- Physical Exam
- UA dipstick for blood and glucose
- Urine drug screen upon reasonable suspicion or employer request
- Cost to driver or employer estimated to be \$100-200



# Range of Possible Commercial Driver Medical Exam Results

- Unrestricted Certification
  - 2 years
- Shortened Certification with periodic monitoring
  - 1 year- Maximum with Chronic medical conditions
  - 6 months
  - 3 months
- Deferred decision
- Failure





# DENVER

## PUBLIC WORKS

- **Major City Employer**

Nearly 1,100 employees in three main divisions – Engineering, Operations, and Administration

- **Diverse Job Functions**

Ranging from trash collection and street and park maintenance to wastewater services

- **Commercial Drivers**

531 workers at DPW require CDLs, servicing 8 agencies



Bicycling In Denver



Bidding Opportunities



Planning & Construction Projects



Park Smart Denver



Street Maintenance



Transportation & Mobility



Right of Way Services



Wastewater Services



Trash and Recycling

# DOT Focused Educational and Biometric Screening Program at DPW

- Educational Program
  - Obstructive Sleep Apnea
  - Diabetes
  - Nutrition
  - What to bring to medical appointments
  - Health and Lifestyle risk factors
- Biometric Screening Program
  - Measures:
    - BMI
    - OSA Risk Factors
      - Mallampati score
    - Metabolic Syndrome
      - Neck and waist circumference
    - Blood Pressure
    - Oxygen Saturation





# Clinical Quality Improvement Question

- Are CDL failure rates decreased among DPW CMVOs who participate in the DOT focused educational and biometric screening program?

# IRB Exemption

- Colorado Multiple Institutional Review Board "QA Program Evaluation Research Tool" used to determine IRB exemption

# Study Design and Population

- Cross-sectional design
- Chart review of all Commercial Driver Medical Exams (CDME) performed at COSH among DPW workers required to have CDL from 2016 to 2017
  - 595 DPW CDME's in Agility EMR at COSH
    - 28 (4.7%) excluded due to incomplete data, admin appointment or cancelled appointment
    - 135 (22.7%) records were collapsed as "repeat exams"
    - 3 records were missing BMI, but were not dropped from the analysis
    - 432 records were analyzed

# Exposure and Measures

- Participation in the DOT focused educational and biometric screening program in either 2016 or 2017
- Exam results
- Number of exams till pass
  - Pass defined as a 1 or 2 year certification

# Analysis

- Statistical analyses were performed using Stata 15.1
- Two-way measures of association were calculated utilizing Pearson Chi-Squared tests for significance
- Two-way t-test performed on mean number of visits till pass



# Results

# No Significant Difference Between Groups in Gender, Age and BMI

Characteristic	Biometric Screening n=48	No Biometric Screening n= 384	P-value
<b>Gender</b>			
Male	46 (95.8%)	376 (97.9%)	0.307
Female	2 (4.2%)	8 (2.1%)	
<b>Age</b>			
Median	44.0	42.3	
Mean (SD)	42.3 (11.6)	42.0 (11.5)	
<b>BMI</b>			
Underweight (<18.5)	0 (0.0%)	1 (0.3%)	0.406
Normal (≥18.5 and <25)	8 (17.0%)	33 (8.6%)	
Overweight (≥ 25 and <30)	12 (25.5%)	124 (32.4%)	
Obese (≥30 and <35)	14 (29.8%)	107 (28.0%)	
Morbidly Obese (≥35)	13 (27.7%)	117 (30.6%)	
Median	31.0	31.05	
Mean (SD)	31.8 (7.4)	32.6 (7.0)	

# No Significant Difference Between Groups in Diagnosis

Characteristic	Biometric Screening n=48	No Biometric Screening n= 384	P-value
<b>Diagnosis</b>			
Hypertension	11(22.9%)	67(17.45%)	0.353
Diabetes	6 (12.5%)	38 (9.9%)	0.574
Obstructive Sleep Apnea	9 (18.8%)	84 (21.9%)	0.619
Other	1(2.1%)	15 (3.9%)	0.528

# No Significant Difference Between Groups for Exam Results

Characteristic	Biometric Screening n=48	No Biometric Screening n= 384	P-value
<b>Exam Result with 2-year pass</b>			0.638
Pass (2-year certificate)	28 (58.3%)	230 (59.9%)	
<b><i>Exam Results with periodic monitoring</i></b>			
1-year certificate	11 (22.9%)	74 (19.3%)	
< 1-year certificate	9 (18.8%)	69 (18.0%)	
Fail/defer	0 (0%)	11 (2.9%)	
Number of visits to pass – mean (SD)	1.23 (.598)	1.34 (.975)	0.477

# Conclusions

- The DOT focused educational and biometric screening program from 2016 to 2017 at DPW did not show a statistically significant benefit
- The effectiveness of the program may be affected by the low DPW CMVO enrollment
- Program participants may have a healthier baseline



# Repeat and Complicated Exams Increase Costs

- DPW CDME Exams cost \$260 per visit at COSH
- Follow up exams cost range \$60-90 depending on complexity
- Additional costs include outside referrals
  - Unable to capture with available data
- With aggressive OSA screening, diagnosis and treatment estimated annual savings:
  - \$19.1 million to small trucking company (~1,000 drivers)
  - \$1.2 billion to large trucking company (~11,000 drivers)
- 207 exams did not pass 1st attempt (\$12,420 - \$18,810)

Gurubhagavatula, et al., JCSM, 2017

# Recommendations

- Enrollment in the program should be increased to better evaluate effectiveness
- Obesity and OSA should be the priorities of the program
- The program should be marketed by COSH and DPW to those with BMI >30, those with OSA and with exam failures or with a less than 1-year certificate
- Drivers with BMI  $\geq$  30, OSA or a shortened certificate should be referred to the DPW Wellness program for weight loss

# Strengths

- The majority of DPW CMVOs receive certification at Denver Health
- The biometric screening program is administered by Denver Health COSH medical providers
- Our findings are consistent national trends in OSA and BMI findings
- Our findings provide DPW with data to target obesity and OSA with the DOT focused educational and biometric screening program as well as the wellness program
- The number of visits it took to pass an exam was investigated

# Limitations

- Errors of misclassification
- Cross-sectional data cannot demonstrate temporality
- Self-selection bias among those in the biometric screening program
- Failures may not have clinical relevance (e.g. failing for administrative reasons then passing at next appointment)
- Low enrollment and short-time frame for the program

# Future Directions

- Study should be repeated after increased enrollment and program duration
- Study exam result data with driving accident and work injury/accident data among DPL CMVOs



# Acknowledgements

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# Questions?

**Center for Health, Work & Environment**  
colorado school of public health



colorado school of  
**public health**

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