CMA SAFETY MANAGEMENT SEMINAR 2023

NAFMP
North American Fatigue Management Program

FRMS Part I:
Fatigue Management Technologies

United States Naval Academy – Annapolis, Maryland

December 6, 2023

Get the slides at the bottom of the page of

nafmp.org/webinars

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NAFMP

North American Fatigue Management Program

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Overview

1. Fatigue Management Program (FMP)
2. Fatigue Risk Management System (FRMS)
3. Controls to Identify & Mitigate Risks
4. Technology Types
5. Technology Best Practices
6. Technology Catalog Sources
7. Next Steps

Fatigue Management Program (1 of 2)

- Safety Culture
  - NAFMP Module 2: Safety Culture and Management Practices
  - NAFMP Module 3: Driver Education & Training

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Fatigue Management Program (2 of 2)

- Fatigue Risk Management System (FRMS)
  - Operation
  - Identify Risks
  - Assess
  - Counter
  - Evaluate

FRMS Slide Deck

Risk Identification and Mitigation

- Controls
  - Predictive
  - Proactive
  - Reactive

NAFMP Recommendations

- Sleep Disorder Screening Program
  - NAFMP Module 7
- Sound Scheduling Practices
  - NAFMP Module 9
- Fatigue Management Technologies
  - NAFMP Module 10

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Fatigue Management Technologies Types

1. Scheduling & Trip Planning
2. Fitness for Duty Testing
3. Performance Monitoring
4. Driver Monitoring

Scheduling & Trip Planning

- Fatigue Prediction Mathematical Models
- Route Optimization Tools
- Dispatch and Communication Tools

Fitness for Duty Testing

- Psychomotor Vigilance Tests
- Reaction Time Tests
- Speech Analysis
- Fatigue Questionnaires
- Behavioral Observation
- Wellness Check

Performance Monitoring

- Computer Vision
- Steering Movements
- Lane Departure
- Telematics Systems
  - GPS Tracking
  - Fuel Consumption
  - Harsh Braking and Acceleration Events

Driver Monitoring (DM)

- Computer Vision
- Eye-Tracking
- Physiological Sensors
- Activity Trackers
- Other Emerging Technologies

DM - Computer Vision

- Eyelid Detection
- Gaze Tracking
- Head Pose Monitoring

DM - Eye-Tracking

- Percentage of Eyelid Closure over the Pupil over Time (PERCLOS)
- Blink Rate and Duration

DM - Physiological Sensors

- Electroencephalography (EEG)
- Heart Rate Variability (HRV):
- Skin Conductance

DM - Activity Trackers

- Movement Patterns
- Sleep Quality Monitoring

DM - Other Emerging Technologies

- Skin Temperature
- Speech Analysis
- Facial Expression Analysis
- Brain-Computer Interfaces (BCIs)

Fatigue Technology Best Practices

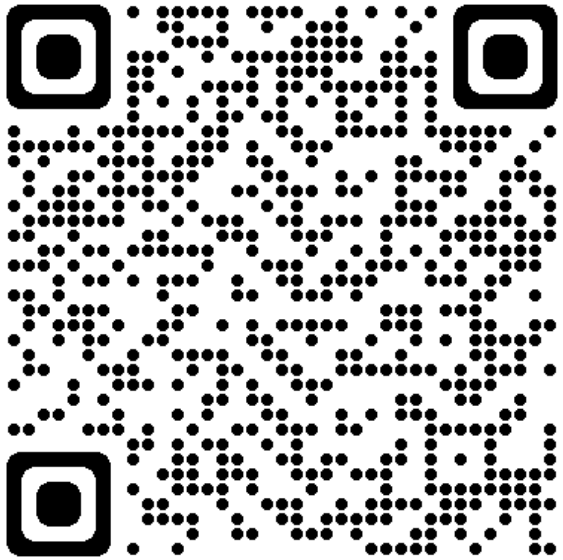
1) Must be integrated into overall FMP
2) Take full advantage of the technology capabilities
3) Develop well-defined protocols
4) Explain the role of technology to drivers
5) Create meaningful driver expectations
6) Present consistent and detailed feedback to drivers
7) Maintain a positive atmosphere
8) Reinforce that safety is everyone's responsibility

Technology Catalog Sources (1 of 4)

- NAFMP Module 10 and Webinar
  - The Alertness Toolkit

    A Motor Carrier's Guide to Fatigue Management Technologies

Recording



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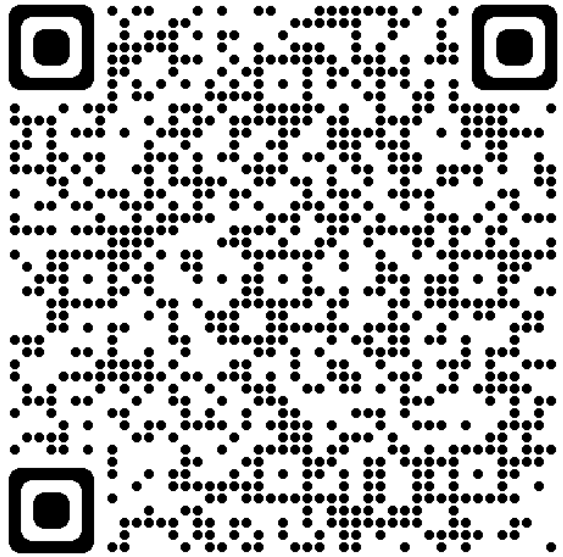

Technology Catalog Sources (2 of 4)

- 2020 Review of Commercially Available Devices to Detect Fatigue and Distraction in Drivers
  - By Institute for Road Safety Research in the Hague, Netherlands
    - Stichting Wetenschappelijk Onderzoek Verkeersveiligheid (SWOV)
  - Commissioned by
    - Shell Global Solutions International B.V.
    - BP International Limited
    - Total S.A.
    - Chevron Services Company
  - Provides a detailed comparison of ≈100 technologies
  - Recommendations on devices to consider for further testing/use

Report PDF

SWOV Report Review Criteria

1. Validity

   Device should respond when the person is showing signs of fatigue or distraction

2. Intrusiveness

   Device that interferes strongly with the driving or the driver is likely to be abandoned

3. Availability
   - Which development stage the product has reached, and how long the product has been on the market, and whether there are signs of continuous development and evaluation, and whether customer support is provided

4. Robustness
   - Device works for different drivers, and under different driving conditions

5. Acceptability
   - Devices that need to be worn or interfere with driving may score low on this criterion, but also devices that record the driver and send the information into the cloud for further processing may cause privacy issues and be less accepted

6. Sustainability
   - How frequently the device needs to be charged, needs replacing or repairing

7. Cost
   - Purchasing the system, any subscription fees or maintenance plans, or costs for repairs and replacements

8. Compatibility
   - Does system interfere with other systems inside the vehicle, such as communication devices, or navigation systems

Technology Catalog Sources (3 of 4)

- 2019 Commercial Motor Vehicle Operator Fatigue Detection Technology Catalog and Review
  - By National Surface Transportation Safety Center for Excellence
    - Housed at the Virginia Tech Transportation Institute
  - Literature Review
    - Physiological Sensors
    - Driver Behavior Monitoring/Computer Vision
    - Hybrid Systems
  - Inventory of Fatigue Detection Technologies
    - Validated
    - Promising
    - Unvalidated
    - Ineffective
    - Unlikely to be used

Report PDF

Technology Catalog Sources (4 of 4)

- Australia's National Heavy Vehicle Regulator (NHVR)
  - Fatigue Monitoring Trial Homepage
    - Phase 1 Fatigue Monitoring Trial Report Summary
    - Phase 2 Research Report - Fatigue/distraction detection technology use in the Australian road freight transport sector (2019)

Reports PDFs

1. Next Step: FMP Template

- Microsoft Form
- Navigate with form controls
- Don’t use browser controls
- Save PDF at the end
- Edit form with MS Account

FMP Template

FMP Template Rubric

1. Terms of reference — 10%
   a. Policy
   b. Responsibilities
   c. Documentation process

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2. Safety Culture — 40%
   a. Education - 10%
   b. Training - 10%
   c. Ongoing communication - 20%

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3. Fatigue Risk Management System — 40%
   a. Operation - 2%
   b. Predictive, Proactive, & Reactive Controls - 20%
   c. Risk Assessment - 5%
   d. Measures and countermeasures - 5%
   e. Evaluation - 8%

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4. Timeline — 10%
   a. Introduction
   b. Training
   c. Evaluation

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5. Total — 100%

2. Next Step: NAFMP Module 3

- Have your drivers take the NAFMP Driver Education & Training

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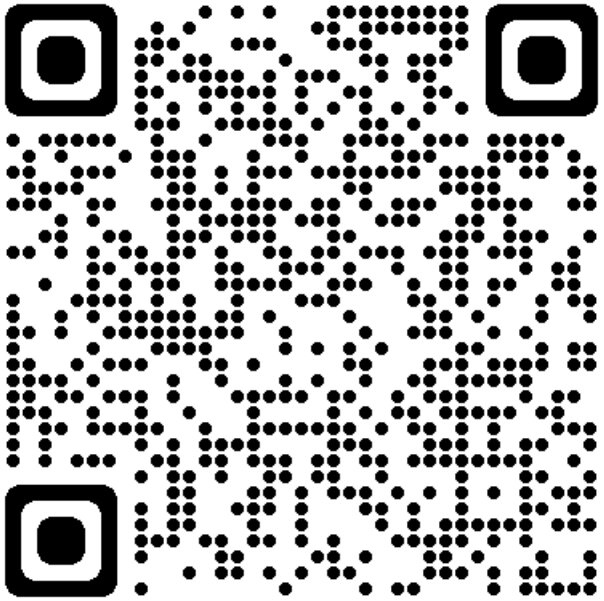
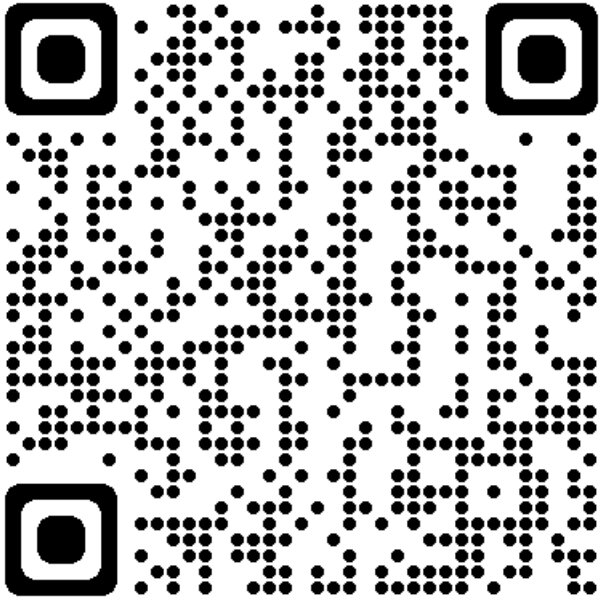
3. Next Step: Register for CVSA Webinars

Fatigue Science



J.J. Keller and Associates



4. Next Step: UMA Motorcoach Expo 2024

- Attend Session FRMS - Part II – Sleep Hygiene & Disorders Management

Register

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Questions?

Please keep safe, well & alert

Thank you!