EMS Fatigue Risk Management and Project Research – What’s New???

Daniel Patterson, PhD, NRP

December 1, 2020
Outline

• Review Phase 1 – Evidence Based Guideline
  – Take Questions

• Discuss Phase 2 – Experimental Study
  – Take Questions
The Fatigue in EMS Project

www.emsfatigue.org

NHTSA DTNH2215R00029
Fatigue

...a subjective, unpleasant symptom, which incorporates total body feelings ranging from **tiredness** to **exhaustion** creating an unrelenting overall condition which **interferes** with an individual’s ability to function to their normal capacity.

Ream & Richardson, 1996
Significance of Fatigue
Significance of Fatigue in EMS

• Placeholder for video on fatigue, sleep, etc.
Fatigue is a threat!

Fatigued EMS Clinician Threatens Clinician

Fatigued EMS Clinician Threatens Patient

Fatigued EMS Clinician Threatens Public
Three Phased Approach to Address Fatigue in EMS

Phase 1
Develop an Evidence Based Guideline for Fatigue Risk Management in EMS

Phase 2
Experimental Study

Phase 3
Freely available biomathematical model tool
Timeline of the Fatigue in EMS Project

Phase 1: Evidence-Based Guideline Development
- 7 systematic reviews
- Special Issue of PEC
- Implementation Guidebook
- Supporting Documents

Phase 2: Planning & Approvals

Phase 2: Experimental Study

Years:
- 2016
- 2017
- 2018
- 2019
- 2020
- 2021
What are Evidence Based Guidelines?

“...are systematically developed statements designed to help administrators, practitioners, and patients make decisions about appropriate health care for specific circumstances.”

A Growing Number of EMS-focused EBGs

www.prehospitalguidelines.org
## EBGs vs. Consensus

<table>
<thead>
<tr>
<th>Evidence Based Guidelines</th>
<th>Consensus Statements</th>
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<tbody>
<tr>
<td>• Labor intensive</td>
<td>• Often short time frame</td>
</tr>
<tr>
<td>• Comprehensive with systematic reviews and meta-analyses</td>
<td>• Limited review of the literature</td>
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<tr>
<td>• Standard protocol</td>
<td>• Inconsistent procedures</td>
</tr>
<tr>
<td>• Full transparency</td>
<td>• Lacks transparency and subject to bias</td>
</tr>
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</table>
Why do we need EBGs?

• Potential to reduce practice variation

• Enhance translation of research into practice

• Improve quality and safety

National Academies, IOM. Clinical Guidelines We Can Trust. 2011
The Process

Grading of Recommendations Assessment, Development, and Evaluation

www.gradeworkinggroup.org

Reviewing the Evidence → Grading the Evidence → Translating into EBGs
Case Report, Case Series, Opinion
Cross-Sectional Studies
Case-Control Studies
Cohort | Prospective Studies
Randomized Controlled Trials
Meta-Analyses
Systematic Reviews

STRONGEST EVIDENCE
WEAKEST EVIDENCE
7 Systematic Reviews

1. Identify reliable and valid instruments to assess fatigue.
2. Determine the impact of shorter versus longer shift durations on health, safety, and performance outcomes.
3. Determine the impact of caffeine on safety and performance outcomes.
4. Determine the impact of on-duty naps on safety and performance outcomes.
7 Systematic Reviews

5. Determine impact of sleep health/fatigue education and training on health, safety, and performance outcomes.

6. Determine the impact of changes in task load/workload on health, safety, and performance outcomes.

7. Determine the impact of using fatigue biomathetical models on health, safety, and performance outcomes.
## Results of the 7 Systematic Reviews

<table>
<thead>
<tr>
<th>Research Question</th>
<th>Literature Screened / Reviewed</th>
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<td><strong>TOTAL</strong></td>
<td><strong>38,972</strong></td>
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</table>
Five Recommendations

1. Use (reliable/valid) fatigue / sleepiness survey instruments to measure and monitor fatigue.
2. EMS personnel work shifts shorter than 24 hours in duration.
3. EMS personnel have access to caffeine as a fatigue countermeasure.
4. EMS personnel have the opportunity to nap while on duty.
5. EMS personnel receive education and training to mitigate fatigue and fatigue-related risks.
Reminder

The purpose of EBGs

- Reduce practice variation
- Translate research into practice
- Improve quality and safety

EBGs are...

A synthesis of the best available evidence to help guide decision making. They are NOT rules, laws, edicts, or ordinances.

36 years of research
1980-2016

> 38,000 pieces of literature
Despite the Rigor: EBGs do have limitations

Evidence is often limited or lacking

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Limitations of EBGs

Judgment

Sleep & Fatigue

Scientist

Sleep Medicine

Physician

Fatigue in Public Safety

Epidemiologist

EMS Medical Director

Emergency Medicine Physician Air-Medical Director

Lawyer with EMS Risk Management Expertise

Fire-Based EMS Front-Line Paramedic Clinician

State Medical Director Expertise

Consumer Representative

Meets the IOM recommendation of diversity in...

Experience

Director

Expertise

State Medical

Content Knowledge

Full Transparency (PMID-29324069):
See Appendix A for panel member disclosures
Judgment

Quality of Evidence

Feasibility, Equity, Acceptability

Values & Preferences of Target Population

Balance of Benefits vs. Harms

Costs & Resource Needs

See Appendix B of PMID-29324069 – Evidence to Decision Framework

Transparent documentation of judgment
Concern, misinformation, and the reality of this EBG

**Concern / Misinformation**
- EMS can’t work long duration shifts
- There is a mandate to not work certain shifts
- The aim is to eliminate shifts

**The Reality**
- Does not say any of this
- Guidelines are not mandates
- Many on the expert panel utilize 24 hour shifts today
- Long duration shifts are necessary in public safety
- Should be no surprise that evidence shows long duration shifts are fatiguing
- If long duration shifts utilized, it is recommended that other strategies be adopted
Let’s dissect recommendation #2 regarding shift duration

- N=21,674
- N=480 full text articles
- N=100 compared different shift durations
- N=38 compared 8hr vs. 12hr shifts
- N=38 compared multiple durations
- N=24 compared two shift durations: (n=15 ~24hr vs. <24 hrs)
# A closer look at the evidence

<table>
<thead>
<tr>
<th>Shift hours</th>
<th>Author, Year</th>
<th>Study Design</th>
<th>Patient Safety $^a$</th>
<th>Personnel Safety</th>
<th>Personnel Performance $^b$</th>
<th>Acute Fatigue $^c$</th>
<th>Sleep and Sleep Quality</th>
<th>Retention / Turnover $^d$</th>
<th>Long-Term Health $^e$</th>
<th>Burnout / Stress</th>
<th>Cost to System</th>
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<tr>
<td>6 vs. 30</td>
<td>Zheng, 2006</td>
<td>Cross-over trial</td>
<td>-</td>
<td>-</td>
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<td>Favorable</td>
<td>-</td>
<td>-</td>
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<td>8.5 vs. 24</td>
<td>Ernst, 2014</td>
<td>Randomized cross-over</td>
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<td>-</td>
<td>Mixed/ Inconclusive</td>
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<td>-</td>
<td>-</td>
<td>Favorable</td>
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<tr>
<td>8 vs. 24</td>
<td>Patterson, 2016</td>
<td>Case report</td>
<td>-</td>
<td>-</td>
<td>Favorable</td>
<td>No Impact</td>
<td>-</td>
<td>-</td>
<td>Favorable</td>
<td>-</td>
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<tr>
<td>9 vs. 32</td>
<td>Fish, 2005</td>
<td>Prospective</td>
<td>-</td>
<td>-</td>
<td>Favorable</td>
<td>-</td>
<td>-</td>
<td>Favorable</td>
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<td>12 vs. 24</td>
<td>Karanovic, 2009</td>
<td>Case-control</td>
<td>-</td>
<td>-</td>
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<td>14 vs. 24</td>
<td>Yi, 2013</td>
<td>Quasi-Experimental</td>
<td>-</td>
<td>-</td>
<td>Unfavorable</td>
<td>No Impact</td>
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<td>14 vs. 28</td>
<td>Boudreaux, 1999</td>
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<td>-</td>
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<td>-</td>
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<td>14 vs. 24</td>
<td>Allen, 2001</td>
<td>Retrospective record review</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Favorable</td>
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<td>&lt;24 vs. ≥24</td>
<td>Guyette, 2013</td>
<td>Prospective cohort</td>
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<td>-</td>
<td>No Impact</td>
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<td>No Impact</td>
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</table>
What exactly is recommended?

**Evidence-Based Guidelines for Fatigue Risk Management in Emergency Medical Services**

P. Daniel Patterson, PhD, NRP, J. Stephen Higgins, PhD, Hans P. A. Van Dongen, PhD,
Daniel J. Buysse, MD, Ronald W. Thackery, JD, Douglas F. Kupas, MD, David S. Becker, MA,
EMT-P, Bradley E. Dean, MA, NRP, George H. Lindbeck, MD, Francis X. Guyette, MD, MPH,
Josef H. Penner, MBA, John M. Violanti, PhD, Eddy S. Lang, MDCM, CCFP (EM),
Christian Martin-Gill, MD, MPH

- The decision on shift duration **should NOT** be based on the evidence alone.

- It may not be practical, cost-effective, or safe to eliminate extended shifts.

- If long duration shifts must be utilized, ensure adequate staffing and use of other fatigue mitigation strategies.
EBGs are NOT rules or law

Rigorous and transparent assessment of the **Best Available Evidence**

Help guide decision making; **DO NOT dictate it**

EBGs are NOT “Magic Bullets” for problems

Need updating every ___ years

Woolf et al., 1999: PMID-10024268
The Reality:
Shift Work in EMS is Here to Stay!

Fatigue cannot be fully eliminated

It must be managed
There is no gold standard fatigue risk management program in EMS
Create a combination of strategies (tools) that works best for you and your agency.
Why is this EBG significant?

No other resource like this
2020 Critical Appraisal of EBGs

Appraised for...

- Scope/Purpose
- Stakeholder involvement
- Rigor of Development
- Clarity
- Applicability
- Editorial independence

Boulanger et al. (66), had the highest average domain score of 89.2%. The Canadian Stroke Best Practice Recommendations, and their updates, are funded in their entirety by the Heart and Stroke Foundation, Canada. This is a well-funded, long-standing, national organization that advocates for stroke awareness and management across all levels of care. This organization possesses the resources to gather and support a large group of interdisciplinary experts, and the guideline development group used a rigorous framework adapted from the Practice Guidelines Evaluation and Adaptation Cycle (91). The second highest scoring guideline, with an average domain score of 88.8%, is the Evidence-Based Guidelines for Fatigue Risk Management in Emergency Medical Services by Patterson et al (7). Similarly, this guideline had robust funding from the U.S. Department of Transportation, National Highway Traffic Safety Administration and used GRADE methodology for evidence evaluation.

Turner et al., 2020
PMID-32286899
Questions about Phase 1?
Update on Phase 2

Phase 1:
- Evidence-Based Guideline Development
  - 2016

Phase 2:
- Planning & Approvals
  - 2017
- Experimental Study
  - 2018
- Support Documents
  - 2019
EMS personnel receive education and training to mitigate fatigue and fatigue-related risks.
Developed Program Tailored to EMS

18 months to develop

Fatigue Risk Management in the Workplace

ACOEM Presidential Task Force on Fatigue Risk Management:
Steven E. Lerman, MD, MPH, Evamaria Eskin, MD, MPH,
David J. Flower, MBBS, MD, Eugenia C. George, MD,
Benjamin Gerson, MD, Natalie Hartenbaum, MD, MPH,
Steven R. Hursh, PhD, and Martin Moore-Ede, MD, PhD

10 Brief Education Modules

- Hazards of Fatigue
- Work-Related Stress
- Sleep Disorders
- Sleep Physiology
- Diet & Exercise
- Fatigue Recognition
- Sleep Health
- Adequate Sleep
- Alertness Strategies
- Fatigue Managed NOT Eliminated
10 Education Modules

• Placeholder for video on modules
Approved Con-Ed Credits

Approved for 2.25 hours of continuing education credits
Comments from Participants

Great course! would do it again...looking forward to finding out the results!

Well organized course.

Great information
Great job. Excellent material and just the right length to keep my attention while achieving the educational objectives! Kudos.

Great course. Well put together. Great job. You should try to get it on _____ website for others to view. Good job.

Since I enrolled in this … i have been doing better on my sleep rest cycles, I have been dieting, and i have lost 30 lbs in 8 weeks. I am very thankful for you guys in saving my life and getting me out of a rut I was in and hope to have many years in this field since I love doing this. Thanks so much.
A “Wait-List Control Study Design”

Everyone will get access to the intervention materials
Eligible Agencies

1. Provide EMS service in U.S.
2. Ground-based (or air/ground mixed).
3. Employ 50 or more paid personnel.
4. Limited restrictions on use of mobile phones.
Individual Participation

1. Full-time or part-time at eligible agency.
2. 18yrs or older.
3. Certified FF, EMT, etc. at any level.
4. Currently working in shifts.
5. Work at least 1 shift per week.
6. Have a cell/smartphone that can send texts.
7. Willing to participate for 6 months.
Remuneration?

Eligible participants will receive
• $5 dollars at enrollment
• $5 every month for 6 months
• Total remuneration worth $35
Access to Education Modules

Example Graph

Agency ID## Progress

Goal n=50

- Number of participants
- Date

30 day open enrollment period

- Agency-ID ## (Enrolled)
- Goal Enrollment (n=50)
Update on Phase 3

Biomathematical model

Model fatigue as it relates to scheduling.
Software program.
Inputs: Scheduling, Rest, Work Hours.
Outputs: Risk of fatigue based on inputs

Steven R. Hursh, Ph.D.
IBR President and Chief Scientist
How to Participate

1. Need agency leaders to agree to participate.
2. Set a date to start recruitment within agency.
3. Help circulate recruitment info in agency.
4. Promote participation for duration of study.

**DEADLINE for agencies = December 15th 2020**

www.emssleephealth.pitt.edu
Clarification

• EMS Sleep Health Study
  – www.emssleephealth.pitt.edu

• Sleep and Teamwork in EMS Study
  – www.saftie.pitt.edu

• EMS Shift Work Project
  – www.emsshiftwork.org
Thank You

Please reach out (pdp3@pitt.edu)