Joint Session

Evaluation of Fatigue Management Programs

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Evaluation of Fatigue Management Programs

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What are we actually evaluating?

- **Operator** fatigue management
- **Company** level fatigue management
- **System** level fatigue management
  - Relationships between individual operators, company, other parties in the system

Measures differ depending on what is being evaluated
What are we actually evaluating?

**Inputs?**
- Is the design of the FMP acceptable?
  - e.g., Hours of rest, Hours of work
- Can the company support it?
- Should it be allowed?

**Outputs?**
- What is the effect of the FMP?
- Does it need to be modified?

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FMP Implementation process

Presented at the FAA Fatigue Management Symposium: Partnerships for Solutions; Vienna, VA: June 17-19, 2008
What do we want to know?

**INPUTS**

- Does the proposed FMP comply with current regulations?
- Does the proposed FMP really manage fatigue?

**OUTPUTS:**

- Does it make operators more fatigued?
- Does it affect performance?
- Does it affect the business?
Measuring the INPUTS: Should the FMP be implemented?

• Operator:
  – Will the FMP really manage fatigue?
  – Is it an improvement on current practice?

• Company:
  – Who wants to implement it: Management? Employees?
  – Can the business sustain it?

• System:
  – Does it comply with current (and foreseen) working hours regulations?
  – Does it set a precedent for the industry?
Measurement of Outputs
The effects of the FMP

• Does it make operators less (or more) fatigued?
• Does it affect performance
  – less safe?
  – poorer quality?
• Does it affect the business?
  – Human resources outcomes
  – OHS outcomes
  – Quality or efficiency outcomes
  – Financial outcomes
What do you measure - INPUTS

• Operator:
  – Modeling of the fatigue in work-rest schedules;
    • wide range of modeling tools ...(FAID, XIMES, HSE fatigue tool.... etc)
  – Workforce sufficiently aware of fatigue management and their role in its management.
  – Workforce accepting of change to FMP
What do you measure - INPUTS

- Company:
  - Audit of systems for managing work-rest, eg.,
    - Management with sufficient knowledge of fatigue effects and effective countermeasures
    - Scheduling approaches to cope with operational demands, staff absences, other realities…
    - Effective systems for monitoring employee work-rest
  - Education/training program for employees of fatigue management.
What do you measure - OUTPUTS

- Operators:
  - Compliance with work-rest scheduling:
    - diaries, log books, Actigraphy
  - Operator fatigue:
    - Subjective ratings: (many techniques, but problems)
    - On-road drowsiness measures (Optalert, Perclos, etc)
    - Physiological changes: (eye activity, (Tsai, et al, 2007; LeDuc, 2005), voice analysis (Greeley et al., 2007), others....)

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What do you measure - OUTPUTS

Operators:

– Performance affects:
  • External to work task: wide range of tests used, sensitivity to fatigue not always well-known
  • PVT, reaction time, vigilance, dual task, various complex cognitive tasks??
– Part of work task: depends on task, has benefits of high validity for the purpose of fatigue management, eg.,
  • Driving – lane tracking, headway, reaction speed etc
  • Flying – checking instruments, order of actions etc
– Employee satisfaction with the FMP, including effects on sleep opportunities, work-life balance etc…
– Family satisfaction with the FMP
What do you measure - OUTPUTS

- Management of work-rest scheduling by companies
  - Audit of management of schedules
    - How often schedules slip? When? Why?
  - Audit of management tracking of violations by operators and other symptoms of non-compliance
    - Does the company know when operators don’t comply? Do they know when? Why?
- Audit of other FMP-related outcomes:
  - Changes in workload, including need to do other tasks, remuneration
What do you measure - OUTPUTS

• Affects on business?
  – Audit of human resources records – absences, lost time
  – Audit of OHS outcomes – near misses, injuries
  – Audit of quality or efficiency outcomes – delays, poor service
When do you measure?

• Input evaluation = before the decision to start the FMP.

• Output evaluation =
  – After the FMP has been in place…But…
  – Balance between maximising time for the FMP to ‘bed-down’ and ceasing a trial FMP that is not working well.
Some of the issues in evaluating FMP’s

Inputs:
• ‘Limitations’ of biomathematical models
• Current state of the art on ‘good’ fatigue management
• Limitations of current regulation
• Balancing of operational needs with fatigue management

Outputs:
• Relationship between subjective fatigue and performance is not clear.
• Labile nature of subjective fatigue – difficult to measure reliably.
Examples of FMP evaluation

- FMP’s appearing in many industries
- Much written, but few attempts at evaluation
- In Australia, started with long distance road transport, aviation, mining etc
Long distance road transport

• Early 1990’s: Queensland Department of Transport established FMP pilot project

• Trucking companies put forward proposals to Technical Expert group for assessment

• If approved, companies allowed to vary aspects of work-rest schedules to make compatible operational (business efficiency) and fatigue management needs.
Evaluation of pilot FMP project
(Burgess-Limbrick, Bowen-Rotsaert, 2002)

• Independent evaluation of fatigue and business efficiency outcomes – five years after pilot started

• Evaluated wholistic effects of FMP not the effects of specific changes
  → Pre FMP Vs Post FMP Vs non-FMP industry group
FMP pilot evaluation – Driver results

- FMP drivers more likely to report:
  - involvement in scheduling
  - schedule allows enough time for non-driving work, time for breaks, needing to speed to meet deadlines

- FMP drivers less likely to report:
  - tired while driving, driving while impaired, already tired at start of trip
  - Noticing indicators of fatigue in their driving performance
  - Needing to use ‘temporary’ strategies to manage fatigue (eating, caffeine, opening window, showering, etc)
  - Not knowing enough about fatigue management
Six companies surveyed

- **Positives**
  
  - More proactive role in managing driver fatigue, liked greater flexibility in scheduling, more driver involvement
  
  - Perceived that FMP was effective in ↓ fatigue
  
  - Two-thirds found FMP more efficient in practice (truck utilisation, customer complaints, not operating illegally, more organised scheduling of drivers)
  
  - ? Increase in operating profit (2% to 6% in one company)
FMP pilot evaluation – Business Results

- Negatives
  - Initial driver resistance (new approach, lack of knowledge), lack of union support
  - Administrative effort required
  - Enforcement officers lack of knowledge of pilot program
  - Drivers wanting to do extra shifts (contrary to FMP requirements)
  - Costs – implementation ($681 per driver; $43,100 total), operating (admin, training, travel, auditing = $659 per driver pa; )
Current approach

- National; Heavy Vehicle Driver Fatigue reform – to be introduced in September, 2008
- FMP with standard, basic and advanced FMP
- Self-audit checklists for Drivers and Operators (with resources for further information)
Current approach

• Implementation with independent auditors using certified auditors and formal audit matrix

• Audit will include, management and operational:
  – scheduling and rostering,
  – fitness for duty,
  – fatigue knowledge and awareness,
  – responsibilities,
  – internal review,
  – records and documentation/
  – health,
  – workplace conditions
  – management practices,
  – operating limits
Aviation

- Part of move to Safety Management System approach
- Previously emphasis on prescribed hours (CAO 48) with exemptions
- CASA Discussion paper on suggested FMP in 2004
- CASA Current Working Group on Fatigue Risk Management Systems
Conclusions

Pre-implementation of FMP (Inputs)

Evaluate

• the system (company) to determine whether it can manage an FMP
• the proposed work-rest schedule for *predicted* effects on safe performance
• understanding of operators and managers of fatigue management principles
Conclusions

Post implementation (Outputs)

Evaluate

• safe work performance and outcomes
• Whether system (company) is maintaining appropriate support systems to back up the FMP
Good Luck!
Think twice about evaluating

• subjective fatigue
• Physiological changes related to drowsiness or sleep onset