

## Managing Fatigue in safety-critical workforces: Primary risk factors and practical approaches

Adam Fletcher, PhD

CEO & Principal Consultant

integratedsafety.com.au

/company/integrated-safety-support



AdamFletcherPhD



ENHANCING FUTURE WORKFORCES TODAY

## A brief intro to Integrated Safety Support (ISS)



#### • Completing projects in 10+ countries per year

 A diverse team with expertise in data analytics, sleep disorders, scientific & workplace research, safety regulation, change management & safety/risk engineering

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@AdamFletcherPhD



#### What do we do?

#### • We provide cost-effective Fatigue Management via:

Fatigue training courses	Roster analysis	Fatigue Risk Assessment	Data Analytics	Sleep & Fatigue studies
<ul> <li>online and classroom -based</li> </ul>	<ul> <li>to assess fatigue 'hot spots' in hours of work</li> </ul>	<ul> <li>to identify risks and improve- ments</li> </ul>	<ul> <li>to find links between safety, costs &amp; other data</li> </ul>	<ul> <li>to assess real-world effects of work</li> </ul>

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#### **Session Overview**

- What is fatigue and what are its effects?
- A (very) brief history of fatigue research
- An overview of primary risk factors
- Fatigue Risk Management (FRM) overview
- Practical examples of effective solutions
- Questions & Discussion





## What is 'fatigue' in an industry/work context?

- 1. Fatigue is a *state of impairment* that can negatively impact on safety, productivity, quality, morale, compliance, profits, and more
- 2. It occurs naturally due to factors like:
  - a) Poor sleep quality and/or quantity
  - b) Workload that is too low (i.e. boring) or too high (i.e. overwhelming)
  - c) Poor nutrition, lack of hydration, etc.





#### Fatigue is often a protective mechanism

- When we are feeling fatigued our brain and body are telling us to rest/recover
- This makes perfect sense from an evolutionary point of view since fatigue can negatively impact on risk taking, safety, immune/health states, etc.
- Depending on the source(s) of fatigue we might need sleep, rest, food, specific vitamins and/or minerals, and/or hydration, etc.





## **Effects of Fatigue:** The Fatigue Spectrum

Mood 🗸	Communication $igstarbol{1}$	Speed $\checkmark$	Accuracy 🗸	Strength $igvee$	Micro-sleeps <b>个</b>
Fully rested					Highly fatigued

- Most businesses aim to manage the risk of falling asleep but the real benefits come from effort much earlier
- If people were more mentally alert and engaged what would happen to error rates, efficiency, morale, etc?

The Fatigue Spectrum is © Integrated Safety Support and available for use with permission



#### Who does fatigue effect?

 All of us, usually due to a combination of work and non-work factors



 Groups whose roles make them especially prone to fatigue include:

 Workers in 24h settings
 DIDO/FIFO/commuters
 Those in boring and/or high tempo work roles
 On-call/call-out workers (and those with children!)



## The experience of fatigue is very personal



- Research clearly indicates a range of inter-related factors
- These impact different people very differently
- Other factors (e.g. desire to work or avoid overtime) are different



#### The effects of fatigue can be catastrophic

 The role of fatigue has been noted in a wide range of wellpublicized catastrophes



**Chernobyl 1986** 



Exxon Valdez 1989



Challenger Space Shuttle 1986



## A (very) brief history of fatigue research

- Scientific studies about work-related fatigue have existed since 1893 in Britain, 1901 in Germany and 1905 in Belgium
- The Harvard Fatigue Laboratory opened in 1927, and its Mission required the group "...to work with industry to explain the physiology of fatigue"
- Their areas of interest included work hours, work environments, sleep, nutrition and hydration



• Clarity existed then that work hours impacted outcomes including productivity, absenteeism & equipment damage

For historical references see Fletcher A, Hooper B, Dunican I., Kazutaka K. (2015). Fatigue Management in Safety-Critical Operations: History, Terminology, Management System Frameworks, and Industry Challenges. In: S. Popkin (Ed) Reviews of Human Factors and Ergonomics, Vol. 10, 2015, 6–28.





### **Fatigue Risk Management: Basics/Essentials**

- **1.** Visible fatigue-related leadership at all levels
- 2. Sufficient personnel to cover all operational requirements including mandatory training and predicted leave, staff turnover, future changes (e.g. seasonal peaks), etc.
- 3. Awareness raising through communication & training
- 4. A reporting system aligned with 'just culture', a formal review process & team, plus de-identified feedback reporting that is visible, to support future reporting



#### **Fatigue Risk Management: Intermediate**

- 5. Formalised shared responsibility in Policy & Procedures, training, documented risk assessment, monitoring & reporting, ongoing reviews and improvements, etc.
- 6. Routine use of a bio-mathematical model to predict fatigue in scheduled & actual work hours (noting that on-call/stand-by are still not well addressed by models)
- 7. Routine analysis of available data to identify valid patterns (e.g. between fatigue model scores, incident data, workload metrics, costs like staff sick leave, etc.)



#### **Fatigue Risk Management: Advanced**

- 8. Engagement of personnel to report on hazards related to fatigue, to allow more proactive visibility/management
- 9. Formal provision of support to manage sleep disorders in people who volunteer for screening & diagnosis (uptake likely to be higher through EAPs)

10.Investment in IT automation & integration: e.g. fatigue bio-mathematical modelling built into the rostering system, data analytics for regular reporting automated



# Comprehensive Fatigue Risk Management (FRM) focusses on eliminating and/or reducing risk factors in multiple layers



### What if I want to read more of the science?

- There are now numerous portals for searching the scientific and medical literature
- Increasingly, these includes links to open source and otherwise free content
- https://scholar.google.com.au/
- http://www.ncbi.nlm.nih.gov/pubmed





#### **Resources for researchers and practitioners**

- Fatigue risk management: Organizational factors at the regulatory and industry/company level
   Gander P, Hartley L, Powell D, Cabon P, Hitchcock E, Mills A, Popkin S (2011) Accident Analysis and Prevention, 43: 573-590
- Fatigue Risk Management in the Workplace Lerman S, Eskin E, Flower D, George E, Gerson B, Hartenbaum N, Hursh S, Moore-Ede M (2012) Journal of Occupational and Environmental Medicine, 54(2): 231-258
- Countermeasures for use in fatigue risk management Phillips R (2016) Institute of Transport Economics, Norwegian Centre for Transport Research, report #1488/2016, ISBN 978-82-480-1713-4 Electronic version



#### **Resources for researchers and practitioners**

- ICAO Fatigue Management Guide for Operators www.icao.int/safety/fatiguemanagement/FRMS%20Tools/FMG%2 0for%20Airline%20Operators%202nd%20Ed%20(Final)%20EN.pdf
- OGP IPIECA Performance indicators for fatigue risk management systems www.ipieca.org/resources/good-practice/performance-indicatorsfor-fatigue-risk-management-systems/
- ISO31000: 2018 Risk management Guidelines https://www.iso.org/standard/65694.html



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# Fatigue risk exposures & controls software (GRAID)

#### Oneminute selfassessment tool for fatigue

	HOW DO YOU FEEL RIGH	T NOW?			
	Very fatigued, having difficulty staying alert				
Current Fatigue State	A bit tired, some effort required to stay alert				
	Very alert – wide awake				
DID	YOU SLEEP IN THE LAST	24 HOURS?			
	No				
Sleep Quantity	Yes, but I did not get my ideal amount of sleep				
	Yes, I got at least my i	deal amount of sleep			
HOW WOUL	D YOU RATE THE QUALIT	Y OF THAT SLEEP?			
	Bad				
Sleep Quality	Average				
	Good				
HAVE YOU EX OF FATIGUE II (NOTE:	PERIENCED ANY SIGNIFIC MMEDIATELY PRIOR TO O SEE DEFINED SIGNIFICAI	ANT PHYSICAL SIGNS R DURING THIS SHIFT NT SIGNS LIST)			
Signs of Fatigue	Yes	No			
HAVE YOU EXP FATIGUE IMI (NOTE:	ERIENCED ANY SIGNIFIC/ MEDIATELY PRIOR TO OR SEE DEFINED SIGNIFICAI	ANT MENTAL SIGNS OF DURING THIS SHIFT NT SIGNS LIST)			
Signs of Fatigue	Yes	No			
<b>DO</b> 1					
DO Y	OU BELIEVE YOU ARE FIL	FOR DUTY?			
DOY					
Fitness for Work	VU BELIEVE YOU ARE FII N Yes, with additio	nal risk controls			





# Use of planned and actual hours of work to predict fatigue 'hot spots' (FAID)





#### **Objective performance testing using an iPad**

Image © Joggle Research

#### Objective sleep tracking









# Fatigue safety surveys & semi-structured interviews

#### Online and classroom training on personal Fatigue Management





#### **Closing Comments**

- Fatigue is an unavoidable experience anywhere that shift work, on-call work and/or long work hours exist
- However, fatigue can be managed successfully at the individual, team, system and organizational levels
- Cost-effective tools and approaches are available, as is guidance/support
- Solutions should be respectful of our human limitations (and strengths) as well as supported by data/technology





## **Closing comments**

- If developing Fatigue Management for your workplace, start small and achieve success in basics before adding complexity (distraction)
- Changing behavior takes time: so treat Fatigue Management as an evolution not a revolution



 We can all be role models & advocates for good sleep & Fatigue Management in our workplaces, families & communities



#### **Questions & Discussion**





# For more information please contact me on:Email:adam@integratedsafety.com.auCell:+61 416 231 456

# To learn more about what we do, or connect with us to keep up-to-date, find us using the links below

integratedsafety.com.au



in /company/integrated-safety-support 🕑 @AdamFletcherPhD

