Managing Fatigue-related Risk

It's about sleep -stupid

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Cognitive effects of Fatigue

Naturalistic Decision Making Model

5 Dimensions of effect

[Petrilli, Lamond, Roach & Dawson, 2003]

- Situational Awareness
- Memory
- Simulation ability
- Performance insight
- Emotional Control

Fatigue and the Law

From Jiminez to Alcatraz

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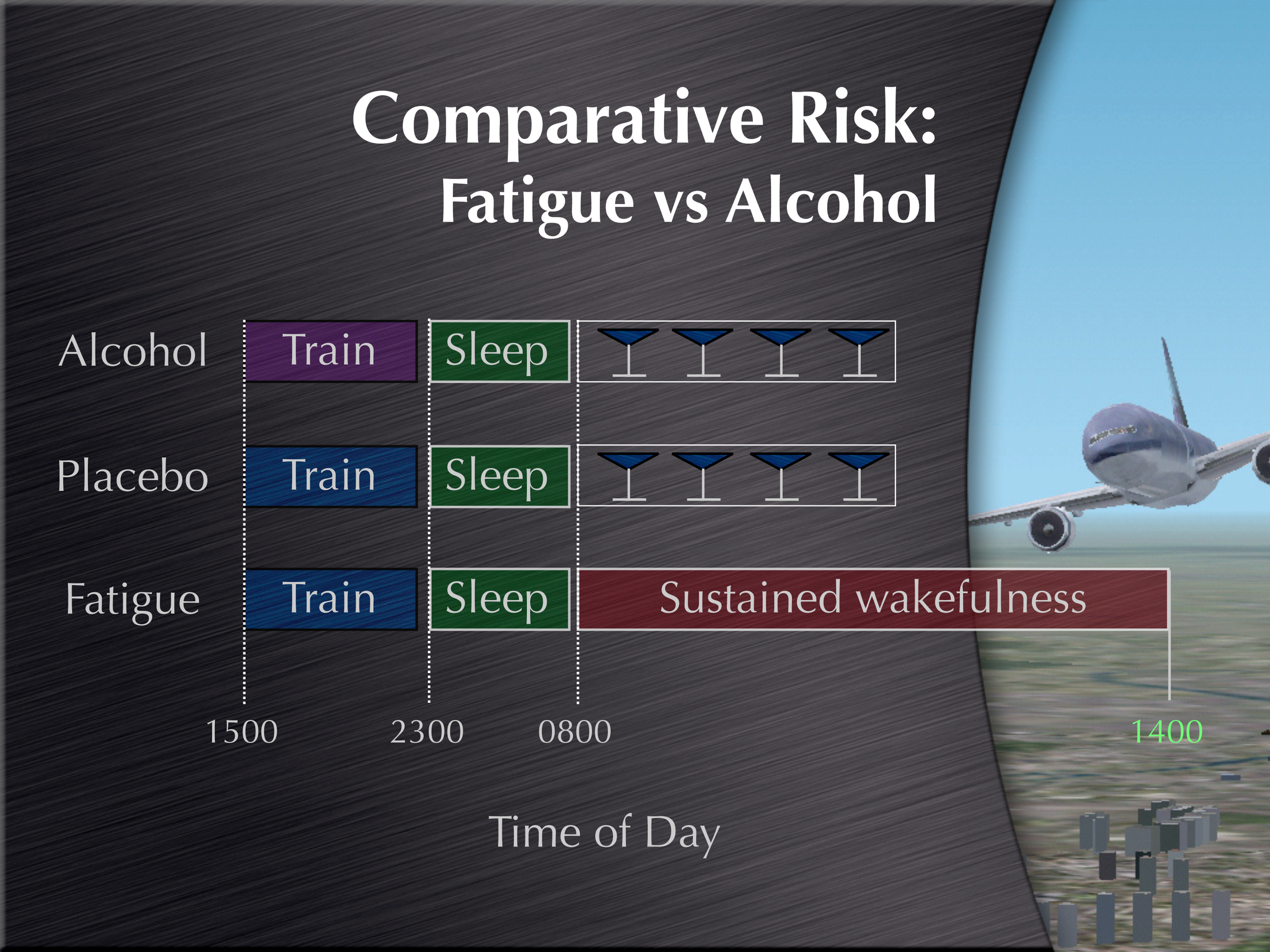
Culture Eats Strategy for Breakfast

Most people over-eat by 100% and over-sleep by 100% because they like to. That extra food and sleep makes them unhealthy and inefficient.

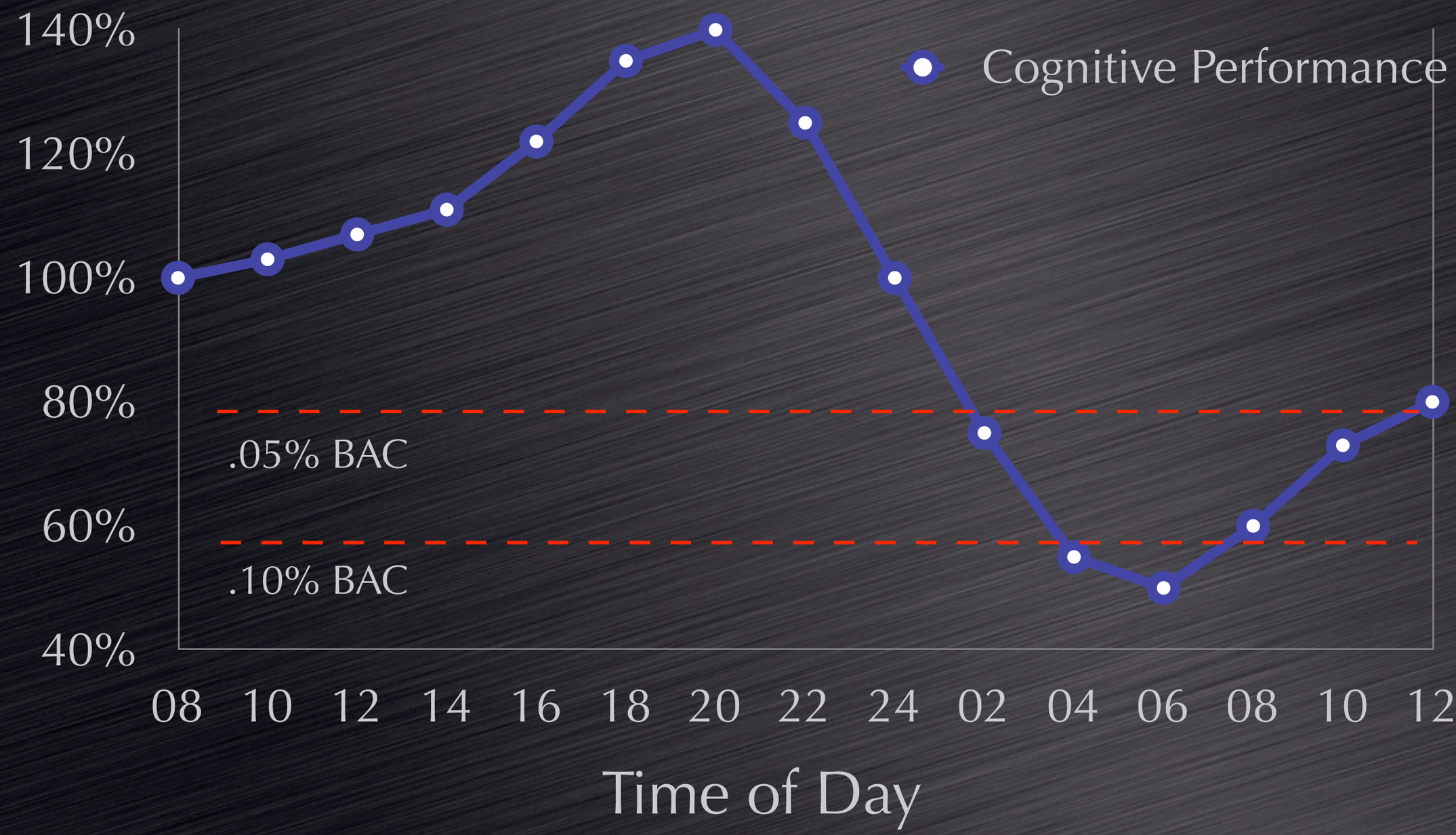
The person who sleeps 8-10h per day is never fully asleep and never fully awake. They have only different degrees of doze throughout the 24h day.

- Thomas Edison [1902]

Comparative Risk:
Fatigue vs Alcohol



Comparative Risk: Fatigue vs Alcohol



Political Context

- Micro-economic ‘reforms’ in 90’s promoted a ‘conspiracy of greed’
- Community concern over issue
- OH&S reforms in 1990’s redefined fatigue as a workplace hazard
- Parliamentary enquiry in 1999-2000 accelerated reform process

Criminal Law

- Shift away from ‘Jiminez’ decision i.e. not responsible for events if one has fallen asleep
- Shift from ‘diminished capacity’ to ‘voluntary impairment’
- Principle of ‘reasonable forseeability’
- Managerial and directorial accountability

Civil Law

Courts and juries increasingly view fatigue as a reasonably forseeable voluntary risk similar to drugs and alcohol and therefore avoidable.

- Organisational Liability under Tort law
- Liability cannot be ‘outsourced’ to sub-contractors
- Chain-of-responsibility can flow upward from organisation to customer

Occupational Health and Safety Law

Fatigue identified as a specific workplace hazard

Organisations to implement a system to manage the hazard.

- Shared responsibility framework [duty of care]
- Risk-based framework [AS 4360]
- Safety Management System framework [AS 4801]

Community Response

General Public

- public awareness programs focussed on risk recognition for target groups

Workplaces

- Increased prescription
- Co-regulation
- Safety Management System approach

Mock Jury Studies

Goal is to understand legal and lay reasoning about attributions of liability for fatigue-related accidents

- Truck drivers
- Hospital doctors

Mock Jury Trials

Summary case arguments presented to

- mock juries of 6-12 people recruited from the community
- lawyers and judges

Mock Juries

- Type of policy
  - prescriptive
  - shared responsibility
- Reason for violation
  - selfish
  - altruistic
- Forseeability
  - obvious
  - subtle

Liability

- Organisational liability maximised [60-90%] when
  - Coercive pressure to work
  - No shared responsibility framework
    - Sleep duration falls below 3-4 hrs
- Organisational liability minimised [20-50%] when
  - individual violated shared responsibility model
  - rationale was income maximisation
  - Sleep duration below 4hrs

Liability

Individual liability maximised [40-70%]

- Violation of shared responsibility model
- rationale was income maximisation
- Sleep duration fell below 3-4 hrs.

Individual liability minimised [10-50%] when

- No employee responsibility model
- Altruistic rationale [e.g sick kids, breakdown]
- moderate sleep reduction 4-6 hrs
  ['there, for the grace of god go I']

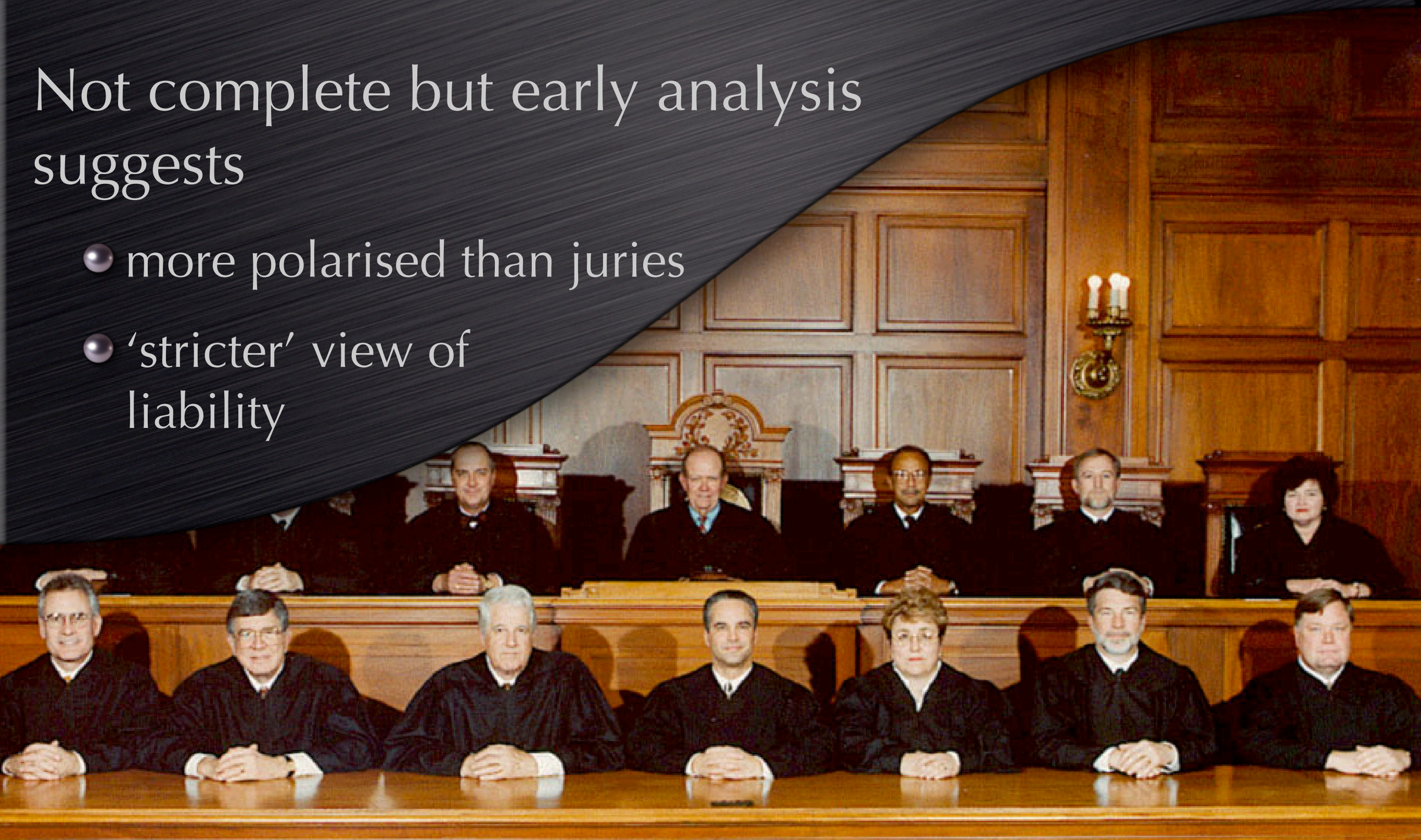
Liability

	Policy type		Rationale		Forseeability	
	Prescrip	Shared	Greed	Altruism	Low	Hi
Employer	↑	↓	↑			↑
Individual	↓	↑	↑	↓	↓	↑

Legal opinion

Not complete but early analysis suggests

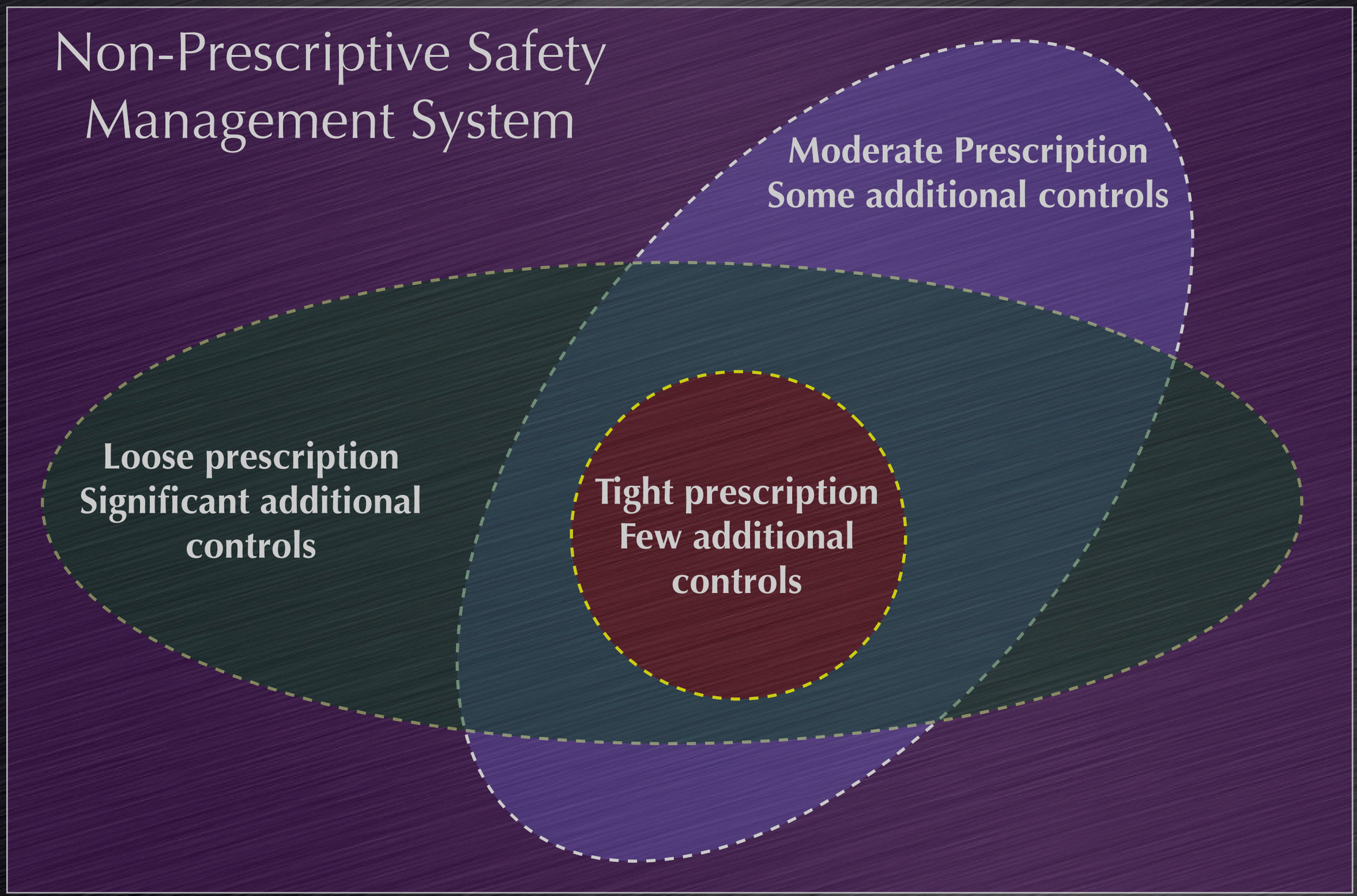
- more polarised than juries
- ‘stricter’ view of liability



Value Statement

- Fatigue is a ‘right-of-passage’ for health care workers. It can be a very different ‘rite-of-passage’ for patients
- For every complex problem there is a simple solution….. and it’s usually wrong

Alternate Compliance/SMS Model



Key Elements of a Fatigue Risk Management System

- Level of control should reflect the level of risk
- FRM policy document
- Training and Education program
- Auditable methodology to minimise fatigue-related risk
- Auditable methodology to ensure compliance

Risk:
Determining Cost

Likelihood						
5	>10/yr	Mod	Hi	Hi	Ex	Ex
4	>1/yr	Mod	Mod	Hi	Hi	Ex
3	>0.1/yr	Mod	Mod	Mod	Hi	Hi
2	>0.01/yr	Lo	Mod	Mod	Mod	Hi
1	>0.001/yr	Lo	Lo	Mod	Mod	Mod
		<$1K	<$10K	<$0.1M	<$1M	<$10M
		1	2	3	4	5

Consequence

Risk:

Ensuring a measured response

Workgroup schedule should be scored and the required degree of control determined

$ARC	Risk	1+ Controls required
$<10K	Low	Few
$10-100K	Medium	Some
$0.1-1M	High	Lots
>$1M	Extreme	All

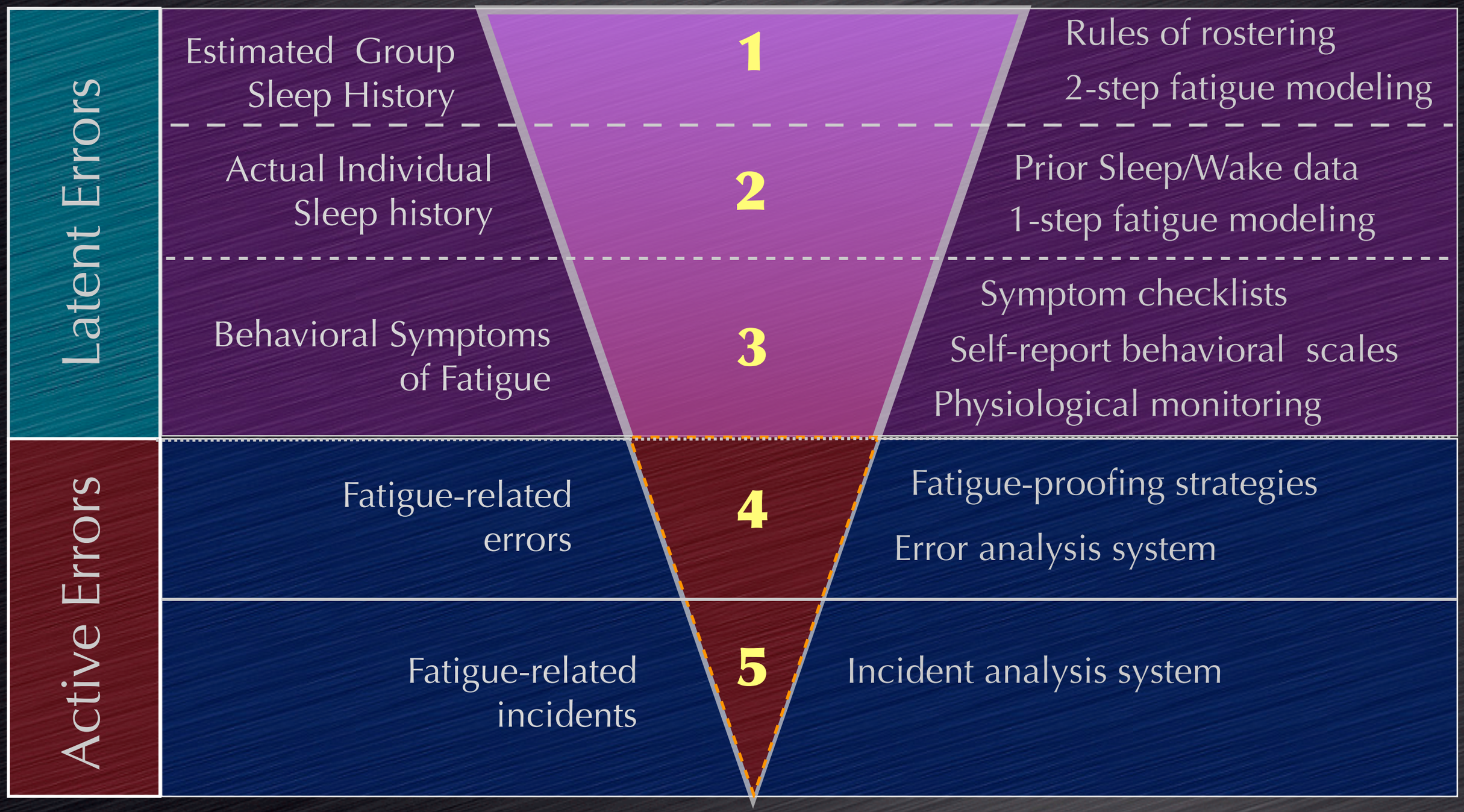
Policy:
A Shared Legal Responsibility

- **Management** is responsible for preventing excessive wakefulness at work and inadequate sleep opportunities between shifts.
- **Employees** are responsible for using time between shifts to obtain sufficient sleep. Employee must notify company if this does not occur.
- **Management** is responsible for providing clear guidelines on how to manage an insufficient sleep/excessive wake incident

Training and Education

- Competency-based adult learning using Australian National Training Authority framework
- Three levels
  - All staff - Personal Fatigue Management Strategies [ANTA 1097B -Cert 2]
  - Line managers - Managing fatigue-related risk in the workplace [Cert 3/4]
  - Accountable Executive - Designing, implementing and and evaluating an organisational FRMS [Cert 4]
- On-site, distance or web-based delivery of training available through Humantra [RTO]

Audit: SMS/Hazard Control Model



A self-regulating System

Level 1 Rostering rules or
2-step fatigue model

Level 2 Prior Sleep Wake data
1-step fatigue models

Level 3 Behavioural data

Level 4 Error Analysis

Level 5 Incident analysis

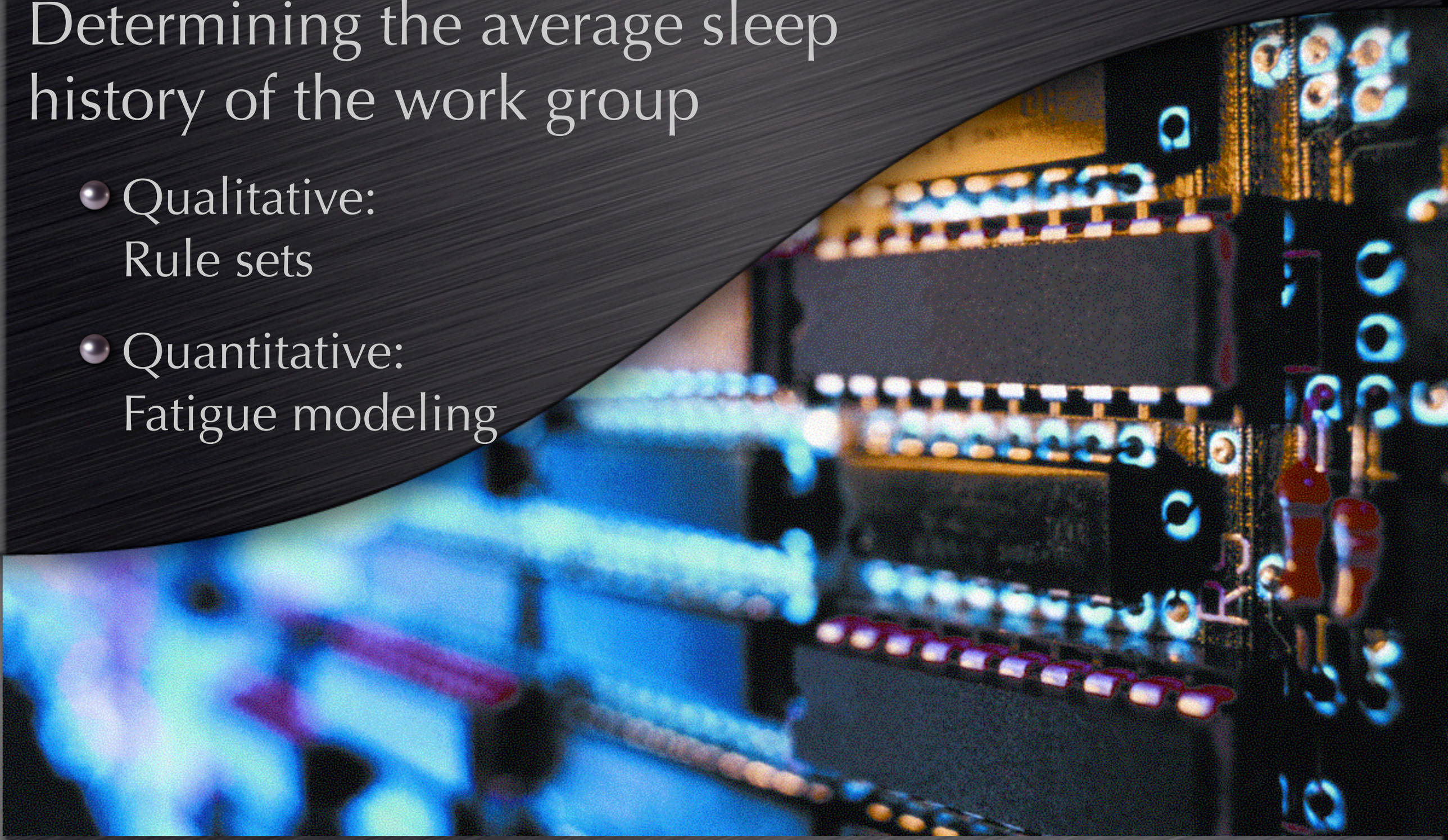
Audit: Hazard Controls

Fatigue Risk Management System Components			Low	Mod	High	Ex
Governance	Personnel	OH&S Committee item	•	•	•	•
		Accountable Executive		•	•	•
		FRM Committee				•
	Policy	Organisational Policy	•	•	•	•
		Work group policy		•	•	•
Training and Education		Personal Management Strategies		•	•	•
		Organisational Implementation Strategies		•	•	•
		Design and Evaluation of an FRMS				•
Risk Assessment	Likelihood Assessment	Prospective Analysis	•	•	•	•
		Retrospective Analysis			•	•
		Aggregate PSW reports			•	•
		Individual PSW reports	•	•	•	•
		Behavioural Checklists			•	•
		Error reporting and analysis				•
		Incident reporting and analysis		•	•	•
	Consequence Assessment	Prospective			•	•
		Retrospective	•	•	•	•

Level 1 Controls

Determining the average sleep history of the work group

- Qualitative:
  Rule sets
- Quantitative:
  Fatigue modeling



Level 1 Controls: Ensuring an adequate opportunity

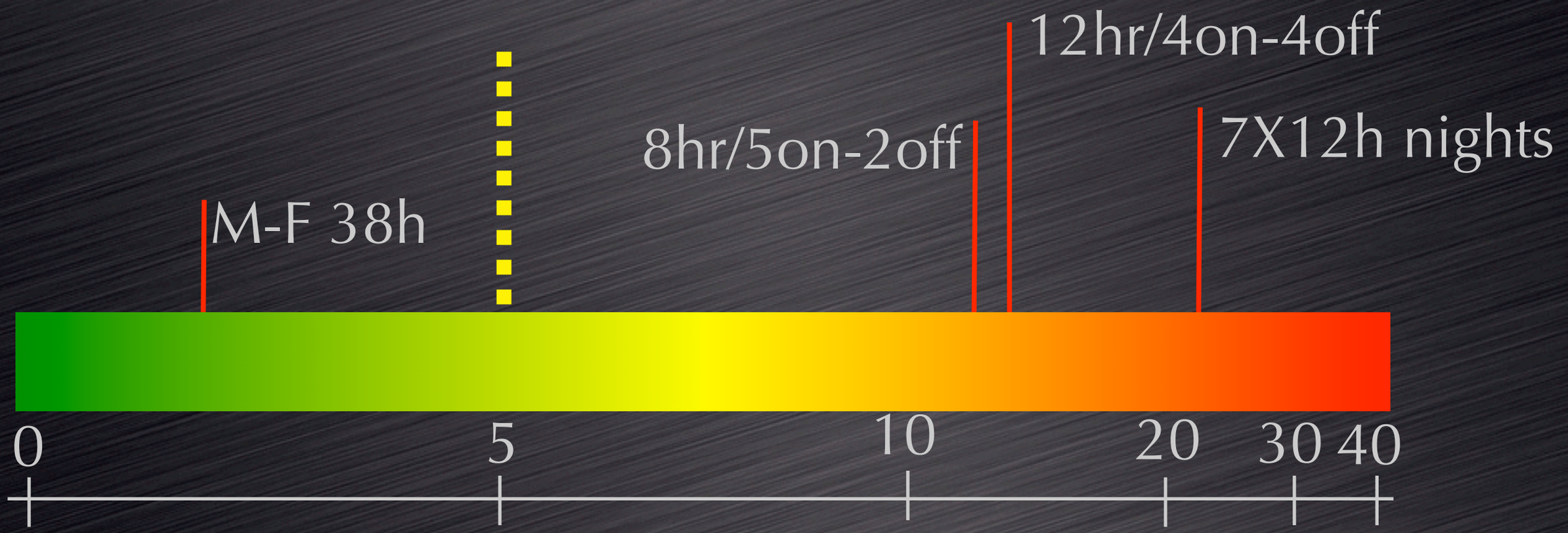
5 dimensions that indicate the level of fatigue associated with a roster

1. Hours per 7 days
2. Shift duration
3. Short break duration [work-sleep-work]
4. Hours of night work per 7 days [9pm-9am]
5. Long Break duration per 7 days [W-(NS-RDO-NS)n-W]

Fatigue likelihood Assessment

No.	dimension	+0	+1	+2	+4	+8
1.	Max hours per 7 days	≤ 36h	36-43h	44-47h	48-54h	55+
2.	Shift duration	≤ 8h	8-10h	10-12h	12-14h	≥14h
3.	‘Short break’ duration	≥16h	16-13h	12-10	10-8h	≤ 8h
4.	Max hours of night work per 7 days	0h	1-8h	8-16h	16-24h	≥24h
5.	‘Long break’ frequency	≥ 1/7d	≤ 1/7d	≤ 1/14d	≤ 1/21d	≤ 1/28d

Estimating Fatigue Likelihood

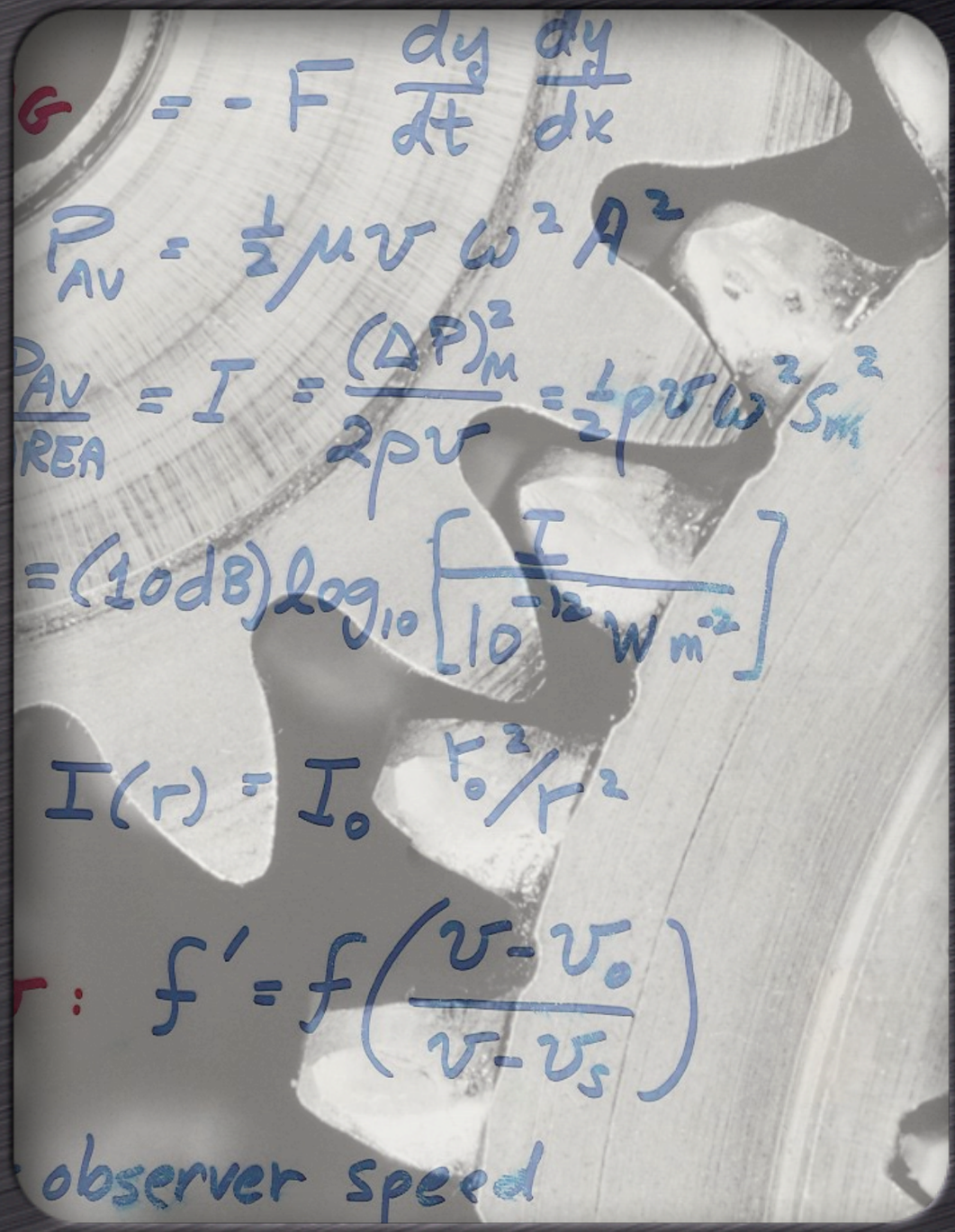


The point score associated with an assessment of each of the 5 dimensions of the roster can be calculated and rated on the scale above. It may be possible to regulate that rosters with a FLS greater than X require controls beyond level 1

Level 1 Controls: Estimating average sleep opportunity

Fatigue modeling

- estimates average fatigue based on
  - actual sleep-wake data
  - SW data inferred from Hours-of-work
- significant potential as risk management tool
- poor predictor of individual behavior
- should use probabilistic data



Level 1 Controls: Theoretical Fatigue Modeling

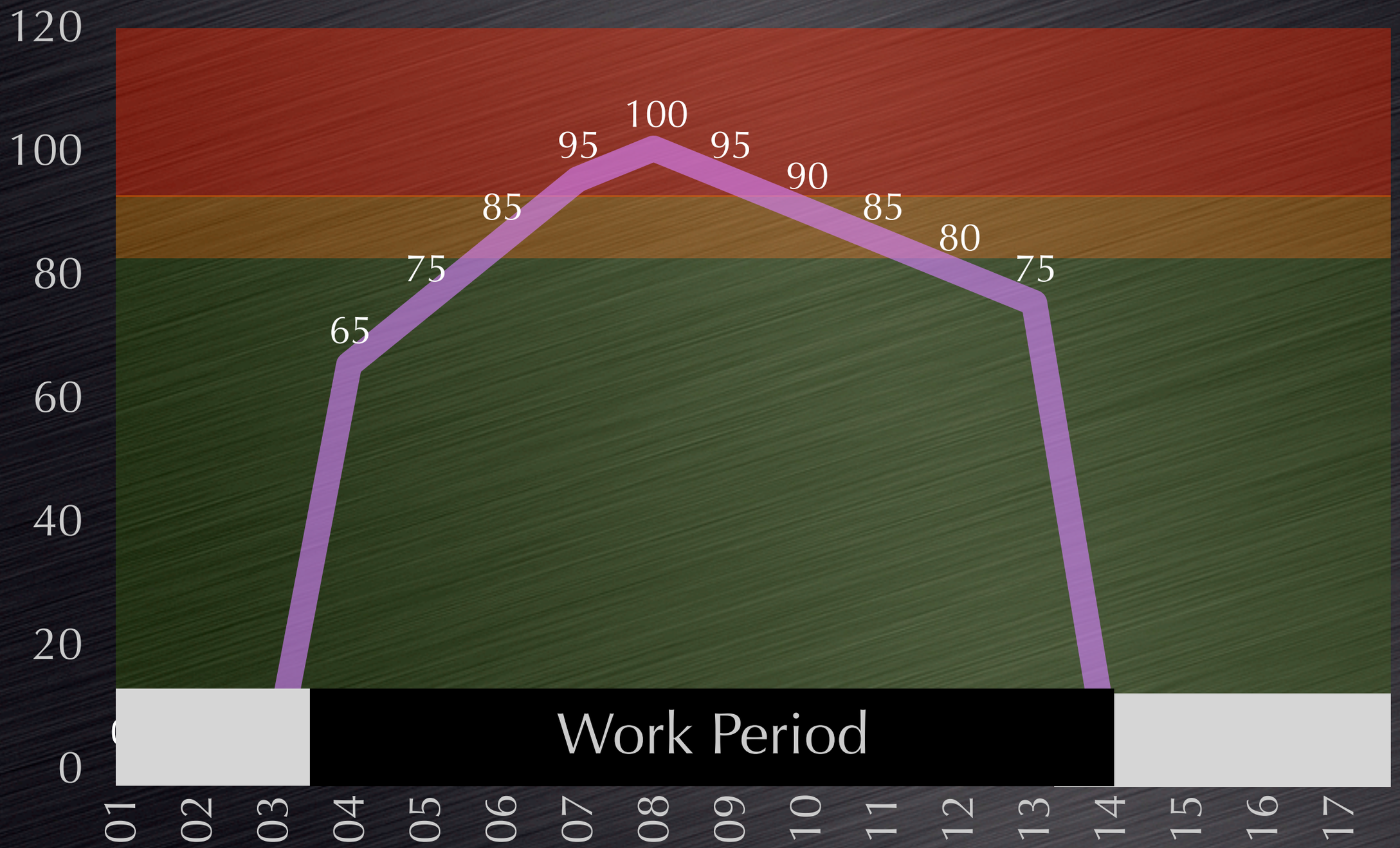
- Timing and duration of actual Sleep-Wake behaviour is used to calculate an index of fatigue
  - Folkhard & Akerstedt
  - Belenky & Hirsch
  - Jewett & Kronauer

Level 1 Controls: Practical Fatigue Modeling

Timing and duration of work and non-work periods is used to infer sleep-wake behaviour and to predict an index of work-related fatigue

- Folkhard & Akerstedt
- Belenky and Hirsch [SAFE-T]
- Dawson and Fletcher [FAID and PSWM]

Defining Compliance



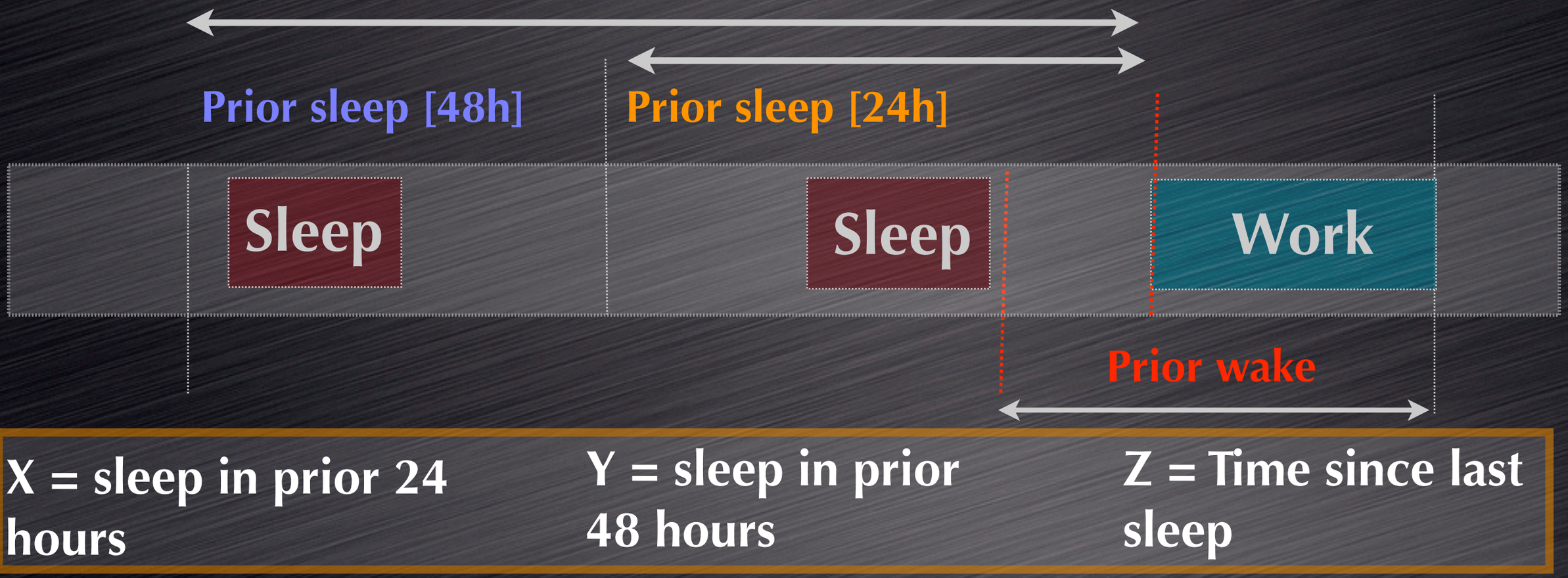
Audit model for a Specific Task

Risk	Band	FAID 'score'	Planned	Actual	Corrective Action
Low	<X	<80	97.5%	**95%**	**None unless evidence of a failure of a level 1+ control**
Moderate	X-Y	80-100	98.75%	97.5%	**Investigate and correct where moderate likelihood of re-occurence**
High	>Y	100+	0%	98.75%	**Investigate and report each non-compliance to regulator. Instigate CA immediately Report outcome/solution**

System of Control

Fatigue Risk Management System Components			Low	Mod	High	Ex
Governance	Personnel	OH&S Committee item	●	●	●	●
		Accountable Executive		●	●	●
		FRM Committee				●
	Policy	Organisational Policy	●	●	●	●
		Work group policy		●	●	●
Training and Education		Personal Management Strategies		●	●	●
		Organisational Implementation Strategies		●	●	●
		Design and Evaluation of an FRMS			●	●
Risk Assessment	Likelihood Assessment	Prospective Analysis	●	●	●	●
		Retrospective Analysis			●	●
		Aggregate PSW reports			●	●
		Individual PSW reports	●	●	●	●
		Behavioural Checklists			●	●
		Error reporting and analysis				●
		Incident reporting and analysis		●	●	●
	Consequence Assessment	Prospective		●	●	●
		Retrospective	●	●	●	●

Level 2 Controls: Individual Sleep History

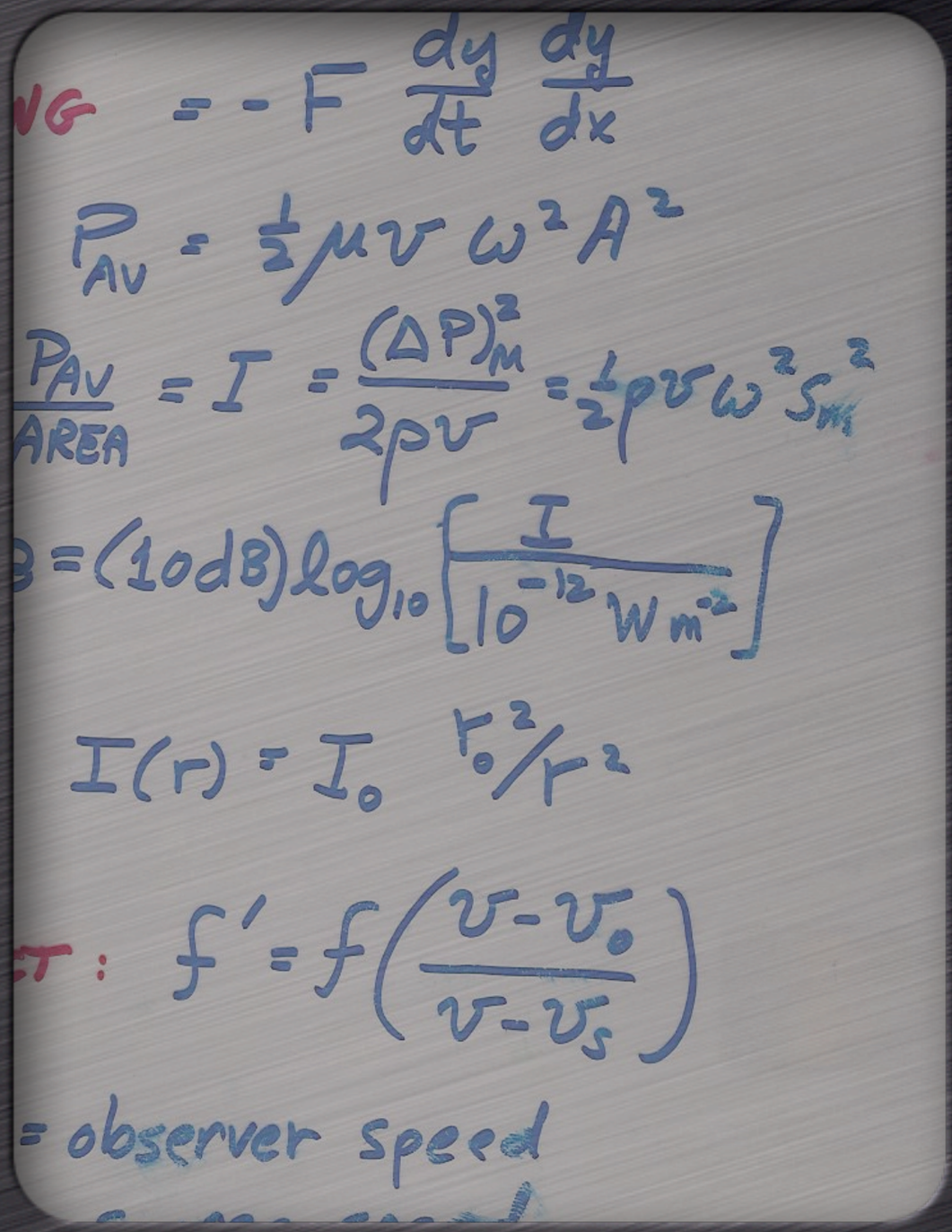


X = sleep in prior 24 hours	Y = sleep in prior 48 hours	Z = Time since last sleep

As prior sleep decreases and prior wake increases the likelihood of fatigue [symptoms, errors and incidents] also increases. In general, **X** should be greater than threshold [**5**], Y should be greater than threshold [**12**] and **Z** should be less than **Y**

Calculate Fatigue likelihood Score

- Add **2** points for every hour of sleep below the 24 hour prior sleep threshold [X]
- Add **1** point for every hour below the 48 hour prior sleep threshold [Y]
- Add **1** point for every hour of work beyond the prior wake threshold [Z]
- Sum and refer to decision tree to determine appropriate response



Agreed behavior in response to non-zero fatigue likelihood score

Score	Agreed response
0	Do nothing unless higher level [3+] hazards are present
a-b	Document locally with supervisor and undertake approved individual countermeasures. Self monitoring for symptoms, napping, strategic caffeine, team monitoring by colleagues, task rotation
c-d	Document externally by supervisor. Organise supervisory checks. Complete symptom checklist, task re-assignment
e+	Document externally, do not engage in any safety-critical behaviors, do not recommence until fit-for-work.

Level 3 controls: identifying impaired behavior

- Symptom Checklists
- Self-report scales
- Karolinska
- Stanford
- Sam Pirelli

Level 3 controls: identifying impaired behavior

- Physiological monitoring
  - Visual Response Times
  - Hand-eye co-ordination
  - Eye blink rates
  - Pupillometry
  - Galvanic Skin Response
  - Chin-chest measure

Level 4 and 5 controls: identifying errors and incidents

For fatigue to be a causal factor two conditions must hold

- Corroborated evidence of a level 1-3 indicator of fatigue
- Nature of error consistent with F-rE

Overview of Industry Progress

Industry	Prescription	Exemption	Alternate Compliance	FRMS	Union preference	Industry preference
Road	Yes	Modeling	No	No	Prescription	Alternate Compliance
Rail	Yes	No	Modeling	2005	Alternate Compliance	FRMS
Aviation	Finishing	No	Modeling	2006	FRMS	FRMS
Maritime	Yes	No	Modeling	2006	Prescription	FRMS
Health Care	Some	No	2006	No	Alternate Compliance	FRMS
Mining	Yes	IR-based	Soon	No	Prescription	Alternate Compliance

Medical Case Studies

Adverse medical events associated with long hours of work . . . . . .

Case Study in Ob-Gyn Unit

These are the circumstances surrounding an adverse medical event that occurred several years ago in a major teaching hospital. The patient was a 35 year old woman who experienced a long and difficult labour. After several hours of unsuccessfully attempting to give birth she experienced third degree tears and was given a somewhat belated episiotomy. The child was delivered in good health without complications. Due to the delayed intervention in the labour, there were significant complications associated with the procedure and the peritoneal damage was so severe that the patient was operated on and a colostomy bag inserted. The woman still has the colostomy bag three years later.

The patient subsequently sought medico-legal opinions over the management of the case and several medical specialists indicated that the medical management of the case was not consistent with current best practice guidelines and, in their opinion, negligent with respect to the patients interests. In particular, they believed the decision to wait on the episiotomy was inappropriate and the patient should have received the episiotomy much earlier. According to the specialists this would have reduced the likelihood of complications

At the time of the incident [0800h], the junior doctor was working on a labour ward in a large public hospital. The doctor was asked to cover several consultants during the Christmas-New Year period. They had all organised to be away during this period to be with their families. The Christmas-New Year break for the consultants was a long tradition going back several decades Thus, there was a historical expectation that the junior doctor assigned to the unit would cover the consultants during this period. Junior doctors were usually quite happy to undertake such activities since many of them felt that it may enhance the possibility of entry into the specialist training program that commenced in February.

There were further additional factors that complicated staffing issues during the period. The acting-CNC on the ward was very junior since senior staff had requested and received leave during this period. Similarly, staffing levels for nursing care were low due to the current hospital policy of using agency and casual staff to supplement minimum staffing levels. Also, as is commonly known, sufficient numbers of agency staff are difficult to obtain at this time of year.

On this particular Christmas-New Year period there had been several quite complicated night-time deliveries across the week and normal workloads during the day. In the six days prior to the incident the junior doctor had worked about 95-100 hours.
Discussions with the junior doctor indicated only about 2-3hrs of unbroken sleep per night for the first five nights and on the night prior to the incident had not received any sleep at all due to long and difficult labour from 1800h on the prior evening through to 0800h the following morning. .

The doctor did not deny the hours worked or to being tired. The patient corroborated this suggesting that, in her opinion, the doctor was tired since the doctor had fallen asleep on several occasions while attending. The patient also alleged that, on one occasion, while listening to the foetus with a stethoscope, the doctor had fallen asleep on the patient's stomach . The doctor did not deny this but could not recall it happening. Under cross-examination, the doctor had very poor recall of the specific event sequence for that evening.

Statements by the nursing staff further corroborated this. They indicated that the doctor had seemed irritable and distracted. In particular, they remarked that the doctor had forgotten several relatively simple tasks that evening. In additon, they had noticed the doctor asleep at the nurses station on several occasions earlier in the evening. The nurses indicated that this was not atypical in junior medical staff on the unit and related several stories of similar periods of extended on-call duty in other junior doctors with similar stories of long hours, inadvertent sleep onset and poor patient management.

Questions

Q.1. If you had been the doctor how would you have responded to the implication of liability?

Q.2. I your opinion, who should be considered liable for the adverse medical event described here? How would you apportion relative blame to the parties?

Q.3. Are such events reasonably preventable?

Q.4. In practical terms, how could such an event could be prevented from occurring again?

Life is an AME!!!!

Questions

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