Risk-based Integrated Fatigue Management Solution

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Workshop Activity

1. Introduction to Inter*Dynamics*
2. Fatigue, Fatigue-risk and current scientific "Sleep" based research knowledge
3. FAID® Roster Analysis Report

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4. **Suggested "Code of Conduct"**
5. Fatigue Hazard Analysis – process review
6. Fatigue Management Strategies – DVD

Introducing Inter*Dynamics*

- **Developed & implemented Inbound Logistics Scheduling System for 2000 Olympics**
- **Provides planning, scheduling & risk systems** for Alcoa, BHP Billiton, Brambles, easyJet, EDI, Fonterra, Linfox, Hitachi, P&O, Pacific National, QR National, Sydney Ports Corp, Kiwi Rail, Union Pacific, Canadian Pacific, BNSF Railway, Norfolk Southern Corp.
- **Developed FAID®** based on research data developed by the Centre for Sleep Research, University of South Australia.
- **Provides FaidSafe®** a risk-based integrated fatigue management solution, developed in alliance with Zurich Insurance – Risk Engineering

What is Fatigue?

- state of impairment associated with lower alertness & reduced performance
- includes physical &/or mental elements
- can impair individual capability to a level where a person cannot continue to perform tasks safely &/or efficiently

Causes of Fatigue!

TASK related Fatigue

- result of excessive & sustained mental or physical activity - can occur within hours
- may be cured by a nap, rest &/or sleep

SLEEP related Fatigue

- when periods of rest &/or sleep are not enough to restore an individual's working performance to their usual level
- can only cured by adequate sleep

Fatigue affects everyone, regardless of skill, knowledge & training

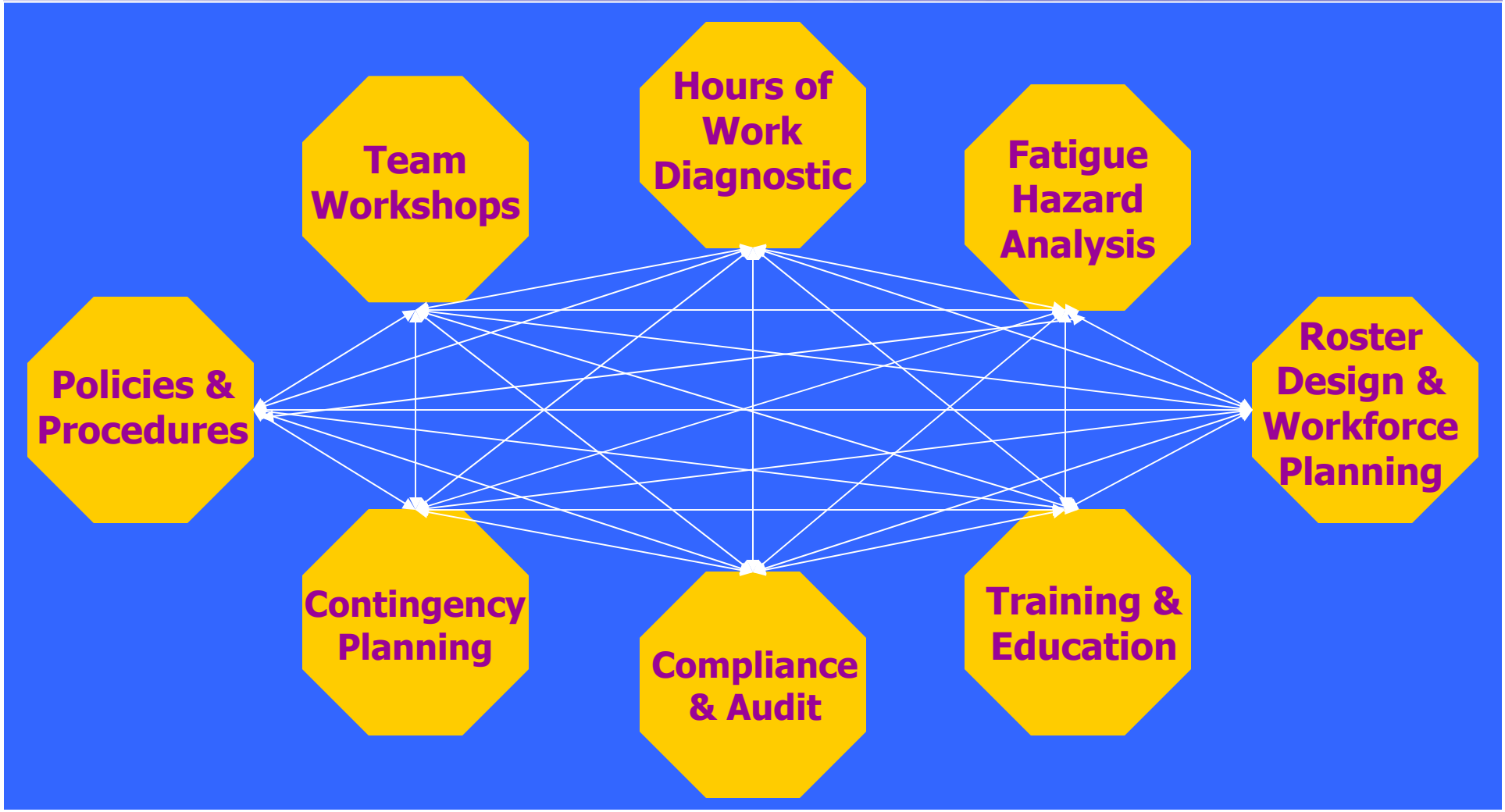
Risk-based Integrated Fatigue Management

- *The management of fatigue in a way that is appropriate for:*
  - *the level and pattern of risk exposure, and*
  - *the nature of the operation (including BOTH **industry type** & **organisational factors**)*
- *in order to **mitigate unacceptable effects of fatigue** on the efficiency and safety of the operation and longer term health impact on the workforce*

Fatigue-risk Mitigation & Control

- Fatigue can not be eliminated
- We can control the risk(s) fatigue presents in the workplace
- No one-system approach can address fatigue
- Certain principles, knowledge & understanding are required to manage this Human Factors issue

Risk-based Integrated Fatigue Management Solution



- To use another analogy: active failures are like mosquitoes. They can be swatted one by one, but they still keep coming.
- The best remedies are to create more effective defenses and to drain the swamps in which they breed.
- The swamps, in this case, are the ever present latent conditions.

  - Professor James Reason

We cannot change the human condition, but we can change the conditions under which humans work

- Professor James Reason

Current Research Knowledge

What we are learning from research into the factors which contribute to fatigue

Humans Are Diurnal

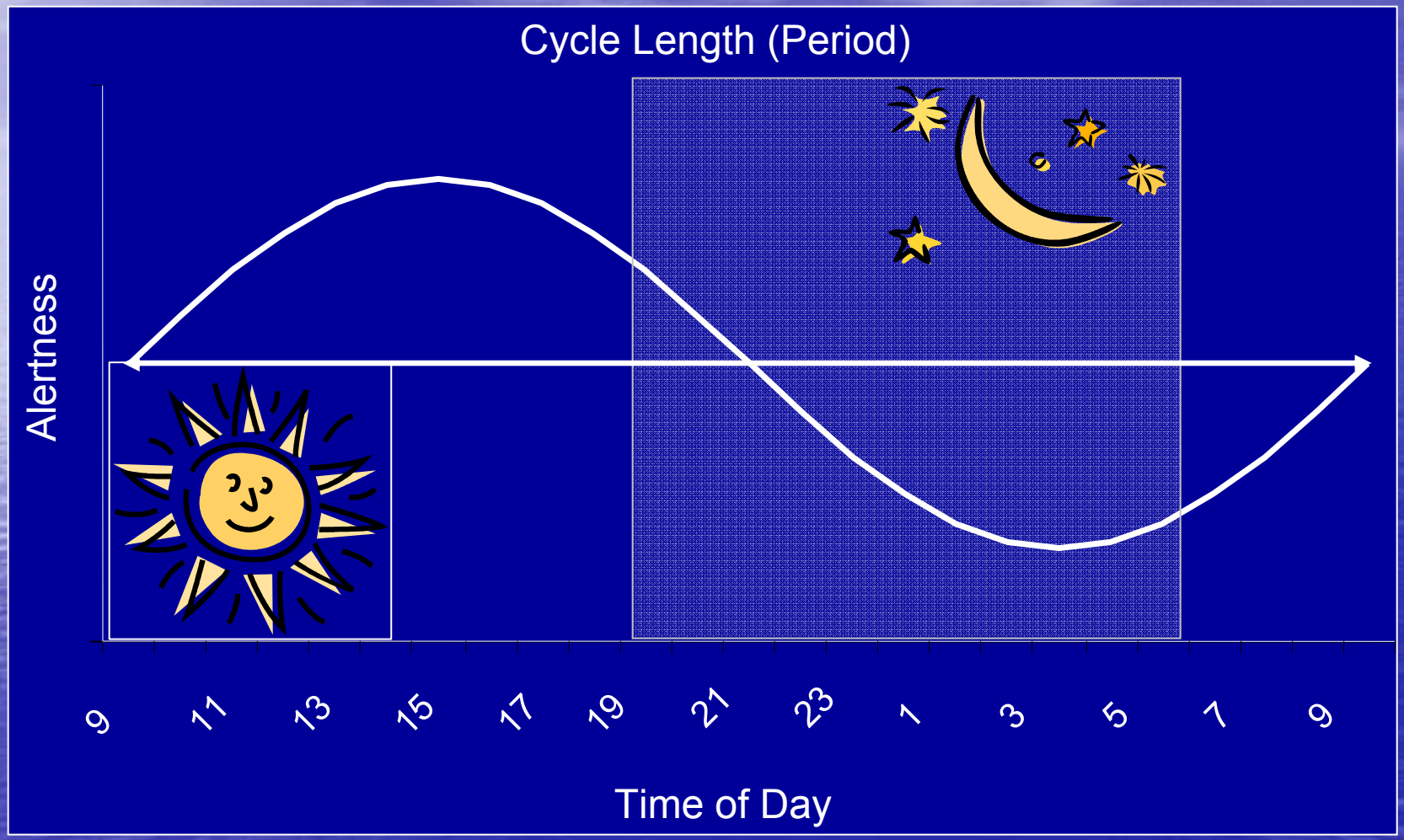
This Means

- We are designed to sleep at night
- Circadian Rhythms or Body Clocks control many functions including:
  - sleepiness/wakefulness
  - digestive enzymes
  - hormone production
  - body temperature

Shift Work & Body Clocks

- Shift work, particularly night work, upsets our body clock or circadian rhythms.
- Can result in sleep disruption and lead to health problems

Circadian Rhythms



No Sleep = Death

Lack of sleep leads to

- feeling sleepier
- harder to pay attention
- slower reaction times, poorer coordination
- slower, channelled, muddled thinking

Muscles can recover with rest

Brain can only recover with sleep

With acknowledgement to
Dr Phillipa Gander
Sleep/Wake Centre NZ

Health Impact of Sleep Loss

University of Chicago Medical School studies of sleep loss suggest rapid & serious physical effects

As a result of 4 hours of sleep for 6 consecutive nights, healthy 30-year old males produced blood test results expected from 60-year old males

- processing of blood sugar down by 30%
- a huge drop in insulin response
- elevated levels of stress hormone, cortisol

Research into the physical effects of sleep loss is shocking sleep experts

Details of Research Study

After 2 nights of 4 hours sleep, appetite changed

- Subjects craved high fat, high carbohydrate/junk food, even though they were fed intravenously & adequately

After 2 nights of 4 hours sleep, flu shots were given. Subjects then had 2 more nights restricted sleep, followed by 10 nights normal sleep

- Subjects immune system response to flu shot was only half that of the group who had normal sleep the whole way through

If sleep was restricted to 6 hours, over a longer period of time, researchers would expect the same results

Summary of Research Study

- **increased appetite**
  - 2 nights of 4 hrs sleep = leptin -19%, ghrelin +24%, global appetite +20%
- **glucose intolerance**
  - 6 nights of 4 hrs sleep (18-27 yr olds) = 61-80 yr old pre-diabetics
- **impaired immune function**
  - 6 nights of 4 hrs sleep, flu shot on day 4, immune response day 14 = 1/2 that of well-rested
- **elevated inflammatory cytokines** (2 x 2-hr naps per day)
- **total sleep deprivation** (but not sleep restriction?) = increased c-reactive protein, blood pressure
  - **TNF, IL-6, CRP are very elevated in OSAS, reduced by CPAP**

Chronic sleep restriction leads to obesity

FACTORS THAT CONTRIBUTE TO FATIGUE

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FACTORS THAT CONTRIBUTE TO FATIGUE

- Inadequate Sleep
- Duration of work periods & breaks
- Time of day at which work or breaks occur
- Work history over last 7 days

FACTORS THAT CONTRIBUTE TO FATIGUE

- Long commutes
- Excessive/inappropriate overtime
- Work environment
  - heat, cold, poor conditions
- High workload/low staffing levels
- Tasks performed

FACTORS THAT CONTRIBUTE TO FATIGUE

- Personal, family, social & other responsibilities
- Health problems
- Age
- Stress

Consequences of Fatigue

- Focus of attention can narrow/tunnel
- Integrating information, *even routine information*, can degrade then stop
- Impairment of ability to self-assess whether safety &/or productivity can be maintained

High Risk Times for Fatigue

- midnight to 0600
- early hours of day shifts
- "siesta" time: 1400 to 1600
- end of a long shift
- first night shift after a break
- introduction of a new roster
- when new to shift work
- commuting