BEST PRACTICE ROSTERING: TRAINING AND RESOURCE KIT

Practical Tools for Rostering Doctors

A joint initiative of the Australian Medical Association and the Australian Healthcare Association.

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Foreword

The Australian Medical Association (AMA) and the Australian Healthcare Association (AHA) are committed to improving the quality of health care provided in Australia's hospitals. Effective risk management is one the central pillars in any organisation's approach to improving quality and safety in health care delivery settings.

The working hours and fatigue levels of medical practitioners, including those of residents and registrars, are increasingly recognised as significant risks for hospitals and their patients. There are a number of reasons for excessive working hours leading to dangerous levels of fatigue among doctors.

Historically, long working hours have been viewed as part of the medical culture and perhaps even a 'rite of passage' for young doctors. Staff shortages can play a significant part, as can the desire by staff for increased remuneration. A contributing factor in many cases is staff rostering practices that are based on an incomplete understanding of the range of factors that can lead to excessive fatigue and increased risk of error.

The AMA and AHA have collaborated to develop this Best Practice Rostering Kit, recognising better rostering as one way of reducing risk. We acknowledge that this Kit is released at a time of national medical workforce shortages, but we also recognise that community and professional tolerance of excessive working hours, and their consequences, is wearing thin.

The provision of safe, quality health care, in a safe and supportive workplace is a joint responsibility of medical professionals and their employing hospitals. We believe that this Kit will assist both parties to work together to achieve that goal.

Dr William Glasson
President, AMA

Deborah Green
President, AHA

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Practical Tools for Rostering Doctors

Best Practice Rostering: Training and Resource Kit
Practical Tools for Rostering Doctors

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Why the kit has been developed

- The AMA and the Australian Health care Association have joined together to further progress practical ways of managing doctor fatigue
- The AMA Safe Hours Code is now well established and this kit will provide practical support for hospital staff managing rosters
- Evidence from studies nationally and internationally demonstrate the link between fatigue and impaired performance levels
- Changes within the health sector are likely to impact on rostering practices (e.g. job sharing, more female doctors, mature age graduates and need for flexibility)

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How to use this kit

- The kit is designed as a self-paced learning guide
- The kit comprises 8 sections covering different aspects of fatigue and rostering
- Each section includes learning outcomes, assessment criteria and resource requirements
- Each section contains notes on the topic and supporting materials with more information
- Some sections include examples and tools you can use to help improve your rosters
- The kit can be used either for individual learning or can be modified for training a small group
- The kit should take about 2 hours to work through and can be used as an ongoing support resource

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Summary of the Kit

1. Fatigue and its characteristics
2. The OHS legislation and fatigue
3. The AMA Code and risk assessment model
4. Roster design principles in the AMA Code
5. Applying design principles to your workplace
6. Managing disruptions to the roster
7. Staff involvement in roster design
8. Measuring the performance of your rosters

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Fatigue and its characteristics

Learning Outcome: On completion of this section the participant will understand the nature and symptoms of fatigue and how it can impact on the medical workforce.

Assessment criteria:

- Outline the common symptoms of fatigue
- Explain how circadian rhythms are related to fatigue
- Outline how fatigue can impact on the medical workforce

Resources:

- Trainee notes
- Supporting material: Fatigue factors diagram, extract from sleep research study, extracts from research into fatigue and patient safety

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Trainee Notes: Fatigue and its characteristics

What is fatigue?

- Fatigue is a broad term covering a range of conditions but in this module can be described as a progressive loss of alertness that ultimately ends in sleep.

- It usually results in impaired performance such as loss of attentiveness, slower reaction times, impaired judgment and poorer performance on skilled control tasks. Feelings of tiredness mean that sleep is imminent and awareness of this must be acted upon immediately.

Fatigue is associated with the following factors:

- Long periods awake
- Inadequate amount or quality of sleep over an extended period
- Sustained mental or physical effort
- Disruption of circadian rhythms (the normal cycles of daytime activity and night sleep)
- Inadequate rest breaks
- Environmental stresses (such as heat, noise and vibration)

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Trainee Notes: Fatigue and its characteristics

The causes of fatigue

The underlying physiological causes of fatigue and potentially poorer task performance are **sleep loss** and **circadian rhythms**.

Sleep is a vital physiological need like hunger and thirst and if sleep is disrupted or we are deprived of normal sleep sleepiness results. During waking hours sleep loss reduces most aspects of human performance. Most people need 8 hours sleep although this varies across individuals.

Failure to get normal sleep results in sleep debt that accumulates and can only be paid back by undisturbed, restorative sleep.

Circadian rhythms or the body clock regulates physiological and behavioural functions on a 24 hour basis. Sleep and wakefulness are programmed and sleepiness is greatest between 3-5 a.m. and to a lesser extent between 3-5 p.m.

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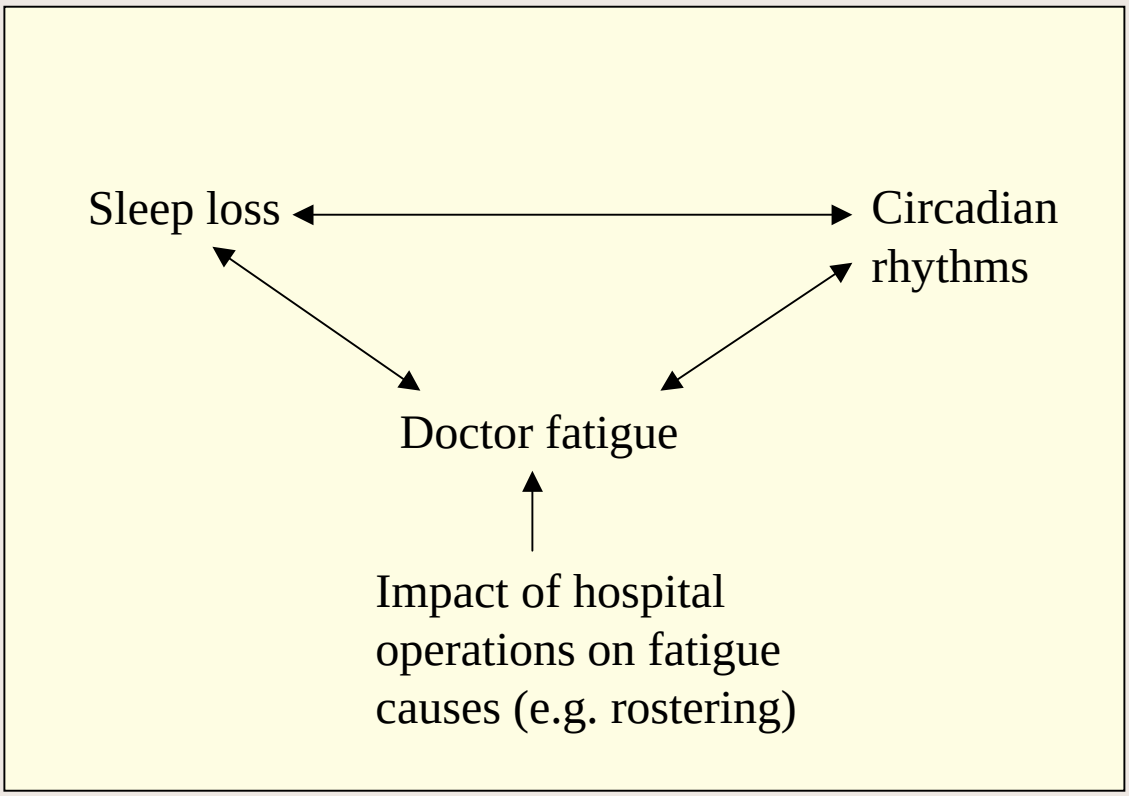
Supporting materials: Fatigue and its characteristics



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Supporting materials: Fatigue and its characteristics

Like food and water, sleep is a physiological need vital to human survival and critical to human existence. Sleep loss can be additive and can result in a cumulative sleep debt. Estimates suggest that in the United States, most people get 1–1.5 hours less sleep than they need. During a regular 5-day work week a typical individual might accumulate a 7.5-hour sleep debt, equal to a full night of sleep loss, going into a weekend. In today's society, many individuals actively attend to their nutrition and exercise to promote good health. Unfortunately, the first physiological need that suffers when individuals are faced with everyday pressures and demands is sleep. Losing sleep becomes a way of squeezing more hours and minutes into the day, which demonstrates a lack of concern for meeting this vital physiological need.

Sleep loss leads to increased waking sleepiness. Many people equate sleepiness with being lazy or acknowledge it only humorously. Sleepiness can have severe consequences for us as individuals and as a society.

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Supporting materials: Fatigue and its characteristics

Sleepiness can degrade essentially every aspect of human performance. Sleep loss and sleepiness can decrease physical, psychomotor, and mental performance, and can increase negative mood and decrease positive mood. Therefore, a principal consequence of sleepiness is an increased vulnerability to performance decrements.

It is important to consider this as a performance vulnerability because, like the effects of alcohol on performance and memory, sleepiness can lead to a reduced safety margin and an increased potential for operational incidents and accidents. Sleep loss and sleepiness resulting from extended duty or altered work/rest schedules have been suggested as contributory factors in many accidents and catastrophes. As individuals, many people put themselves at personal risk by driving when too sleepy, sometimes experiencing a near incident or an actual accident.

Extract from **Crew Factors in Flight Operations X: Alertness Management in Flight Operations Education Module,** Mark R. Rosekind, Philippa H. Gander, Linda J. Connell, and Elizabeth L. Co, NASA,2001.

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Supporting materials: Fatigue and its characteristics

Relationship between fatigue and patient safety

One of the reasons for minimising doctors fatigue through good roster design is to reduce the possibility that performance impairment may impact on patient safety. Research in other industry sectors has shown a relationship between fatigue and reduced performance levels. An Australian study noted below compares the effects of fatigue with alcohol intoxication. The study compared the effects of fatigue and alcohol intoxication on a range of neurobehavioural tasks. By doing so, it was possible to quantify the performance impairment associated with fatigue and express it as a blood alcohol impairment equivalent.

One of the report's findings was that:

"Similarly, as hours of wakefulness increased performance levels for four of the six parameters significantly decreased. More importantly, equating the performance impairment in the two conditions indicated that, depending on the task measured, approximately 20-25 h of wakefulness produced performance decrements equivalent to those observed at a blood alcohol concentration (BAC) of 0.10%. Overall, these results suggest that moderate levels of fatigue produce performance equivalent to or greater than those observed at levels of alcohol intoxication deemed unacceptable when driving, working and/or operating dangerous equipment."

Lamond N & Dawson D 1999, 'Quantifying the performance impairment associated with fatigue', Journal of Sleep Research, 8 (4), pp 255—262.

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Supporting materials: Fatigue and its characteristics

Relationship between fatigue and patient safety

- Apart from the general research into the impact of fatigue on performance there is some evidence of a similar link in medicine. A summary of findings is shown below.
- A study using a simulated surgical procedure found surgeons awake all night made 20% more errors and took 14% longer to complete the tasks than those who had had a full night's sleep. This study, while not based on actual surgical practice, concluded that:

  "our findings suggest that lack of sleep may affect performance in the operating theatre".

Effect of sleep deprivation on surgeons' dexterity on laparoscopy simulator, NJ Taffinder, IC Mcmanus. Y Gul, RG Russell and A Darzi, The Lancet, V 352, 1998.

- A study of anaesthetist's hours of work in New Zealand found that 86% of respondents reported they had at some time in their careers, made an error in clinical management that they attributed to fatigue. A major finding was that:

"50% of trainees and 27% of specialists indicated that their average working week exceeded what they believed they could do on an ongoing basis while maintaining patient safety".

Hours of work and fatigue related error: a survey of New Zealand anaesthetists, PH Gander, A Merry, MM Millar and J Wellers, Anaesthesia and Intensive Care, Vol 28, 2000.

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Supporting materials: Fatigue and its characteristics

The professional environment of pilots and doctors has been recently used to highlight some of the cultural factors that can contribute to a 'culture of denial".

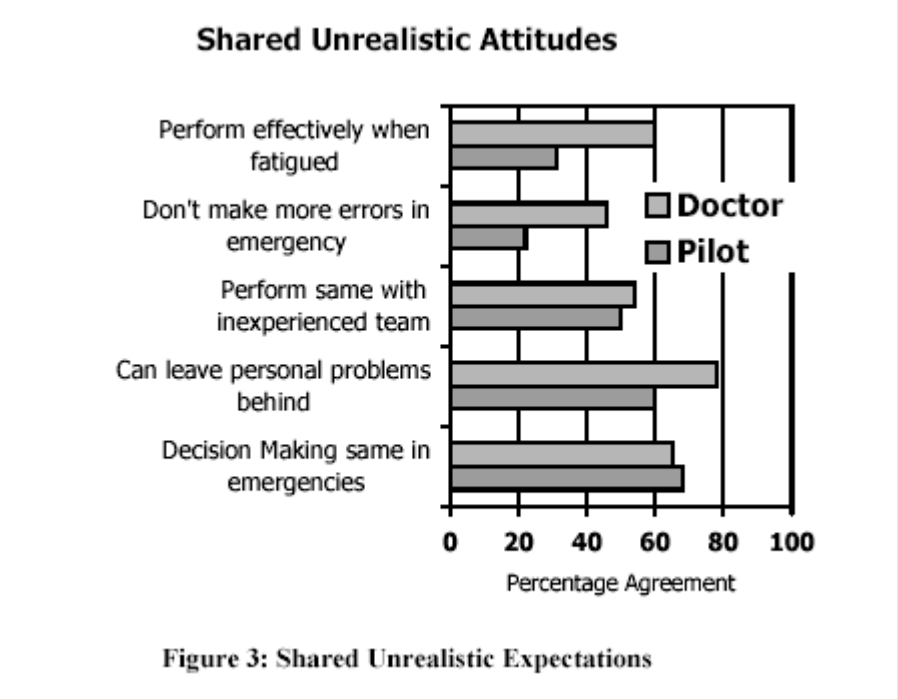

Figure 3: Shared Unrealistic Expectations

Extract from **Special Medical Seminar Lessons for Health Care: Applied Human Factors Research**, 22 November 2000, prepared for the Australian Council for Safety and Quality in Health Care & NSW Ministerial Council for Quality in Health Care January 2001.

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OHS legislation and fatigue

Learning Outcome: On completion of this section the participant will be familiar with the legislative basis for fatigue as an occupational heath and safety hazard and the duties of different parties.

Assessment criteria:

- Understand the duties set out in OHS law as they apply to fatigue
- Ability to advise on potential compliance issues

Resources:

- Trainee notes
- Supporting material: Extract from legislation. List of relevant OHS Acts, example of provisions from NSW OHS Act

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Trainee Notes: OHS legislation and fatigue

Fatigue as a occupational health and safety issue is one of many hazards that an employer has a duty to manage. Fatigue is not subject to specific requirements under current OHS legislation in the same way as hazards such as noise or chemicals are.

Under respective OHS Acts in each state and territory the employer (in this case the hospital) has a **general duty** to make the workplace as safe and healthy as is practicable.

This means that while there may not be specific steps an employer must follow they nonetheless must ensure that the outcome of a safe and health workplace is achieved. Suitable rostering that minimises fatigue would be an important way of meeting this duty of care.

Employees (in this case salaried medical officers) also have a **duty of care** to ensure that they do not put themselves at risk or others at risk by their actions or inactions. Using opportunities for sleep when there is a build up of fatigue is an important way in which employees can meet their obligations so they are ready for their next shift. "Moonlighting" in other jobs compromises the rest opportunity provided and undermines the effort in establishing well designed rosters.

The legal duties are stated a little differently in each state and territory but have a similar effect. Employers (hospitals)must minimise risks associated with long working hours and employees(doctors) must assist the employer in managing these risks.

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Supporting materials: OHS legislation and fatigue

List of OHS Acts in which general duties are outlined.

Victoria: Occupational Health and Safety Act 1985

New South Wales: Occupational Health and Safety Act 2000

South Australia: Occupational Health Safety and Welfare Act 1986

Tasmania: Workplace Health and Safety Act 1995

Queensland: Workplace Health and Safety Act 1995

Western Australia: Occupational Health and Safety Act 1984

Commonwealth: Occupational Health and Safety (Commonwealth Employment) Act 1991

Australian Capital Territory: Occupational Health and Safety Act 1989

Northern Territory: Work Health Act 1986

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Supporting materials : OHS legislation and fatigue

NSW OCCUPATIONAL HEALTH AND SAFETY ACT 2000

Duties of employers

(1) An employer must ensure the health, safety and welfare at work of all the employees of the employer.(1) That duty extends (without limitation) to the following:

(a) ensuring that any premises controlled by the employer where the employees work (and the means of access to or exit from the premises) are safe and without risks to health,

(b) ensuring that any plant or substance provided for use by the employees at work is safe and without risks to health when properly used,

(c) ensuring that systems of work and the working environment of the employees are safe and without risks to health,

> The system of work includes hours of work, schedules, rosters, staffing levels etc.

d) providing such information, instruction, training and supervision as may be necessary to ensure the employees' health and safety at work,

> Information and training such as this package and monitoring of rosters to see if fatigue is minimised

(e) providing adequate facilities for the welfare of the employees at work.

> Provision of eating and rest areas.

(2) An employer must ensure that people (other than the employees of the employer) are not exposed to risks to their health or safety arising from the conduct of the employer's undertaking while they are at the employer's place of work.

> The duty to of the employer to manage fatigue applies not only to employees but also to patients.

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The AMA Code and risk assessment model

Learning Outcome: On completion of this section the participant will be familiar with the AMA Code and the risk factors associated with fatigue

Assessment criteria:

- Be familiar with the AMA Code and the associated method of assessing fatigue risks
- Understand the risk factors that contribute to and escalate fatigue risks
- Capacity to recognise fatigue risks when setting and reviewing rosters

Resources:

- Trainee notes
- Supporting material: survey results from AMA risk assessments

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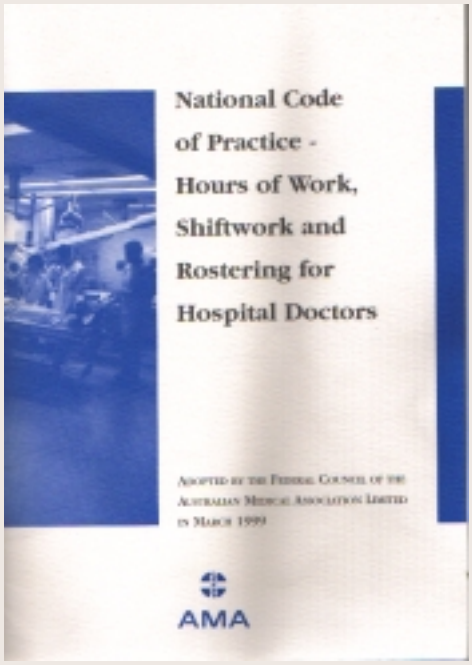
Trainee Notes: The AMA Code and risk assessment model

Adopted by AMA in 1999

Based on OHS approach used by government agencies

Identifies fatigue risks



Outlines ways of reducing fatigue

Increasingly used as a key reference in hospitals

Referred to in agreements on working conditions

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Trainee Notes: The AMA Code and risk assessment model

Fatigue is generated by a number of factors and can have a short term impact as well as building up over a longer period. In the AMA Code of Practice a risk assessment checklist is used to guide the level of risk that may apply. This checklist is based on a number of fatigue risk factors and includes:

TIME OF DAY

The circadian pattern of waking and sleeping is linked to the time of day so when we work and sleep can determine the likelihood of fatigue being a problem. The fatigue risk factors associated with time of day are night shifts, lack of night sleep and shifts or additional hours that extend into low alertness periods (particularly midnight to 6 a.m.).

TIME SPENT WORKING

The longer the time spent working the more likely the build up of fatigue. Continuous working periods within a shift without a break and the daily shifts (e.g. more than 12 hours) increase fatigue and also reduce the opportunity for rest and sleep.

CUMULATIVE FATIGUE

Fatigue not only is a problem over shorter periods such as a day but builds up over longer periods unless there is an opportunity to recover. If a doctor loses a hour of normal sleep every day this builds up into a days sleep debt over a weekly period.

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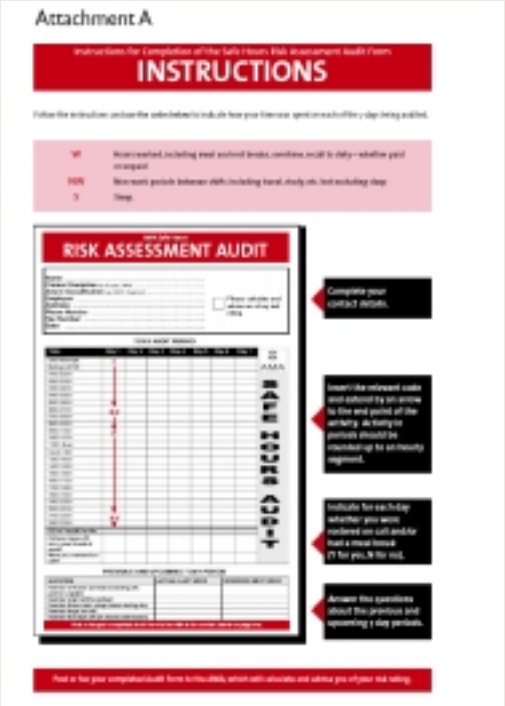
Trainee Notes: The AMA Code and risk assessment model

To supplement the Code of practice a risk assessment tool was prepared to help doctors and the hospitals they work in to better understand the size of the fatigue problem. The risk assessment guide uses a weighted hours model to calculate a risk score based on the balance between non-work time, sleep time and working time.

Hours worked at night are given a higher risk rating.

Sleep taken during the day is rated as less restorative than night sleep.

Shifts longer than 14 hours are rated as a higher risk.


Attachment A

INSTRUCTIONS

RISK ASSESSMENT AUDIT

Risk points are also allocated where the working week is longer than 50 hours, where there is less than 10 hours between shifts and where there is no 24 hour break in 7 days.

The number of times a doctor is on call is also weighted as a risk factor.

Using the risk rating system doctors can evaluate their current work pattern and see if it places them in a high risk category. The ratings can also provide feedback on whether the roster is contributing to fatigue problems.

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3 Supporting materials: The AMA Code and risk assessment model

During 2000/2001 the AMA conducted detailed risk assessment audits of 417 junior doctors' work schedules and has classified each doctor's work schedule into one of the three risk categories in the Code. The data indicates that 24% of respondents fell into the higher risk category during the audit period. Total hours for some higher risk doctors exceeded 100 per week, with one doctor reporting a period of 63 hours of continuous hospital duty.

The data indicates that, while total weekly work hours are important, a number of other variables contribute to the level of risk associated with a roster. These include whether the work was undertaken at night, if shifts exceed 14 hours, the extent of on call commitments, access to work breaks and the long term work pattern.

The characteristics of the risk assessment audit data collected by the AMA are broadly consistent with the trends identified in other much larger data collections covering the medical workforce and highlight the systemic nature of unsafe work and rostering practices for junior doctors across the hospital system.

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Roster design principles in the AMA Code

Learning Outcome: On completion of this section the participant will be familiar with the roster design principles set out in the AMA Code and their relationship to fatigue risk factors.

Assessment criteria:

- Understand the design principles
- Explain how the principles are linked to risk factors

Resources:

- Trainee notes
- Supporting material: extract from NIOSH guide

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Trainee Notes: Roster design principles in the AMA Code

- Minimise shifts of more than 10 hours
- Ensure breaks between shifts enable a minimum 6 hours continuous sleep
- Ensure extended shifts are compensated with longer breaks between shifts
- Use forward shift rotation
- Avoid rapid shift changes
- Allow at least one day free in every 7 in which opportunity for unrestricted sleep is possible
- Minimise consecutive night shifts
- Allow longer breaks between and following night shifts
- Build in contingencies for sickness and absences
- Maximise the opportunity to take short breaks within shifts

Note: it is critical to include all time worked in assessing fatigue, not just what the roster says. This includes un-rostered overtime and time on call.

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Trainee Notes: Roster design principles in the AMA Code

Brief rationale for each principle

Minimise shifts of more than 10 hours

Fatigue increases on long shifts, and secondly, long shifts eat into the time available for sleep.

Ensure breaks between shifts enable a minimum 6 hours continuous sleep

Most people need 7-8 hours sleep every day but the time of day sleep is taken will influence the amount of time needed to get minimum sleep. It is more difficult to get good sleep during the day. To get the absolute minimum of 6 hours a break of 7 hours would be required, ideally at night.

Ensure extended shifts are compensated with longer breaks between shifts

Work and rest needs to be balanced to avoid the build up of sleep debt.

Use forward shift rotation

It is generally considered that it is easier to go to bed later and wake up later than to have to go to sleep earlier and wake earlier as required in a backward rotation. The evidence on this, however, is equivocal.

Avoid rapid shift changes

Rapid shift changes may further disrupt the body clock and not allow an opportunity to recover from any built up sleep debt.

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Trainee Notes: Roster design principles in the AMA Code

Brief rationale for each principle

Allow at least one day free in every 7 in which opportunity for unrestricted sleep is possible

The opportunity to get undisturbed night sleep allows sleep debt to be reduced. Two consecutive night sleeps is considered adequate to minimise sleep debt.

Minimise consecutive night shifts

Night work contributes to sleep debt and disrupts the body clock. The question of rapidly rotating night shifts or slowly rotating night shifts is contentious. It is agreed that 4 to 7 consecutive night shifts is the worst of all worlds in getting circadian rhythms out of synch.

Allow longer breaks between and following night shifts

Night work contributes to sleep debt and disrupts the body clock.

Build in contingencies for sickness and absences

Any schedule is likely to be disrupted for one reason or another and building in contingencies to reduce any high risk fatigue situations.

Maximise the opportunity to take short breaks within shifts

Whilst short breaks are never a substitute for sleep they can provide temporary relief. Naps taken when feeling tired can be beneficial in the short term.

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Supporting materials: Roster design principles in the AMA Code

Permanent versus Rotating Schedules: We might think that permanent night workers adapt or get used to their work times. Usually, the longer somebody does something, the easier it becomes. With experience, many night workers figure out tricks or personal methods to fight off some of the nighttime fatigue. However, research tells us that most permanent night workers never really get used to the schedule. That is, there are many nights when they still feel tired and sleepy. Fatigue occurs because most night workers go back to a day schedule on their days off. This is not surprising because family and friends are active during the day.

Also, many errands and chores (like getting the car fixed) must be done during the day. Because most night workers often return to a day schedule, they never completely allow their sleep and body rhythms to adapt to being awake at night. They also sleep less during the day, so they don't recover from fatigue. This fatigue can carry over from day to day. Over several days, fatigue can accumulate to unsafe levels.

People working rotating schedules face a similar situation. Because the shift times are always changing, they can never completely adapt to a set work schedule. Rotating schedules are often used because they are considered fairer to all workers. Everybody in the workforce takes their turn at both the popular and unpopular shifts. Rotating shift workers are always trying to get used to changing work times. This is not easy, which is why rotating shift workers have more complaints than other workers about physical health and psychological stress. Research has shown that rotating shifts have special features that might affect a person's ability to get used to the schedule. These features are explained below.

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Supporting materials: Roster design principles in the AMA Code

Speed and Direction of Rotation: Adapting to rotating shifts can be affected by the speed of rotation and the direction of rotation. Speed of rotation means the number of consecutive day, evening, or night shifts before a shift change occurs. Direction of rotation means the order of shift change: A *forward* rotation is in the clockwise direction, from day to evening to night shift. A *backward* rotation is in the counterclockwise direction, from day to night to evening shift. Different *rotation speeds* also affect a worker's ability to get used to change of shift times.

We have already talked about the same situation under permanent versus rotating shifts. Longer rotations (for example, three to four weeks of working the same hours) are supposed to allow workers more time to get used to night shifts. However, workers usually return to a day schedule on their days off. A fast rotation (every two days, for example) allows no time to get used to night work. Some researchers prefer the fast rotation, because the worker quickly gets through the tough shifts and then has a couple of days off. Very fast rotations are used in Europe more than in America.

Direction of rotation can affect the ability of circadian (daily body) rhythms to adapt to the change in work times. Sleep, for example, is a circadian rhythm because each person sleeps for part of every day. Some researchers suggest that a forward, or clockwise, rotation is better for helping a worker adjust to new sleep times. This suggestion was made because it is easier to go to bed later and wake up later than earlier. Our body rhythms make us feel more awake and alert in the early evening. This makes it harder to fall asleep earlier. Backward rotations work against the body rhythm by forcing the worker to go to sleep earlier and earlier.

Extract from **Plain Language About ShiftWork**, Public Health Service, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, USA, 1997.

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5 Applying roster design principles to your workplace rosters

Learning Outcome: On completion of this section the participant will be able to apply roster design principles to rosters in their own workplace.

Assessment criteria:

- Incorporate design principles into normal rosters
- Evaluate rosters for potential fatigue problems

Resources:

- Trainee notes

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Trainee Notes: Applying roster design principles to your workplace rosters

Preparation of rosters need to meet a number of operational requirements such as:

- Expected peak demand times
- Matching of junior doctors with supervising consultants
- Sufficient overlap between shifts to manage patient handover
- Availability of specialist categories particularly after hours
- Leave and absences
- Cost

In addition the nature of rosters will vary according to the size and role of the hospital. The key variables from a fatigue point of view in roster design are:

- Time worked on a daily and weekly basis (including un-rostered overtime and on call)
- Length of shifts
- Shift start times
- Break between shifts
- Rest days
- Fixed or rotating shifts (direction and speed of rotation)

Other factors important to the roster design include the functional area (e.g. Emergency Department) and the nature and intensity of the work.

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Trainee Notes: Applying roster design principles to your workplace rosters

PREAMBLE TO ROSTER EXAMPLES

In the examples that follow the objective is to highlight key fatigue management issues. It is not possible to replicate the intricacies of many rosters (e.g. annual, term or monthly components, swaps etc) and so the examples track an individual through the roster. On call rosters add further complexity.

The advantages and disadvantages of each roster are illustrated by following a doctor through the roster from start to finish.

To understand the group nature of the roster some additional comments are made about each example. In the examples, the number of weeks equates to the number of doctors in the roster. Clearly the number of doctors in the rotation influences the options to improve fatigue management. In some specialist areas and in smaller rural hospitals options to improve rosters are limited.

In the examples there are a number of cases of long continuous periods of work (e.g. 12 days in a row) and even though they allow regular night sleep, options to break up this long schedule may be possible. In this circumstance a longer daily shift may be a reasonable trade-off to create a 24-hour break.

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Trainee Notes: Applying roster design principles to your workplace rosters

TYPICAL ROSTER SCENARIOS: Resident Medical Officer in large teaching hospital (1)

8 week cycle	M	T	W	T	F	S	S	TOT hrs
1				0800-2100	0800-2100	0800-2100	0800-2100	52
2				0800-2100	0800-2100	0800-2100		39
3	0800-2100	0800-2100	0800-2100				0800-2100	52
4	0800-2100	0800-2100	0800-2100					39
5	2000-1000	2000-1000	2000-1000					42
6	2000-1000	2000-1000	2000-1000					42
7				2000-1000	2000-1000	2000-1000	2000-1000	56
8				2000-1000	2000-1000	2000-1000	2000-1000	56

Low fatigue risk and good opportunity for night sleep

Low fatigue risk and good break before next shift

Long night shift with fatigue risk increasing by second night then good recovery opportunity

Significant fatigue risk by end of shift then good recovery opportunity

There are 8 RMO's rotating through this roster. Each RMO starts at their week number and works through for the rest of the full cycle.

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Trainee Notes: Applying roster design principles to your workplace rosters

TYPICAL ROSTER SCENARIOS: Resident Medical Officer in large teaching hospital (1)

Advantages: Doctors in the first 4 weeks of the roster commence with opportunity for night sleep and thus can begin fully rested. The move on to night shifts is preceded by a break with good opportunity for night sleep. Doctors who begin their rotation at the 5th and 6th week point of the cycle need to be coming off a good opportunity for night sleep. Night shifts are long but quick rotation may minimise circadian disruption. Roster is stable and for this situation in a large teaching hospital unlikely to be disrupted by additional hours.

Disadvantages: Long hours particularly on second cycle of night shifts means fatigue risks are likely to be significant at the end of the four nights.

Fatigue critical management points: This roster is predictable and until the night shifts begin does not present a fatigue risk. Night shifts increase the fatigue risk but the quick rotation and opportunity for recovery minimises the risk escalating. The key fatigue management points on this roster would only arise where there are additional hours required in weeks 5-8 that compromise the opportunity for night sleep on days off.

Note: The FAID fatigue modelling software, a commercially available product, has been used to check aspects of each roster (and those that follow) although only very broad observations are made here. Much more specific assessments can be made by using such tools.

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Trainee Notes: Applying roster design principles to your workplace rosters

TYPICAL ROSTER SCENARIOS: Resident Medical Officer in large teaching hospital (2)

Cycle	M	T	W	T	F	S	S	Tot hrs
Week 1	0800-1700	0800-1700	0800-1700	0800-1700	0800-2200	0800-1230	0800-2200	68.5
Week 2	0800-1700	0800-1700	0800-1700	0800-1700	0800-1700			45

12 consecutive days a minor fatigue risk

In this roster two RMOs work through this two-week rotation for a term of 13 weeks.

Advantages: Stable and opportunity for night sleep after each shift. No night shifts.

Disadvantages: Long weekly working hours (68.5 in first week) and 12 days before a full day break from work. A long stretch such as this may be mentally fatiguing. Need for normal family and social activity may mean sleep is compromised.

Fatigue critical management points: Fatigue risk would be low until beginning of second week coming off reduced opportunity for night sleep. The doctor on this roster is also rostered on call each Monday and if required into night shift would contribute to build up of fatigue. The problems with this roster are a function of the number of doctors rotating through it. The ability to break the 12 day straight run on the first weekend requires an additional RMO in the roster (or the shift is covered by other RMOs) or one longer shift if a short weekend break is to be possible.

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Trainee Notes: Applying roster design principles to your workplace rosters

TYPICAL ROSTER SCENARIOS: Surgical Registrar in large teaching hospital (1)

Cycle	M	T	W	T	F	S	S	Tot hrs
Week 1	If not fully rested or undertaking overtime before commencing nights fatigue risk increases				1630-0800	2130-0800	2130-0800	36.5
Week 2	2130-0800	2130-0800	2130-0800	2130-0800	7 consecutive nights would mean fatigue risk is high			42
Week 3	0800-1700	0800-1700	0800-1700		1630-0800	2130-0800	2130-0800	63.5
Week 4	2130-0800	2130-0800	2130-0800	2130-0800	7 consecutive nights would mean fatigue risk is high			42

This roster rotates 4 registrars through a four-week cycle.

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Trainee Notes: Applying roster design principles to your workplace rosters

TYPICAL ROSTER SCENARIOS: Surgical Registrar in large teaching hospital (1)

Advantages: The seven days on night shift and seven days off spreads continuous night work across the medical workforce and theoretically spreads fatigue risk. Full week off is attractive for travel and social opportunities and enables recovery from potential sleep debt.

Disadvantages: Assuming the doctor is fully rested before commencing this shift cycle significant levels of fatigue risk will still arise early into this cycle and will increase considerably by the end of the cycle.

Fatigue critical management points: if this roster is used the best practice issues are:

- Ensuring that doctors 2 and 4 enter this cycle fully rested having had a minimum of two night sleeps prior to commencement
- Ensuring that doctors do not have to work extended hours beyond the rostered 9-12 hour shift as this accelerates fatigue risks by increasing work duration and further limiting the opportunity for recovery
- Ensuring that the return from a weeks break is not on shifts that are likely to disrupt circadian rhythms and allow for adjustment to upcoming rosters (e.g. avoid early morning or night starts on return)

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Trainee Notes: Applying roster design principles to your workplace rosters

TYPICAL ROSTER SCENARIOS: Surgical Registrar in large teaching hospital (2)

Cycle	M	T	W	T	F	S	S	Tot hrs
Week 1	0800-1700	0800-1700	0800-1700	0800-2200	0730-1300	0800-1300	0800-1200	55.5
Week 2	0730-1330	0730-2200	0730-1330	0730-1630	0730-2200			50
Week 3	0730-2130	0730-1330	0730-2200		2100-0830	2100-0830	2100-0830	69
Week 4	2100-0800	2100-0800	2100-0800	2100-0800				44

Changeover to night shift comes off minimum night sleep opportunity

12 consecutive days low risk but any overtime will escalate risk significantly

7 consecutive nights would mean fatigue risk is high

This roster is based on 4 registrars rotating through a 4-week cycle over a term.

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Trainee Notes: Applying roster design principles to your workplace rosters

TYPICAL ROSTER SCENARIOS: Surgical Registrar in large teaching hospital (2)

Advantages: Consecutive days are all followed by the opportunity for night sleep. 7 day night shift cycle may assist continuity of care.

Disadvantages: 12 consecutive days without a break builds a platform for fatigue if there is an extension of hours because of overtime or relieving duties. 7 consecutive night shifts means fatigue risks will be significant by the end of the night cycle. The changeover from day to night off the back of a long day, even with a day off, may mean the doctor is not fully rested to commence night shifts.

Fatigue critical management points: any compromise of sleep opportunities in the break between the end of day shift and commencement of night shift would increase fatigue risks earlier into the night shift cycle. The registrar who begins at the 4th week point in the cycle has the greatest need for sleep opportunity prior to commencing the roster.

Overtime or on call that extends hours into night in the block of 12 consecutive days would increase fatigue risks.

The opportunity to break the 12 days straight may be available by working a longer shift on one day and creating a full day free of work.

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Trainee Notes: Applying roster design principles to your workplace rosters

ISSUES IN IMPROVING ROSTER DESIGN TO REDUCE FATIGUE

- Where possible minimise critical fatigue situations with relief staff
- Where possible provide opportunities for doctors to get extended breaks following extended hours shifts
- Make every effort to provide the opportunity for two consecutive night sleeps after potentially high fatigue risk situations
- Anticipate the impact of on call demands and the specialties most likely to be recalled. Factor this into the roster design
- For cost and fatigue reasons minimise unscheduled overtime
- In the longer term do some planning to establish what resources would be needed to get the majority of rosters within safe hours principles
- Use fatigue management software to check your rosters. This software can estimate how much of a break a person needs before they can safely commence a new shift. There are commercial packages available.

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Managing disruptions to rosters

Learning Outcome: On completion of this section the participant will be familiar with strategies to cope with disruptions to schedules.

Assessment criteria:

- Understand the design principles
- Capacity to apply short term adjustments to rosters that minimise fatigue

Resources:

- Trainee notes

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Trainee Notes: Managing disruptions to rosters

Despite careful consideration to develop a roster that meets both operational and safe hours needs circumstances may arise that disrupt the scheduled roster.

The most likely disruption is sickness of a rostered doctor.

Short term absences are usually covered by extending a shift for a doctor or in larger hospitals relieving doctors may be available. The fatigue issues in extending a shift will depend on the prior workload and time of day during which extra hours have to be worked.

In smaller hospitals absences of over a week present major disruptions to rosters that are not easily overcome. In this case continued extension of hours may create a significant fatigue risk.

Short term strategies for dealing with roster disruptions include:

- Use relievers where available
- Where doctors are asked to extend hours to cover a shift look at prior workload and next opportunity for night sleep
- Compensate an extended shift with a longer break before the next shift

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Trainee Notes: Managing disruptions to rosters

Short term strategies for dealing with roster disruption include:

- Where extended hours and double shifts are being used try to allow an opportunity for even a reduced sleep period in the 0000-0600 period
- Look forward in the roster to the "knock on effects" of extended hours and double shifts into the following days and weeks to ensure there is an early opportunity to pay off sleep debt. This should be the earliest opportunity to get two consecutive night sleeps
- Look forward in the roster to make sure a doctor who has been working extended hours is able to be phased back into the normal roster in the most "sleep friendly" way (e.g. avoid backward rotations, jumps from early morning to night starts etc.)

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Staff involvement in roster design

Learning Outcome: On completion of this section the participant will be able to incorporate staff feedback into rosters.

Assessment criteria:

- Understand the individual and social factors that may influence individual response to rosters
- Capacity to get input from staff and adjust roster to meet individual needs where practicable

Resources:

- Trainee notes
- Supporting material: sample doctor survey, extract from AMWAC report

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Trainee Notes: Staff involvement in roster design

Roster design has to take into account a number of factors including operational requirements, specialist staff availability and leave scheduling. These factors make rostering a complex task in many organisations. If fatigue is to be minimised by good scheduling practices the input of staff will be required. The reasons for seeking staff involvement include:

- **Obligation under OHS legislation to consult with staff:** employers have a duty to consult with employees or their representatives on matters that may affect their health and safety under most OHS legislation. Even where the obligation may not be specified in legislation it has become an accepted part of OHS practice to consult on matters such as fatigue. Staff also have obligations under the same legislation to work safely.
- **There is no "perfect" roster:** the complexity of some rostering tasks has led to the development of roster experts and expert software packages designed to produce the "optimum" solution. Software packages can be helpful but they can be based on assumptions that are at odds with both fatigue principles and staff perceptions and preferences. Experience in a range of industries suggests that staff involvement in the rostering process is more likely to lead to better outcomes as staff are able highlight factors that may be important to them (e.g. family commitments) and the roster is more broadly accepted and maintained. Management should set the operating parameters and allow some involvement to maximise employee preferences within these constraints.

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Trainee Notes: Staff involvement in roster design

- **Individual characteristics can influence suitability of a roster:** the fundamental causes of fatigue such as lack of sleep and circadian adjustment can be accounted for in roster design but there is still individual variation that should be considered. The amount and structure of sleep changes as we get older. We get less deep sleep and less overall night sleep particularly from the 45-50 age point onwards. Other individual factors relate to the concept of morning people ("larks") and night people ("owls") and although the research is contentious people's perception of their best times is very important.
- **Personal, social or family considerations:** giving consideration to out of work factors may make rostering more complex but failure to do so can create issues through absences and requests for change. Doctors with family responsibilities may not be obtaining sufficient rest on some shifts as they need to care for children or because they are caring for an aged person in the household.

  Care also needs to be taken that personal considerations such as income, second job and lifestyle preferences do not create fatigue risks. Rosters with a number of consecutive days off should be seen by doctors as principally an opportunity to recover rather than as an opportunity to work more hours in another job.

  Surveys of staff regarding their rosters can assist in establishing individual needs such as study or family commitments.

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Supporting materials: Staff involvement in roster design

Extract from ***Australian Medical Workforce Advisory Committee (2002), Career Decision Making By Doctors In Their Postgraduate Years – A Literature Review, AMWAC Report 2002.1, Sydney***

Hours of Work

Surveys of younger graduates have indicated they have a preference for working shorter hours than their predecessors (Warde et al. 1996). Long working hours and overtime have been implicated in stress experienced by young doctors (Luck, 2001; BMA, 1995). In some instances, the requirement to work long hours has been attributed to financially driven staff shortages, and covering for staff on leave (Allen, 1997).

It has been noted in both the Australian and overseas literature that female doctors tend to work shorter hours and have a preference for working shorter hours primarily due to family commitments (AMWAC, 1998; Firth-Cozens et al. 1999).

BEST PRACTICE ROSTERING: TRAINING AND RESOURCE KIT

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Measuring the performance of your rosters

Learning Outcome: On completion of this section the participant will be able to measure the performance of rosters in minimising fatigue.

Assessment criteria:

- Understand the AMA risk assessment model
- Be able to prepare a brief report on the performance of rosters in meeting fatigue management principles

Resources:

- Trainee notes
- Supporting material: sample performance measures

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Trainee notes: Measuring the performance of your rosters

Hospitals operate within quality assurance frameworks in which measurement and review of performance against operating standards is required on a regular basis. The performance of the roster should also be subject to measurement and review. There are a number of performance standards that could apply to rosters (e.g. cost, skill mix) but from a fatigue management point of view the following aspects could be considered:

- **Management of fatigue risk**: using the roster design principles the degree to which rosters over a period of time (e.g. quarterly) stay within these principles is a relevant measure of performance. This is a measure of the effectiveness of rostering in minimising fatigue risk.
- **Individual doctor ratings:** using the AMA risk rating system rosters could be examined to see if there are individual doctors who got into "red zones" in a sample period. Secondly, if that did occur did the roster adjust to allow recovery before the next shift.
- **Doctor satisfaction with the roster:** involvement in roster design by doctors may improve its stability and effectiveness. A periodic check of doctor satisfaction with the roster may be another relevant performance measure.
- **Amount of un-rostered overtime:** continual use of un-rostered overtime reflects both cost and potential fatigue issues. Better designed rosters should minimise un-rostered overtime and associated costs.

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8 Supporting materials : Measuring the performance of your rosters

Sample performance measures

% of time roster within design principles	This measure could be calculated by *Total hours within principles* _____ *Total hours in period* *x 100* Probably could be calculated on a quarterly basis.
Number of times individual doctors in high risk range on AMA rating	This measure could be calculated by using the AMA risk rating to see if any individuals were in the high risk range in a sample period.
Doctor satisfaction with roster	This measure could be calculated from responses to a simple survey with questions about suitability of the roster and the doctors' view about their levels of fatigue in the period.
% of un-rostered overtime	This measure could be calculated by *Number of hours un-rostered overtime* _____ *X 100* *Number of hours rostered in period* Probably could be calculated on a quarterly basis.