Scoping Review

The impact of fatigue in the healthcare setting

Citation	Garrubba M & Joseph C. 2019. The impact of fatigue in the healthcare setting: A scoping review. Centre for Clinical Effectiveness, Monash Health, Melbourne, Australia.

Executive Summary

Background

While long work hours remain a cultural norm in medicine, in comparable high-risk industries (eg, aviation), work patterns and work hours are tightly regulated [1]. The need for similar evidence-based policies in medicine has become a topic of increased interest. For physicians, it has been argued that there is a need to adapt healthcare systems and provide support in identifying the signs of fatigue and mitigating its risks [1].

Monash Health would like to work proactively to rectify any shortcomings in the way that workload and fatigue directly impact our clinical workforce (both junior and senior). A review of the best available evidence to inform best practice for managing fatigue and workloads in the clinical setting is required.

Objective

The objective of this Scoping Review was to identify the impact of fatigue in the healthcare setting.

Specifically our aims were to:

1. Define fatigue
2. Understand the causes and contributing factors of fatigue in the healthcare setting
3. Determine if fatigue can be measured
4. Understand the impact of fatigue for: staff, patient safety and healthcare services
5. Determine what the current effective practices are & what evaluated strategies exist to mitigate/improve risks associated with fatigue.

Identifying evidence

A search of Google and medical databases (Medline, CINAHL, Psych Info and All EBM) was undertaken using a combination of relevant search terms (Appendix 1) for peer reviewed and grey literature published from 2014 onwards.

Results

A total of 15 national and international grey literature and peer reviewed papers were included in this review. One key paper from 2012 was all included to provide relevant background information [2].

Defining Fatigue

Fatigue can be caused by a number of factors both work and non-work related and usually refers to impairment in task performance at an individual's normal capacity.

Causes and contributing factors of fatigue

Experiencing fatigue for a variety of reasons, the two major causes of fatigue for healthcare workers are disruption of circadian rhythm sleep and sleep deprivation and the literature provides a number of strategies to prevent and manage fatigue both in and outside of the workplace setting. Organisation responsibilities for mitigating fatigue are also stressed.

Measuring fatigue

Fatigue is a complex variable to operationalise and measure, however, there are a number of fatigue and sleep scales in existence.

Impact of fatigue

An increase in awareness that fatigue impairs performance is well documented and can impact health workers in both the short and long term. Increase error rates, slow reaction times, increase in the likelihood of accidents and injuries to staff and reduce motivation are all noted impacts of fatigue.

The impact of fatigue for health services shows that fatigue is a product of workload and a cause for burnout – thus ultimately affecting recruitment and retention of physicians both in community and acute care settings. Health services do have the capability to help prevent and mitigate fatigue for health care workers and successful strategies have shown improvements in better health and safety outcomes, fewer workplace incidents and injuries, reductions in absenteeism and staff turnover, and better performance and productivity.

The evidence for the impact of fatigue on patient safety is somewhat different with a recent systematic review concluding that despite the accumulation of literature into the negative impact of fatigue on medical errors and impact on patient care the evidence remains equivocal.

Effective interventions to mitigate/improve risks associated with fatigue

In order to prevent and mitigate fatigue related risks to staff, patients and the health service the literature describes Fatigue Risk Management Systems (FRMS) as a commonly used tool to monitor and manage safety risks associated with fatigue-related behaviour. The key components of FRMS include education and training on the effects of fatigue; strategies to increase alertness and mitigate fatigue; opportunities to identify and treat any medical conditions that may affect alertness or fatigue such as sleep disorders, scheduling policies, and general operational policies and practices; adverse event, medical error, and occupational injury investigation and data-driven programs and continuous improvement. Positional responsibilities within the FRMS are also outlined.

Minimal evidence was identified of where health organisations had changed practice to prevent and mitigate the impact of fatigue. Anecdotal evidence showed organisations revising work scheduling processes, staff education, and policies and procedures for personal conduct with regard to sleep deprivation.

Conclusion

Fatigue of healthcare workers is a known problem globally. Subsequently, there is evidence present that clearly defines what fatigue is and what the causes of fatigue are for healthcare workers. At present, there are a number of ways to measure fatigue although, it is complex to do. Despite the complexity, the presence of fatigue has a negative impact, both in the short and long term, on staff and potentially patients. Further, fatigue has a negative effect on service performance, retention and recruitment, and also can have a negative financial impact.

It is clear that an organisation-wide approach is required to have a successful fatigue risk management system. A system that involves education and training, policies and practices, shared responsibility, mitigation and improvement is essential. A system that both intervenes to prevent fatigue, but also one that is sophisticated enough to capture errors that are related to fatigue will also ensure that errors can be mitigated and practices can be improved.

Background

Work Safe Victoria have focused their attention on worker fatigue and workloads and are issuing improvement notices to employers who fail to address the issue. Under Victorian occupational health and safety legislation, employers are required to "take all reasonably practicable steps to protect workers from injury by providing a working environment and systems of work that are safe and without risks to health and safety." This includes ensuring that working hours, rostering and workloads are reasonable. Whenever health and safety issues are alleged or identified, WorkSafe may issue an improvement notice that charges the employer with responsibility to rectify the breach. Employers who fail to comply with the relevant legislation – the Occupational Health and Safety Act – may be prosecuted.

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Identifying evidence

Search strategy

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Inclusion criteria

Population	Health workers (nurses, midwives, doctors)
Concept	Fatigue and workload
Context	Healthcare setting only
Types of information	Peer reviewed literature, grey literature
Timeframe	2014 - current

Results

Definition of fatigue

Fatigue is a complex phenomenon that can be attributed to many factors and difficult to find a comprehensive definition [3]. Fatigue usually refers to impairment in task performance at an individual's normal capacity. A state of feeling tired, weary, or sleepy that results from prolonged mental and physical workload, extended periods of anxiety, exposure to harsh environment, or loss of sleep" [3]. Fatigue is a result of prolonged mental or physical exertion; it can affect people's performance and impair their mental alertness, which leads to dangerous errors [3-9].

Fatigue can be attributed to prior non-work related and work related physical and/or mental processing activities [4] and can be influenced by time of day and how long an individual has been awake [6].

Causes and contributing factors of fatigue in the healthcare setting

Evidence that medical resident fatigue can negatively impact cognitive functioning and performance, resulting in an increased risk of medical errors, has been accumulating for almost 40 years [1]. Healthcare workers experience fatigue for a variety of reasons, but the two major causes of fatigue are **disruption of circadian rhythm sleep and sleep deprivation** [8]. Occupational injuries are associated with long working hours and extreme fatigue [9].

Table 1 highlights that fatigue can be caused by work-related factors, factors outside work and/or a combination of both, and may accumulate over time [10-12].

Table 1. Factors for fatigue

Work-related factors		Factors outside of work
• Roster patterns • Length of shift • Poor work scheduling and planning • Length of time worked • Timing of shifts (e.g. night shift) proportionally increases the impact of fatigue • Insufficient recovery time between shifts	• Long periods of time awake • Harsh environmental conditions • Type of work being undertaken (e.g. under –demand/over-demand) • Mentally or physically demanding work • Inadequate rest breaks	• Poor quality of sleep • Sleep loss • Social life • Family needs • Other employment • Travel time • Sleep disorders

Measuring fatigue

Fatigue is a complex variable to operationalise and measure [13]. However, there are a number of fatigue and sleepiness scales in existence [3, 13]. Tools identified in the literature are listed in table 2.

Table 2. Fatigue and sleep scales and tools.

Sleep	Fatigue
• Karolinska Sleepiness Scale • Multiple Sleep Latency Tool • Sleep, Activity, Fatigue & Task Effectiveness for Aviation	• Fatigue Severity Scale of Sleep Disorders • AMA Fatigue Risk Assessment Tool (Risk assessment checklist) • Manual Fatigue Audit System • Fatigue Avoidance Scheduling Tool • Fatigue Questionnaire • Piper Fatigue Scale

Impact of fatigue

Staff

There is an increase in awareness that fatigue impairs performance, and studies have shown that 17 hours of sustained wakefulness is equivalent to a blood alcohol level of 0.05% and that after 24 hours, it is equivalent to 0.10% [8].

Regardless of fatigue, healthcare workers are required to maintain an astute level of alertness and vigilance to ensure that safe, quality healthcare is delivered [8].

Human factors, including fatigue, are the most frequently identified root cause of a sentinel event, and it is now recommended that fatigue be considered and evaluated as a contributing factor in the root-cause analysis process [8].

Fatigue has been shown to increase error rates, slow reaction times, increase the likelihood of accidents and injuries, cause micro-sleeps and reduce motivation [8-10, 12].

The effects of fatigue on health and work performance can be both short and long term. Short-term effects on an individual include impaired work performance, such as the reduced ability to [7, 8, 10, 12]:

- concentrate and avoid distraction
- think laterally and analytically
- make decisions
- remember and recall events and their sequences
- maintain vigilance

- control emotions
- appreciate complex situations
- recognise risks
- coordinate hand-eye movements
- communicate effectively

Long-term effects on health that are associated with shiftwork and chronic sleep loss may include [10, 12]:

- heart disease
- diabetes
- high blood pressure
- gastrointestinal disorders
- depression, and anxiety

Where do fatigue related errors occur?

The top five locations in which safety events occur (due to staff fatigue) are shown to be the medical-surgical unit, emergency department, pharmacy, general medical ward, and the laboratory [8].

Medication errors and errors related to a procedure, treatment, or test comprise the majority of all events that list healthcare worker fatigue as a contributing factor [8].

Patient safety

This review of evidence identified a high quality 2018 systematic review looking at the impact of fatigue and insufficient sleep on physician and patient outcomes [1]. It notes that despite the accumulation of literature into the negative impact of fatigue on medical errors and impact on patient care the evidence remains equivocal [1].

While the systematic review identified a diverse body of evidence, it could not draw definitive conclusions on the relationship between clinician fatigue and patient outcomes due to methodological weaknesses and heterogeneous outcome measures in the included studies [1]. The evidence for potential associations with performance and safety outcomes was mixed and meta-analyses for patient outcomes demonstrated that in many cases, potential relationships with physician sleep deprivation remain unclear. The systematic review suggests that further methodologically robust research that includes consistent outcomes that are of interest to physicians and their patients is needed to inform strong practice recommendations and policy decisions [1].

Healthcare Services

Preventing and reducing fatigue in the healthcare setting may lead to [7, 10]:

- better health and safety outcomes
- fewer workplace incidents and injuries
- reductions in absenteeism and staff turnover, and
- better performance and productivity.

Fatigue is a product of workload and a cause for burnout – thus ultimately affecting recruitment and retention of physicians both in community and acute care settings [1].

Collective actions at the organisational level that promote clinicians abilities to rest sufficiently after work and prevent them from becoming tired or exhausted is important for both job satisfaction and retention [9].

Cost

National Safety Council (2019), in collaboration with the Brigham and Women's Hospital Sleep Matters Initiative developed an online fatigue cost of sleep deficiency for individual businesses. This tool uses four data points – workforce size, industry, location, and shift scheduling practice to generate an estimated dollar cost that helps organisations to quantify the cost of fatigue and justify the implementation of a fatigue risk management system [11].

The monetary cost of fatigued workers in the workplace was not widely document in the identified evidence. Anecdotally it is known to cost organisations with one report estimating that fatigue in the workplace is costing more than $18 billion a year in the US [3].

Effective current practices & evaluated strategies to mitigate/improve risks associated with fatigue

Frameworks

The Fatigue Risk Management System (FRMS) is a commonly used system to monitor and manage safety risks associated with fatigue-related behaviour [7]. FRMS is defined as "a data driven and scientifically based process that allows for continuous monitoring and management of safety risks associated with fatigue-related error. It is part of a repeating performance improvement process. This process leads to continuous safety enhancements by identifying and addressing fatigue factors." [8] A successful fatigue risk management program will be system-based and will limit the potential for human errors and have the ability to catch errors before they reach patients [8]. As a result, fatigue interventions must be developed that include the ability to reduce fatigue as well as capture fatigue-related errors.

Well documented and referenced tools from Queensland Health [6] and Canada [5] describe the key principles for FRMS.

- There must be a shared approach between the employer and employees, with each party discharging their duty to address matters that fall within their responsibility and accountability.

- Every member of staff bears a responsibility to self, to their peers, and to those they provide care for, to manage their own fatigue.

- A sound risk management approach is needed where risks are identified, assessed, controlled and reviewed on a regular basis.

- The fatigue risk management system implemented shall recognise the complexity of services provided and acknowledge that increased fatigue levels may be unavoidable.

- A systematic approach to management of fatigue and fatigue related risk shall be incorporated into the core business operations and shall incorporate fundamental risk management principles.

- A just culture learning environment must be created that enables the reporting of fatigue-related incidents.

- The FRMS shall incorporate training that:

  o enhances employees' ability to recognise signs of fatigue in themselves and others, and actions that can be taken to manage their own fatigue

  o outlines the obligations of all parties to manage workplace fatigue

  o provides an awareness of this policy and the resources available to help meet the policy's purpose

  o The FRMS shall be integrated with existing work health and safety management systems to achieve consistency and to demonstrate compliance with legislated work health and safety requirements.

As well as key principals, characteristics and components of FRMS are documented and outlined in table 3.

Table 3. Characteristics and components of FRMS

Key characteristics of Fatigue Risk Management Systems [8]:	Key components of Fatigue Risk Management Systems [2, 8]:
- **Science-based** - supported by established peer-reviewed science. - **Data-driven** - decisions based on collection and objective analysis of data. - **Cooperative** - designed together by all stakeholders - **Fully implemented** - system-wide use of tools, systems, policies, procedures. - **Integrated** - built into the corporate safety and health management systems - **Continuously improved** - progressively reduces risk using feedback, evaluation, and modification - **Budgeted** - justified by an accurate return on investment business case - **Owned** - responsibility accepted by senior corporate leadership.	- Education and training on the effects of fatigue - Strategies to increase alertness and mitigate fatigue - Opportunities to identify and treat any medical conditions that may affect alertness or fatigue, such as sleep disorders - Scheduling policies, and general operational policies and practices - Adverse event, medical error, and occupational injury investigation - Data-driven programs and continuous improvement

Implementing Fatigue Risk Management Systems [11]

Implementing fatigue risk management frameworks requires integration of the program with current organisational safety systems.

As a first step, organisations should make an effort to understand what fatigue risks exist in their organisation. The following points have been suggested as steps to take when developing a risk management system [11].

Incremental components or comprehensive plan

While a comprehensive fatigue management program may be the best approach, especially for larger organisations, individual elements can be tested to start with. An initial element, perhaps smaller in scope, can be implemented and evaluated. Lessons learned can then be applied as the element is expanded upon and other activities are considered [11].

Form a fatigue committee

Designating an individual, or individuals, to lead fatigue management activities is critical for success. For larger organisations, a small committee can oversee activities, gather and evaluate feedback, and determine areas to focus efforts. Having representatives from across the organisation such as safety, operations, and health/wellness will ensure that different perspectives are included from all aspects of the organisation's operations [11].

Getting buy-in

It is important that the fatigue management process be transparent and that appropriate information is shared throughout the effort to obtain buy-in from all levels of the organisation. Providing open forums that allow employees to share how fatigue affects them is one way to get engagement from the outset [11].

Identifying fatigue risks

In addition to employee input, an audit or survey of supervisors and managers can help identify where fatigue risks exist and provide an indication of the magnitude. Such information can help prioritize what countermeasures or mitigation actions can be taken and where to focus efforts. For the initial activities, it is important to present some action in the near term so contributors will feel their input was and is incorporated. As a result, they are more likely to be engaged in the ongoing process and actions [11].

Positional responsibilities within fatigue risk management systems

In order to establish a proactive approach to the management of fatigue, the Queensland Health policy [6] outlines the positional responsibilities with fatigue risk management systems. These are outlined in table 4.

Table 4. Responsibilities within a FRMS

Positional responsibilities of fatigue risk management		
Position	**Responsibility**	**Audit criteria**
Director-General	• Provide leadership and stewardship for fatigue risk management in Queensland Health. • Encourage a just safety culture to manage fatigue-related risk. • Fatigue risk management is considered in strategic planning and executive decision making. • Support prioritising allocation of available resources to reduce very high and high risk fatigue to as low as reasonably practicable. (Delegated to Deputy Director-General, System Support Services Division). • Support the inclusion of fatigue risk management in performance monitoring criteria. • Advise government of barriers preventing the reduction of very high or high risks to an acceptable level. The Director-General is supported by the roles and positions below to ensure that fatigue related risk is managed through the implementation of a fatigue risk management system.	• Regularly review the FRMS.
Health Service Chief Executives/ Divisional Heads or	• Actively support the implementation of a FRMS. • Monitor compliance with the policy and effectiveness of the FRMS. • Encourage a just safety culture to manage fatigue related risk	• Fatigue risk factors are considered across all work areas • Control measures for very high and high risk

Positional responsibilities of fatigue risk management		
Position	**Responsibility**	**Audit criteria**

delegates	effectively.
	• Ensure high level risks are noted on the risk register in accordance with the overarching Risk Management Policy.
	• Maintain ownership of fatigue related risks and associated management strategies within their portfolio of responsibility.
	• Ensure the principles outlined in the Fatigue Risk Management HR Policy are implemented within their portfolio of responsibility for:
	  ○ management decision making
	  ○ performance reporting
	  ○ strategic and operational planning
	• Support the collection and monitoring of risk data and information.
	• Ensure a mechanism exists for review of, and acting on fatigue reports through a local fatigue working group or other nominated committee.
	• Prioritise allocation/realignment of available resources to reduce very high risk fatigue to as low as reasonably practicable.
	• Advise the Director-General of barriers preventing the reduction of very high of high risks to an acceptable level.
		situations are regularly monitored and reviewed to determine effectiveness
		• Fatigue related risk register is current
		• Fatigue risk mitigation strategies are effectively communicated.
		• Very high and high risks are identified in reports.

Line Manager/ Supervisor	• Ensure that fatigue related risks within their area of responsibility are managed, monitored, reviewed and communicated within established reporting structures • Ensure that all employees are aware of, and comply with the Fatigue Risk Management HR Policy. • Record fatigue related risks in the work area's work health and safety risk register. • Encourage a just safety culture to manage fatigue related risk effectively. • Provide appropriate resources to support effective management of fatigue related risks. • Advise executive management of barriers preventing the reduction of very high or high risks to an acceptable level. • Ensure training requirements are communicated and facilitate workers' access to training. • Provide advice and guidance on the management of fatigue related risks as required.	• Fatigue-related risks are recorded on the risk register and treatment actions recommended and progressed. • All very high and high risks are reported as soon as they are identified and treatment actions prioritised. • Fatigue-related incidents are reported and recorded in the approved incident management system. • Fatigue-related incidents are investigated and actions to prevent recurrence are implemented. • Training records are maintained.
Workers (including medical officers)	• Must present at work 'fit for duty'. • Must undertake fatigue risk management training stipulated in the FRMS policies, and associated documents. • Identify, report and respond to actual and potential risks associated with fatigue. • Declare any work undertaken outside of rostered hours at primary place of employment that is likely to increase risk of fatigue.	• Knows requirements for reporting potential fatigue risks. • Mandated fatigue risk management training completed. • Knows how to report fatigue related incidents.

Positional responsibilities of fatigue risk management		
Position	**Responsibility**	**Audit criteria**
	• Report fatigue related incidents including near misses via the appropriate incident reporting system.	

Executive Director, Patient Safety Unit	• Include fatigue as a contributing factor in clinical incident investigation and reviews.
	• Report and (where necessary) make recommendations to the relevant member of the HHS executive where fatigue has been found to be a contributing factor to a clinical incident.
	• Support the collection and monitoring of risk data and information within their area of responsibility.
	• Report to their local executive or senior management any fatigue related risks and their controls that:
	    o have the potential to impact on HHS or facility operations
	    o have been rated very high or high
	    o require legal advice or guidance
	    o are beyond the control or delegations of their position
		• Clinical incident reports consider fatigue as a contributing factor

Fatigue risk management officer (FRMO) / work health and safety practitioner or equivalent	• Ensures the FRMS is being implemented.
	• Assess and report to the local executive or senior management any work practices or other matters that:
	    o create fatigue risks that may impact adversely on worker or patient health and safety or create other organisational risks
	    o do not comply with the FRMS or this policy
	• Monitor fatigue related incidents and effectiveness of control strategies.
	• Ensures that training requirements are communicated, and facilitate training programs as required.
		• Implementation status of FRMS is monitored and reviewed.
		• Work practices are assessed for fatigue risks and these are reported to senior management.
		• Effectiveness of FRM control strategies are monitored and reviewed.
		• Training records are maintained.

Senior Director, Organisational Health (Department of Health)	• Establish a WHS monitoring program that includes compliance with this policy as a criterion. • Analyse and report on monitoring program results.	• WHS performance monitoring program/audits includes assessment of FRMS compliance
Executive Director, Payroll Services	• Provide line managers and executive with information on workers' (including medical officers) fatigue leave and hours worked.	• Rosters

Individual strategies

Research into healthcare worker fatigue has presented a range of fatigue interventions used to reduce fatigue, reduce or capture fatigue-related errors, and minimize the harm caused by fatigue related errors [8]. These interventions are presented in table 5. Previous work conducted with resident physicians suggested a range of areas for intervention and assessment for fatigue risk management, highlighting that these should be undertaken in a multidimensional approach across areas of self, program and system levels [13]. These suggestions include:

- **Self-specific approaches**: Adequate sleep and sleep hygiene practices, Exercise, Nutrition and hydration, Organisation, Personal checklists and reminders, Planning ahead, Social support networks, Time management and writing detailed notes [13].

- **Program level approaches**: Checking in with preceptors, context specific planning, FAQ documents for rotations, mentorship, orientations during each rotation, peer support from other residents in the program, program director as resident advocate, protected time for family and self-care, protected time for studying, resident control over scheduling and safe zones for breaks [13].
- **System level approaches**: Education for other healthcare providers on the role and work of residents, Collegial work environment with other healthcare providers, FAQ documents for rotations, Safe environment to disclose fatigue, Safe zones for breaks, Shift in culture, Stack calls to avoid frequent interruptions/bundle pages, Streamlining the patient handover process, Use of electronic systems for patient handover [13].

Table 5. Strategies to mitigate fatigue [8]

Intervention	Reduce fatigue	Reduce or capture fatigue-related errors	Minimise the harm caused by fatigue
Hours of service limits	x		
Scientific scheduling	x		
Napping strategies	x		
Training and education of staff	x	x	
Training and education for supervisors and planning staff	x	x	x
Excluded absences		x	
Medical treatment for sleep disorders	x		
Self-assessment		x	
Fatigue detection technology	x	x	
Work breaks	x	x	
Work environment		x	
Careful use of caffeine	x	x	
Fatigue proofing of task procedures		x	x
Task scheduling interventions		x	x
Progressive restrictions of work responsibilities		x	x

Case studies where organisations have changed practice

Reading Hospital [8]:

Reading Hospital in Pennsylvania is have revisited their scheduling process to reduce healthcare worker fatigue. A subcommittee was also formed to develop an evidence-based toolkit to educate and inform staff about fatigue and minimising fatigue.

Northwestern Memorial Hospital [14]:

A large urban academic medical center located in Chicago, Illinois developed an initiative to address worker fatigue within nursing strategic plan. Specifically, they made 3 changes; 1) They revised their rules around personal conduct with specific focus in their sleep policy: 2) They developed a take-a-break initiative and education: 3) Modification of staff scheduling guidelines: 4) Assessment of the impact of fatigue on employee injuries and patient incident reports: 5) The designation of quiet rooms: and 6) The creation of a transport kitty.

Austin Health and Monash Health [15]:

Staff at Austin and Monash Health joint with sleep researchers to create a staff rostering schedule for doctors that best mitigates fatigue, based on the latest sleep research. Intensive care doctors work no more than three consecutive night shifts, have a minimum of 11 hours' rest between rostered shifts and work no longer than 13 hours straight. Shift patterns that run against the 24-hour body clock are also restricted.

Conclusions

Fatigue of healthcare workers is a known problem globally. Subsequently, there is evidence present that clearly defines what fatigue is and what the causes of fatigue are for healthcare workers. At present, there are a number of ways to measure fatigue although, it is complex to do. Despite the complexity, the presence of fatigue has a negative impact, both in the short and long term, on staff and potentially patients. Further, fatigue has a negative effect on service performance, retention and recruitment, and also can have a negative financial impact.

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References

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Appendix 1

Search terms

Google search strings	Results
(Fatigue or workload) and (nurse or doctor or midwife or clinician or health)	84
fatigue risk management frameworks	154
management of fatigue	264
healthcare worker fatigue and patient safety	178
healthcare worker fatigue current strategies for prevention	158

Medical Database search terms	
1	fatigue.mp
2	exp Fatigue/
3	exp Workload/
4	1 or 2 or 3
5	exp Workplace/
6	work-related.mp.
7	5 or 6
8	(nurse or doctor or midwife).mp.
9	4 and 7 and 8
10	limit 9 to (english language and humans and yr="2014 -Current")