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ISCRR
Institute for Safety, Compensation and Recovery Research

Fatigue and burnout in healthcare

Prevalence, impact and interventions

An Evidence Review on physical, mental and emotional fatigue in healthcare and social assistance workers

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A joint initiative of WorkSafe VICTORIA and MONASH University

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Abbreviations

Abbreviation	Details
CBI	Copenhagen Burnout Inventory
CBT	Cognitive based therapy
CFST	Compassion Fatigue Self-Test
CI	Confidence Interval
COR	Conservation of Resources theory
ED	Emergency Department
FU	Follow up
HCSA	Health Care and Social Assistance (workforce)
ISCRR	Institute for Safety, Compensation and Recovery Research
MBI	Maslach's Burnout Inventory
MBSR	Mindfulness-Based Stress Reduction
NS	Not significant
OR	Odds Ratio
RCT	Randomised controlled trial
SMD	Standardised mean difference
STS	Secondary traumatic stress
WSV	WorkSafe Victoria

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Disclaimer

Please note: This Evidence Review has been produced by the Institute for Safety, Compensation and Recovery Research (ISCRR) in response to specific questions from WorkSafe Victoria. The content of this report does not involve an exhaustive analysis of all existing evidence in the relevant field, nor does it provide definitive answers to the issues it addresses. The review findings were current at the time of publication, August 2020. Significant new research evidence may become available at any time. ISCRR is a joint initiative of WorkSafe Victoria and Monash University. The opinions, findings and conclusions expressed in this publication are those of the authors and not necessarily those of WorkSafe Victoria or ISCRR.

1. EXECUTIVE SUMMARY

1.1 Introduction

Work-related fatigue has been identified as a health risk for workers in the healthcare and social assistance (HCSA) industry due to job demands and work schedules. WSV are currently reviewing and revising their existing guidance on fatigue risk management; and considering all types of fatigue (physical, mental, emotional fatigue) in line with current evidence.

1.2 Purpose and approach

ISCRR undertook an Evidence Review of the prevalence and impact of fatigue, the current guidelines, potential interventions and prevention strategies to address fatigue in the HCSA industry.

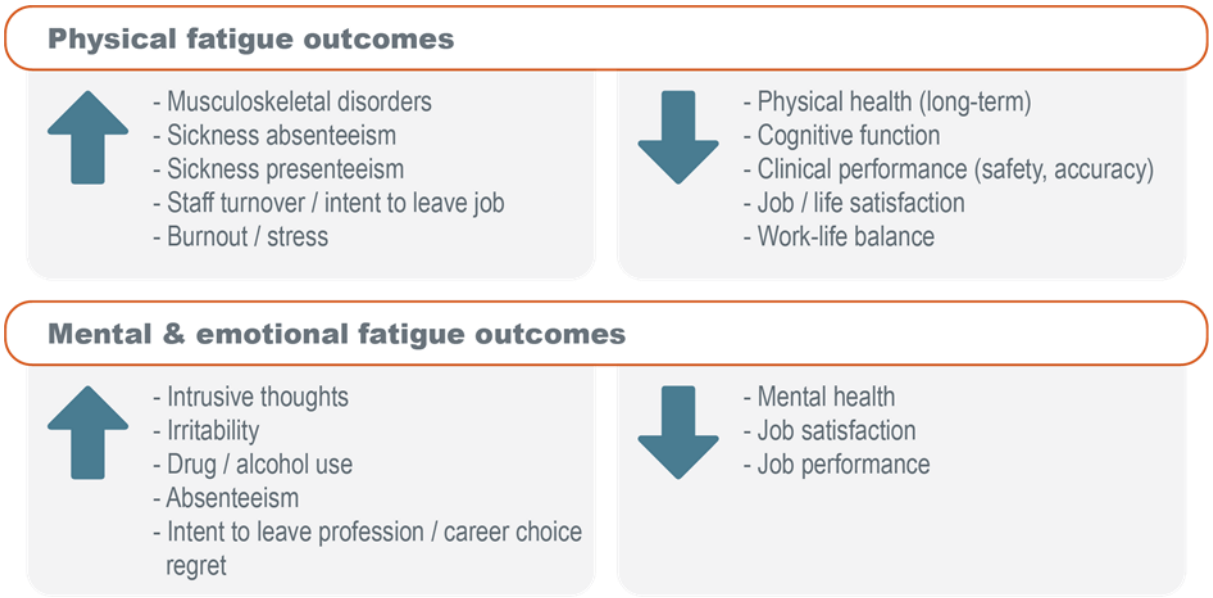
1.3 Findings

1.3.1 Prevalence of fatigue

Long hours and shift-work, which led to physical fatigue, was common practice across all HCSA areas, both in Australia and internationally. Task-specific fatigue was common in some specialties, such as muscular fatigue in laparoscopic surgeons and visual fatigue in radiologists. Mental and emotional fatigue, which was reported as compassion fatigue and burnout, was reported in 30-50 per cent of nurses and 20-40 per cent of physicians and specialists in Australia and overseas. Approximately 18-27 per cent of HCSA workers in aged care and palliative care experienced burnout.

1.3.2 Outcomes of fatigue for workers

Across all sectors of healthcare, physical, mental and emotional fatigue were associated with: musculoskeletal injury, sickness absenteeism/presenteeism, poor physical/mental health, job dissatisfaction, increased drug/alcohol use, staff turnover and intention to leave or change profession.



1.3.3 Impact of fatigue on patients

For nurses and emergency medical workers, long work hours (>40 hours/week) and insufficient recovery time between shifts (<10 hours) was associated with medication errors and near misses. Few empirical studies directly assessed the relationship between patient outcomes and

mental/emotional fatigue in surgeons and specialists in a rigorous manner. Therefore, the evidence was inconclusive for this occupational group.

1.3.4 Risk factors and protective factors

Work-related risk and protective factors: Workload, long hours, shift-work and inadequate rest between shifts were consistently identified as risk factors for physical fatigue and burnout across all healthcare professionals. Other risk factors for burnout included: lack of autonomy/control over the work environment; exposure to violence/aggression and critical incidents in emergency department and mental health nursing; bureaucratic job demands, risk of litigation and changing work environments amongst specialists.

Protective factors were generally the inverse of risk factors (e.g. restricting hours of work, adequate staffing levels). Additional protective factors included provision of support for workers, such as clinical supervision and mentoring.

Individual risk and protective factors: Demographics (e.g. age, gender, relationship status) were not significantly related to fatigue; and years of experience and/or level of education showed mixed results. While mental health (anxiety, depression) and substance use were frequently associated with fatigue, these may be both a cause and consequence of fatigue. Additional individual protective factors included: high levels of self-efficacy and resilience; a sense of humour; optimism; engaging in hobbies outside of work; social support; and valuing making a difference through work.

1.3.5 Interventions and prevention strategies

Organisational preventive strategies were more effective than individual-focus interventions. Sleep health education and fatigue awareness training had significant positive effects on the quality of workers' sleep and reduced levels of burnout in the short term. Scheduled napping also significantly reduced the level of sleepiness. Interventions involving modification of job tasks/work schedules to reduce the overall workload significantly reduced burnout in doctors. Interventions that consistently reduced burnout and compassion fatigue (in the short term) included: mindfulness, meditation and resilience training.

1.3.6 Practice guidelines

We identified 14 Australian and international guidelines/policies for managing fatigue in the workplace, although few specifically related to healthcare. Common themes of policies and guidelines were design of work schedules, education/information, facilities and services, and addressing workplace safety culture.

1.4 Summary and implications

There are some common stressors across all areas of the HCSA workforce that contribute to fatigue and burnout, particularly if sustained over time. These include staff shortages and high workloads, where staff output exceeds maximal workforce capacity.

In keeping with evidence from the published literature and recommendations in practice guidelines, we conclude that the optimal strategy to combat fatigue and burnout in HCSA workers is a multimodal upstream approach, with a strong emphasis on organisational-level preventive strategies. This includes appropriate modification of work schedules, provision of sufficient opportunities for rest between shifts, scheduled breaks during long work hours and adequate rest areas and facilities in the workplace. Alongside the organisational strategies, access to interventions that enhance the workers' ability to cope with fatigue (e.g. relaxation courses, resilience/coping training) may provide additional benefit.

2. INTRODUCTION

Work-related fatigue has been identified as a health risk for workers in the healthcare and social assistance (HCSA) industry due to job demands and work schedules. Fatigue is both an outcome of several risk factors (e.g. workload, shift work) and a predictor of physical and psychological injury in HCSA workers.

In 2019, findings from the Large Employer Assessment Process (LEAP) intervention with Barwon Health indicated that fatigue was a significant, and poorly controlled risk. Moreover, knowledge about fatigue risk management in the healthcare industry was generally poor and inconsistent.

WorkSafe Victoria (WSV) are currently revising their existing guidance on fatigue risk management to adopt a more comprehensive approach that incorporates physical, mental and emotional fatigue in line with current evidence.[1]

The Institute for Safety, Compensation and Recovery Research (ISCRR) has undertaken a review of the evidence on the prevalence and impact of fatigue; the current guidelines on fatigue; and the potential interventions and prevention strategies to address fatigue in the HCSA industry.

2.1 Definitions and measures of fatigue

For the purposes of this report, we have used the definitions of mental, emotional and physical fatigue described by Frone and Tidwell (2015):[1]

- ***Physical work fatigue*** is extreme physical tiredness and reduced capacity to engage in physical activity that is experienced during and at the end of the workday
- ***Mental fatigue*** is extreme mental tiredness and reduced capacity to engage in cognitive activity that is experienced during and at the end of the workday
- ***Emotional fatigue*** is extreme emotional tiredness and reduced capacity to engage in emotional activity that is experienced during and at the end of the workday.

2.1.1 Measures of physical fatigue

Physical fatigue is a broad concept incorporating numerous sub-components that are often occupation-specific, such as visual fatigue in radiographers or muscular fatigue in surgeons. Patterson et al.[2] described fatigue as "a subjective, unpleasant physical and cognitive state, with feelings of tiredness and exhaustion, all contributing to an unrelenting overall condition that impacts the ability to function safely and efficiently".

Physical fatigue is an outcome resulting from work-related factors (e.g. strenuous physical activity, long shifts) or personal factors (e.g. lack of sleep). It contributes to outcomes, such as absenteeism or medical errors. Physical fatigue is often used interchangeably with sleepiness and exhaustion, and interacts with emotional and mental fatigue, including burnout (see below). Therefore, the manner in which physical fatigue is represented and defined in the literature depends on what is being researched, in which occupation, and whether it is being examined as an outcome itself or as a factor contributing to outcomes. There is very little reference to the term physical fatigue in the literature, with most studies broadly referring to fatigue.

There is no gold standard survey instrument to measure physical fatigue.[2] The predominant subjective measures of fatigue are self-reported – some measure global fatigue, and others focus on a sub-component of fatigue, such as visual or musculoskeletal fatigue. Standardised fatigue measures include: the Brief Fatigue Inventory; Fatigue Severity Scale; Epworth Sleepiness Scale; Stanford Sleepiness Scale; Pittsburgh Sleep Quality Index;[3] and Swedish Occupational Fatigue

Inventory.[4] Fatigue is also represented by a single question (e.g. 'feeling tired' on a 7-point scale);[5] or fatigue is inferred from arbitrary sleep deprivation states as 'rested' or 'unrested'.[6] Different measures also focus on different time frames (e.g. real-time fatigue, past 7 days, past month and chronic fatigue).

Occurring less frequently in the literature, objective assessment of physical fatigue involves indicators of human physiology or indicators of performance, including measuring psychomotor performance, such as the psychomotor vigilance task, which is the gold standard for measuring reaction speed on simulators;[3, 7] or measuring success rate in performing a particular surgical procedure (e.g. retrospective review of medical records).[7]

2.1.2 Measures of mental and emotional fatigue

Mental and emotional fatigue are symptoms that have been characterised in several syndromes, including burnout, compassion fatigue, secondary traumatic stress, vicarious trauma and post-traumatic stress disorder. These terms share conceptual similarities, with common characteristics and overlapping definitions (see Table 14, Appendix 1 for details). There is little consensus on the definitions of these terms in the published literature; and an academic discourse on definitions is beyond the scope of this review.

Mental and emotional fatigue are also common dimensions used in a variety of different instruments to assess burnout, secondary traumatic stress and compassion fatigue in research. Maslach's Burnout Inventory (MBI) is the most widely used tool for assessing burnout across three dimensions: emotional exhaustion; depersonalisation; and personal accomplishment. Table 1 shows the most commonly used MBI cut-off scores for low, medium and high levels of burnout. However, while MBI is considered the 'gold standard' validated measure for burnout, there is substantial variability in scoring (different cut-off points) and interpretation.[8] This leads to markedly different prevalence rates in the literature and hampers efforts to obtain an accurate estimate of the prevalence of fatigue in particular occupational groups.

Table 1. Burnout risk according to Maslach's Burnout Inventory (MBI)

Burnout	**Burnout risk**		
Dimension	**Low**	**Medium**	**High**
Emotional exhaustion: 9 items *Measures feelings of being emotionally overstretched and exhausted by work demands*	≤16	17-26	≥27
Depersonalisation: 5 items *Measures lack of empathy towards patients*	≤6	7-12	≥13
Personal achievement: 8 items *Measures feelings of competence and sense of achievement in work*	≥39	38-32	≤31

Source: Cited in Guerra et al. (2019)[9]

Other measures of burnout include: Copenhagen Burnout Inventory (CBI); Oldenburg Burnout Inventory (OBI); Pines Burnout Measure; Organisational Social Context Scale; and the Hamburg Burnout Inventory. Each takes a different perspective on the factors that contribute to burnout.

3. AIMS AND METHODS

This Evidence Review aimed to examine the evidence related to the prevalence, outcomes and impacts of physical, emotional and mental fatigue in HCSA workers. The review also aimed to identify interventions and prevention strategies to mitigate the risk of fatigue in HCSA workers.

3.1 Research questions

1. What is the prevalence of fatigue (physical, emotional, mental) in the Australian HCSA industry?
2. What are the outcomes of fatigue (physical, emotional, mental) on HCSA workers?
3. What impact does HCSA worker fatigue have on patient safety?
4. What treatments, preventative actions, and practice guidelines exist to address the risk of fatigue in the HCSA industry?

3.2 Methods

A synthesis of evidence from systematic reviews pertaining to fatigue and burnout in the HCSA industry was undertaken in April-July 2020. The synthesis was based on relevant systematic reviews and meta-analyses. A desktop scan was conducted to identify existing fatigue risk management guidelines for the HCSA industry in Australia and internationally. The grey literature search was performed in the search engine Google Advanced using search terms such as fatigue, burnout, healthcare, aged care, policy, and guideline.

3.2.1 Literature search

Four databases were searched (EMBASE, CINAHL, PubMed, Cochrane library) to identify relevant systematic literature reviews or meta-analyses that were published in English, in the peer-reviewed academic literature between January 2010 and June 2020. Primary studies, case studies, and opinion pieces were excluded. An additional seven systematic reviews were identified through reference list searching.

Given that the systematic reviews lacked specific data on the prevalence rates for fatigue in the Australian healthcare workforce, we supplemented searches with an additional targeted search of Scopus and Google Scholar to identify relevant Australian studies.

Search terms

The following search terms were combined with a limited focus on systematic reviews/meta-analyses, and searches through key words, titles, and abstracts, including search term variations:

> **Line 1**: nurse OR nursing OR (medical staff) OR (allied health) OR doctor OR physician OR clinician OR psychologist OR psychiatrist OR (social worker) OR physiotherapist OR (aged care) OR (disability support) OR (personal care) OR (community support) OR (care giver) OR carer
>
> AND
>
> **Line 2**: fatigue OR exhaustion OR tired OR (sleep deprivation) OR insomnia
>
> AND
>
> **Line 3**: depression OR anxiety OR distress OR burnout OR (medication errors) OR (near miss) OR injury OR headaches OR safety OR (patient safety) OR (decision making) OR (risk management)

The targeted search for Australian data included combinations of the following terms: Prevalence AND (nursing OR physician* OR doctor* OR clinician* OR specialist* OR healthcare provider* OR aged care OR disability) AND (fatigue OR burnout) AND Australia.

Population

Systematic reviews were included for review if they focused on workers who provided paid professional services. This included medical and allied health professionals (e.g. nurses, doctors) or support workers (e.g. community, disability or aged care support workers). Systematic reviews that focused on family carers, students, trainees, interns, and registrars were excluded.

Intervention

Any interventions and preventive strategies that aimed to minimise the impacts of fatigue and burnout in the workplace.

Outcomes

Fatigue and burnout were conceptualised as both outcomes (e.g. as a result of work pressure) and as factors contributing to outcomes (e.g. staff turnover, medical errors). Primary outcomes of interest were fatigue (physical, mental, emotional), mental health outcomes, compassion fatigue, burnout, psychological distress, and impacts on patient safety outcomes. Additional work-related outcomes of interest were sick leave, engagement, staff turnover and job satisfaction.

We excluded articles focusing on chronic fatigue syndrome and sleep disorders (e.g. sleep apnoea, insomnia).

Search process

The search process is summarised in Figure 1.

The scientific quality of included systematic reviews was assessed using the Health Evidence Quality Assessment Tool.[10] The quality ratings were completed by reviewers independently with a sub-section cross-checked by a second reviewer for accuracy.

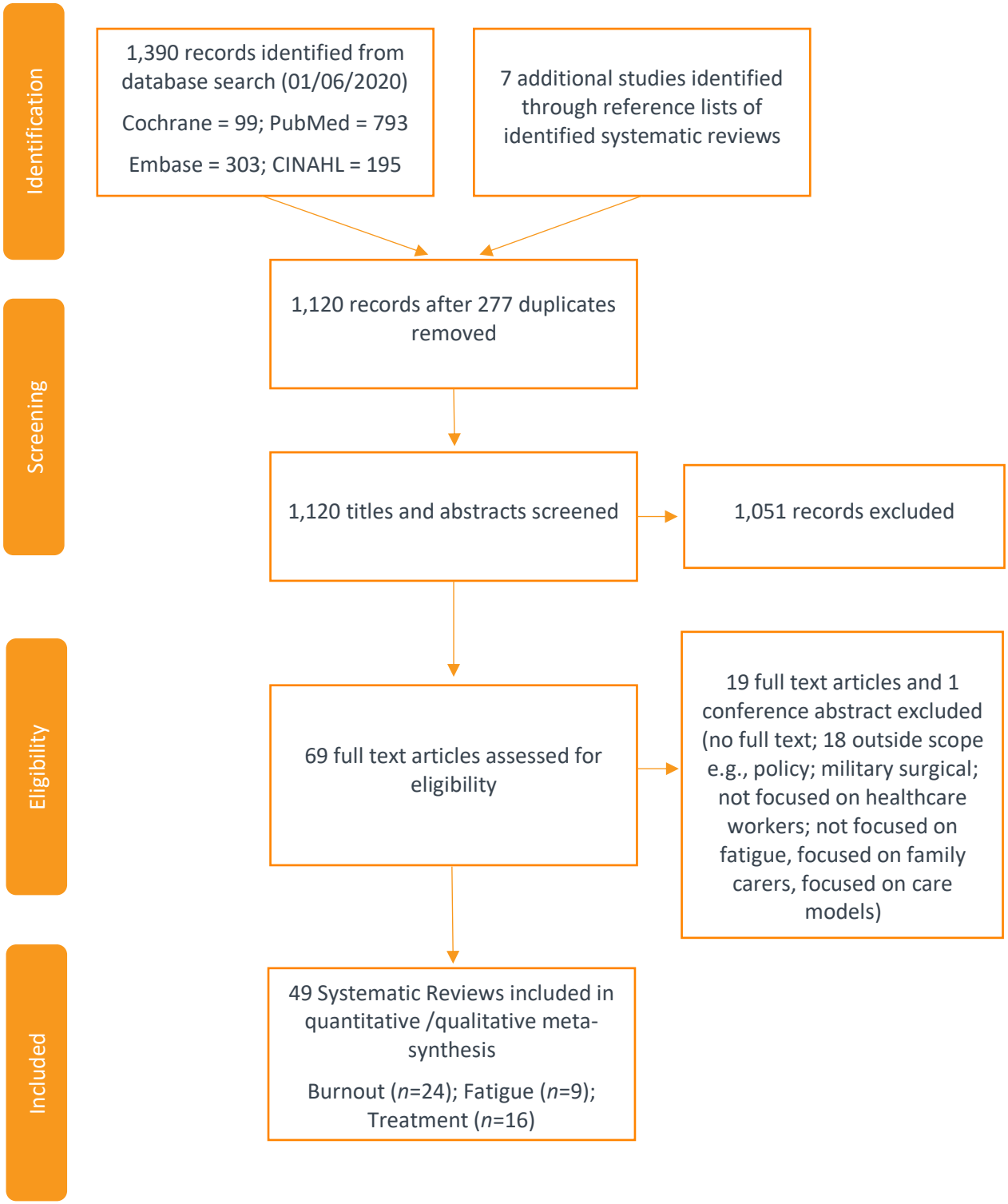


Figure 1. PRISMA diagram showing search process for identifying studies related to fatigue in healthcare and social assistance workers

4. WHAT IS THE PREVALENCE OF FATIGUE?

Key points

Physical fatigue

- Prevalence data on physical fatigue *per se* were rarely provided in the literature; but mainly discussed in terms of long work hours/shifts and inadequate sleep.
- In Australia, one-third of nurses/midwives worked >40 hours/week, with up to 8% working >50 hours/week; and more than half of doctors worked long hours, with up to 10% working average 78 hours/week. Similar data were reported in international studies.
- Task-related muscular fatigue was reported in laparoscopic surgeons (74%); and visual fatigue in radiologists (35%).

Mental and emotional fatigue

- Mental and emotional fatigue was reported as compassion fatigue and burnout (comprising high emotional exhaustion and depersonalisation; and low personal achievement).
- Overall, Australian nurses/midwives experienced medium levels of mental and emotional fatigue across all specialty areas; up to 20% reported high levels of burnout. Similar prevalence rates were reported in international studies.
- Up to one-third of Australian doctors reported high emotional exhaustion; high depersonalisation (10%); and low personal achievement (4%). This was consistent with international prevalence data.
- In aged care and palliative settings, the prevalence of burnout was 18% in nurses; 15% in physicians; and 27% in social workers.

The prevalence of physical, mental and emotional fatigue in HCSA workers was reported in 33 systematic reviews, which were generally moderate-strong in quality: 17 (52%) were rated strong; 12 (36%) were rated moderate; and four (12%) were rated weak. All of the systematic reviews contained studies from across the world. Evidence on Australian prevalence data, which was not reported separately in the systematic reviews, was extracted from 14 Australian cross-sectional surveys and one report published by the Australian Medical Association (AMA).[11] There was considerable heterogeneity across studies and variability in measures, which led to wide ranges in estimates for some occupational groups. In addition, since cross-sectional surveys are prone to the biases inherent in self-report, estimates of prevalence may not fully represent all the occupational groups of interest.

This chapter summarises the available evidence on the prevalence of physical fatigue (Section 4.1) and mental and emotional fatigue (Section 4.2).

The key characteristics of the systematic reviews that addressed physical fatigue in healthcare workers; and mental and emotional fatigue are provided in Table 15 and Table 16, respectively (Appendix 2).

Additional evidence on vicarious trauma and cumulative trauma, which are related to mental and emotional fatigue, is available in two previous Evidence Reviews undertaken by ISCRR.[12, 13]

4.1 Prevalence of physical fatigue

The nine systematic reviews and two additional Australian articles on physical fatigue were limited to the health and medical sector, with none identified that focussed on community services, aged care or the disability sectors. With the exception of visual fatigue in radiologists[4] and muscle fatigue in laparoscopic surgeons,[14] data on the prevalence of physical fatigue *per se* (e.g. muscle fatigue, 'time-on-task' fatigue) were not provided in the literature reviewed. Instead, physical fatigue was discussed as a function of long work hours, shift-work or inadequate sleep.

4.1.1 Physical fatigue in nursing

Physical fatigue was assessed in a large cross-sectional survey of 4,419 Australian and New Zealand nurses and midwives.[15] Approximately one-third of nurses and midwives reported working 40-49 hours per week; 7.5 per cent worked more than 50 hours per week; and 14 per cent stated that they engaged in harmful daily drinking. These working patterns were consistent with international data from the systematic reviews. Long work hours was reported to be common practice in nursing, with 53 per cent of respondents to the 2008 US National Sample Survey of Registered Nurses indicating that they routinely worked more than 39 hours per week;[16] and that nurses working longer shifts or overtime experienced fatigue and poor quality of sleep.

Night shift nurses were more likely to be more fatigued compared with those working day shifts. For example, one study in Di Muzio et al.[3] reported that only 6.3 per cent of night shift nurses experienced at least four hours of restorative sleep (per 24 hours) compared with 92 per cent of day/evening shift nurses; and a cross-sectional study of 289 full-time night shift nurses reported that more than half of the sample reported being sleep deprived; and more than 75 per cent of the nurses slept 4.7 hours or less (per 24 hours) over a 7-month period.[3]

4.1.2 Physical fatigue in physicians, clinicians and specialists

Physical fatigue in 716 Australian doctors was assessed in a report by the Australian Medical Association.[11] More than half (53%) of doctors reported that they worked hours that put them at significant risk of fatigue; and ten per cent of these worked an average of 78 hours per week. The disciplines that were most at risk of fatigue were: intensivists (75%); surgeons (73%); obstetricians and gynaecologists (58%); and physicians (54%).

International prevalence data from systematic reviews reported similar patterns of long work hours and risk of physical fatigue. Physicians and specialists routinely worked long/non-standard hours (e.g. shifts);[6] and 40 per cent of practicing physicians in the US reported working more than 80 hours per week.[5]

Different types of physical fatigue were associated with different specialties. For example, 22 to 74 per cent of laparoscopic surgeons experienced musculoskeletal complaints resulting from use of laparoscopic equipment.[14] Pain and discomfort was related mainly to the neck (53%), back (51%), shoulders (51%) and hands (33%). Those using robotic equipment for surgery also reported discomfort in the neck and hand/wrist region, including thumbs and fingers, but to a lesser extent than laparoscopic surgeons.

Visual fatigue was commonly reported in radiology. Approximately 35 per cent of radiologists reported eyestrain; and the prevalence of eyestrain increased with higher numbers of images read, or when work time exceeded six hours.[4] Higher levels of visual fatigue were also reported amongst radiology residents compared with attending radiologists; although the reasons for this were not clear.

Fatigue affected more than half of emergency services medical personnel and reports of personnel falling asleep while performing critical duties (e.g. driving) had reportedly increased.[7]

4.2 Prevalence of mental and emotional fatigue

Mental fatigue, which includes cognitive fatigue due to intense concentration or prolonged time spent on a task, is presented together with emotional fatigue in this section as data were not reported separately in the literature, but rather as dimensions of burnout and compassion fatigue.

Twenty-four systematic reviews assessed the prevalence of mental and emotional fatigue, including burnout and compassion fatigue. Only one review measured burnout as a predictor of patient outcomes;[17] and one review examined burnout as a predictor of staff turnover.[18] The quality of systematic reviews paralleled those for physical fatigue - mostly moderate-strong.

Data on mental and emotional fatigue in Australian HCSA workers were reported as burnout or compassion fatigue in 13 cross-sectional surveys, including: six on nurses and midwives;[19-24] five on doctors and specialists;[25-29] and two on any HCSA workers in mental health[30] and cancer care.[31]

The key findings from these studies are summarised in the following tables:

- Burnout in Australian nurses and midwives (8 cross-sectional surveys, Table 2)
- Burnout amongst nurses, by specialty area (9 systematic reviews, Table 3)
- Burnout in Australian doctors and specialists (5 cross-sectional surveys, Table 4)
- Burnout in clinicians, physicians and specialists (12 systematic reviews, Table 5)
- Burnout in healthcare workers in aged care and palliative care settings (3 systematic reviews, Table 6).

4.2.1 Prevalence of mental and emotional fatigue in nurses

Prevalence of mental and emotional fatigue in Australian HCSA workers

Table 2 provides details on six cross-sectional surveys that reported on prevalence of burnout and compassion fatigue in Australian nurses and midwives;[19-24] and two studies that provided data on a range of HCSA workers in specific specialty areas of cancer treatment[31] and mental health.[30]

Levels of burnout, compassion fatigue and secondary traumatic stress were reported to be at an average level for most nurses and midwives, irrespective of their specialty area. For example, 76.7 per cent of ED nurses reported average levels of burnout and none reported high levels.[21] According to the Copenhagen Burnout Inventory, nurses and midwives reported work-related (43-51%), client-related (11-24%) and personal burnout (47-65%).[22-24] Overall, burnout scores were in the medium range across the HCSA workers – not in crisis, but not ideal.

Table 2. Prevalence of mental and emotional fatigue in Australian nurses and midwives

Area of specialty (Reference)	Key findings
132 nurses (Hegney 2014)[19]	Compassion fatigue: • Potential risk: 20% • At risk: 12.4% • Very distressed: 7.6% Burnout (MBI): High level 20.6%
86 emergency department nurses (O'Callaghan 2020)[21]	Survey response rate: 37% Burnout: Mean 26.6±5.4 (range 16-40) • 76.7% average level; 0% high level Secondary traumatic stress: Mean 24.6±4.5 (range 12-37) • 68.6% average level; 0% high level Compassion satisfaction: Mean 38.3±5 (range 23-47) • 73.3% average level; 26.7% high level
98 nurses in critical care units (Jakimowicz 2018)[20]	Survey response rate: 58.5% Compassion satisfaction: Mean 35.5±6 Burnout: Mean 25.5±5.3 Secondary traumatic stress: Mean 21.4±4.6 Burnout scores were higher in younger/less experienced nurses
1027 nurses/midwives (Creedy 2017)[22]	Burnout (CBI): • 64.9% personal burnout • 43.8% work-related burnout • 10.4% client-related burnout
58 midwives (Jordan 2013)[23]	Survey response rate: 53% (CBI) Burnout: • 52% personal burnout • 50.9% work-related burnout • 23.9% client-related burnout
148 midwives (Newton 2014)[24]	Burnout: (CBI) • 47.2% personal burnout • 43% work-related burnout • 17.4% client-related burnout
Various healthcare providers in specific settings	
579 cancer workers (nurses, radiation, allied health, administration, research, physicians) (Poulsen 2011)[31]	Survey response rate: 57% (OBI) Total burnout = 31.1%
277 mental health personnel, in-patient and community services (nursing ~50%, medical, occupational therapy, psychology and social work) (Scanlan 2019)[30]	Survey response rate: 25.2% (OBI) Disengagement: Mean 2.24 (scale 1-4) Exhaustion: Mean 2.38 (scale 1-4)

Notes: CBI = Copenhagen Burnout Inventory; MBI = Maslach's Burnout Inventory; OBI = Oldenberg Burnout Inventory

Prevalence of mental and emotional fatigue - international

Generally, data from international studies were consistent with the Australian prevalence data (Table 3).

Ten systematic reviews assessed the prevalence of mental and emotional fatigue (i.e. burnout, secondary traumatic stress or compassion fatigue) in nurses working in a variety of specialty areas. Nurses work in an environment where a series of stressful events is a routine part of their working day. Three reviews included nurses working in emergency departments (ED) where they were commonly exposed directly to threats of violence as well as indirectly to the trauma and suffering of others.[18, 32, 33] Beck et al. reported that one third of ED nurses experienced compassion fatigue;[32] and in a meta-analysis of eight studies on burnout in ED nurses, Li et al.[33] estimated that 27 per cent reported emotional exhaustion and ten per cent reported depersonalisation (see Table 1 for burnout dimensions). .

Table 3 summarises the key findings on the prevalence of mental and emotional fatigue across different nursing specialties.

Although different scales were used to measure the components of compassion fatigue and burnout across studies, there were similarities in the prevalence of emotional and mental fatigue in nurses across different hospital units and specialty areas. One third of obstetrics and gynaecology nurses experienced at least two dimensions of burnout.[34] Up to one-third of nurses in mental health, primary care, paediatrics and other areas of the hospital consistently reported high levels of emotional exhaustion (25-33%) and depersonalisation (10-21%).[35-38] Similarly, low levels of personal achievement across the nursing sector were reported by at least 22 per cent (mental health nursing) and up to 44 per cent of nurses (obstetrics/gynaecology).

A meta-analysis of 21 studies showed that over half of nurses across all specialties experienced burnout or compassion fatigue.[39] However, the prevalence rates varied in different areas of nursing. A sub-analysis showed that burnout and compassion fatigue were significantly higher in nurses working in non-paediatric areas (59% and 60%, respectively) compared with paediatric nurses (39% and 27%, respectively).

Midwives who were older and more experienced or worked in outpatients (vs inpatients) reported higher levels of burnout.[40] However, newly qualified midwives also had high levels of burnout, and Welford et al.[40] suggested that this may be related to their lack of autonomy in decision-making.

Table 3. Key findings on prevalence of mental and emotional fatigue in nurses, by specialty area

Area of specialty (Reference) Country	Key findings
Nurses – all specialties (Beck 2011)[32] US	Sexual assault nurses (N=110): • 25% met criteria for secondary traumatic stress (≥2 on CFST) ED nurses (N=67): • 33% met criteria for secondary traumatic stress (≥38 on STS scale) • Intrusive thoughts; avoiding patients; sleep problems (>50%) Oncology nurses (N=43): • 38% met criteria for secondary traumatic stress (STS scale) • Sleep problems; intrusive thoughts Hospice nurses (N=216): • 26.4% high risk; 52.3% moderate risk (CFST)

Area of specialty (Reference) Country	Key findings
	Critical care units (N=185 healthcare workers): • ↑compassion fatigue related to ↑personal stress Children's hospital (N=314 healthcare workers): • 39% met criteria for moderate-extremely high risk of compassion fatigue (CFST)
Nurses – all specialities (Zhang 2018)[39] China	All nursing: • Burnout: 52.0% [95% CI 41.7, 62.2] • Compassion fatigue: 52.6% [95% CI 59.7, 65.4] • Compassion satisfaction: 47.6% [95% CI 34.3, 60.8] Paediatric vs non-paediatric nursing: • Burnout: 38.7% [95% CI 27.7, 49.5] vs 58.6% [95% CI 41.9, 75.4] • Compassion fatigue: 27.0% [95% CI 26.5, 27.4] vs 60.0% [95% CI 46.0, 73.8]
Medical nurses (Molina-Praena 2018)[36] Spain	Burnout (MBI) • High emotional exhaustion: 31% (similar to other studies with emergency nurses) • High depersonalisation: 24% (lower than emergency nurses) • Low personal achievement: 38%
ED nurses (Li 2018)[33] China	Burnout (MBI): • High emotional exhaustion: 40.5% • High depersonalisation: 44.3% • Low personal achievement: 42.7% Meta-analysis of 8 studies (N=1,609) pooled mean estimate: • High emotional exhaustion 25.6% [95% CI 22.2, 28.9%] • High depersonalisation 10.4% [95% CI 9.3, 11.5%] • Low personal achievement 30.7% [95% CI 24.9, 36.4%]
ED nurses (McDermid 2019)[18] Australia	Factors that contribute to high turnover rates in EDs: three major themes: aggression and violence, critical incidents, and work environment Multiple challenges faced by nurses working in EDs. These challenges may result in high levels of occupational stress, burnout, compassion fatigue, and posttraumatic stress disorder or secondary traumatic stress, which further contribute to attrition rates
Mental health nurses (Lopez-Lopez 2019)[35] Spain	Burnout • High emotional exhaustion ranged from 4.7% to 55.9% • High depersonalisation ranged from 7.5% to 44.7% • Low personal achievement ranged from 18.6% to 62.7% The meta-analytic prevalence estimation (n=868): • High emotional exhaustion 25% [95% CI 17, 35%] • High depersonalisation 15% [95% CI 9, 20%] • Low personal achievement 22% [95% CI 20, 43%]

Area of specialty (Reference) Country	Key findings
Primary care nurses (Monsalve-Reyes 2018)[37] Spain	Burnout (MBI) • High emotional exhaustion: 28% [95% CI 22, 34%] • High depersonalisation: 15% [95% CI 9, 23%] • Low personal achievement: 31% [95% CI 6, 66%]
Nurses in Obstetrics/ Gynaecology (De la Fuente-Solana) [34] Spain	Burnout: • High emotional exhaustion 29% [95% CI 11, 52%] • High depersonalisation 19% [95% CI 6, 38%] • Low personal achievement 44% [95% CI 18, 71%] At least 2 dimensions of burnout in 33% Psychological stress: high levels of stress/anxiety; but low levels of depression reported
Midwives (Welford 2018)[40] UK	Burnout (CBI) Area of work and hours worked: • Outpatients – 4 times more personal burnout • More full-time/working shifts: NS overall Newly qualified midwives: less autonomy and higher burnout
Paediatric nurses (Pradas-Hernandez 2018)[38] Spain	Burnout (MBI) • High emotional exhaustion: 31% [95% CI 25, 37%] • High depersonalisation: 21% [95% CI 11, 33%] • Low personal achievement: 39% [95% CI 28, 50%]

Notes: CBI = Copenhagen burnout inventory; CFST = Compassion fatigue self-test; CI = confidence intervals; ED = emergency department; MBI = Maslach's Burnout Inventory; NS = not significant; STS = secondary traumatic stress

4.2.2 Prevalence of mental and emotional fatigue in physicians and specialists

Prevalence of mental and emotional fatigue in Australian physicians and specialists

Table 4 provides data from five cross-sectional surveys on mental and emotional fatigue in Australian doctors and specialists.[25-29]

Across specialties, up to one-third of specialists reported high levels of emotional exhaustion. High levels of depersonalisation (up to 10%) and low personal achievement (4%) were also reported.

Table 4. Prevalence of mental and emotional fatigue in Australian clinicians and specialists

Area of specialty (Reference)	Key findings
914 junior doctors (Sorenson 2016)[25]	Burnout: 69% met criteria Compassion fatigue: 54% met criteria Job dissatisfaction: 71%
92 general practitioners (Pit 2014)[27]	Survey response rate: 56% Burnout: (MBI) • High emotional exhaustion: 26% Medium to high burnout had higher odds of intending to retire
168 doctors doing after hours house calls (Ifediora 2016)[26]	Survey response rate: 56% Burnout: (MBI) • High emotional exhaustion: 19.8% • High depersonalisation: 6.1% • Low personal achievement: 4%
113 radiation therapists in cancer hospital (Diggens 2014)[29]	Survey response rate: 57.7% Burnout: 19% burnout (MBI) Job stress: 12%; Source of job stress: 54% workload; 42% inefficient teams; 41% machine breakdown; 41% time constraints; 36% problematic team relations; 35% angry patients
29 gynaecologic oncologists (Stafford 2010)[28]	Survey response rate: 78.4% Burnout: (MBI) • High emotional exhaustion: 35.7% • High depersonalisation: 10.7% • Low personal achievement: 3.7%

Notes: MBI = Maslach's Burnout Inventory

Prevalence of mental and emotional fatigue – international data

International data were extracted from ten systematic reviews that assessed the prevalence of burnout in clinicians, physicians and specialists (Table 5). Three reviews of surgeons or surgical residents[8, 41, 42] and one review comprising a variety of specialist areas[43] reported that up to half of the healthcare professionals experienced at least two dimensions of burnout.

Two reviews reported wide variance in the prevalence of burnout in mental health professionals. Emotional exhaustion was experienced by up to 40 per cent of all mental health professionals, including nurses, doctors, social workers, psychologists, occupational therapists and counsellors in one review;[44] and 22 per cent in another that included only psychiatrists.[45] High levels of depersonalisation were also inconsistent in both reviews (22% and 7.4%). Heterogeneity in the burnout measures, cut-off scores and interpretation of burnout makes it difficult to determine more accurate prevalence estimates.

In the area of oncology, two reviews[9, 46] estimated similar prevalence of the burnout dimensions: high emotional exhaustion (32-39%); high depersonalisation (22-24%); and low personal achievement (28-37%).

Table 5. Key findings on the prevalence of mental and emotional fatigue in clinicians, physicians and specialists, by area of specialty

Area of specialty (Reference) Country	Key Findings
Surgeons -various specialties (Bartholemew 2018)[8] US	Meta-analysis of data (standardised interpretation) Burnout: 3% [95% CI 2, 5%] • High emotional exhaustion: 30% [95% CI 25, 36%] • High depersonalisation: 34% [95% CI 25, 43%] • Low personal achievement: 34% [95% CI 18, 32%]
Orthopaedic surgeons (Hui 2019)[41] Hong Kong	Burnout: • High emotional exhaustion ranged from 16.2% to 50.7% • High depersonalisation ranged from 11.4% to 59.4% • Low personal achievement ranged from 4% to 43% Equivalent levels of burnout compared with other specialties
Specialists in Physical medicine; and Rehabilitation (Bateman 2019)[43] US	Burnout: 51.6% (range 48-62%) Increase prevalence (2012-2015) by 29% (1.5x higher vs all specialists) OR = 1.6 vs primary care physicians
Medical and surgical residents (Low 2019)[42] Singapore	Burnout: 51% [95% CI: 45, 57%] • NS difference in prevalence rates among 14 specialties, or regions (selected countries in Asia and Europe, and North America)
Radiation therapists - oncology (Guerra 2019)[9] Portugal	Burnout: • High emotional exhaustion: 38.7% [24.8, 54.6] • High depersonalisation: 21.5% [10.1, 40.2] • Low personal achievement: 28% [17.4, 41.6] Overall, medium-high risk of BO; but aligns with % in other healthcare professionals
Oncologists (Yates 2019)[46] UK	Burnout: • High emotional exhaustion: 32% • High depersonalisation: 24% • Low personal achievement: 37%
Physicians (Rotenstein 2018)[47] US	Burnout: 0-80.5% • High emotional exhaustion: 0% to 86.2% • High depersonalisation: 0% to 89.9% • Low personal achievement: 0% to 87.1%
Physicians (Williams 2019)[48] US	Burnout: associations between burnout and low wellbeing • High emotional exhaustion: 39 out of 44 (89%) associated with lower wellbeing • High depersonalisation: 24 out of 43 (56%) related to lower wellbeing • Low personal achievement: 22 out of 34 (65%) related to poorer wellbeing
Mental health professionals (O'Connor 2018)[44]	Burnout: • High emotional exhaustion: 40% [95% CI 31, 48%]

Area of specialty (Reference) Country	Key Findings
Ireland	• High depersonalisation: 22% [95% CI 15, 29%] • Low personal achievement: 19% [95% CI 13, 25%] Increasing age was found to be associated with an increased risk of depersonalisation but also a heightened sense of personal achievement
Psychiatrists (Rotstein 2019)[45] Australia	Burnout (pooled mean) • High emotional exhaustion: 22% [95% CI 19.7, 24.3%] • High depersonalisation: 7.4% [95% CI 5.9, 8.9%] • Low personal achievement: 30% [95% CI 24.7, 35.3%]

Notes: CI = confidence intervals; NS = not significant; OR = odds ratio

4.2.3 Prevalence of mental and emotional fatigue in aged care and palliative care workers

Apart from two studies that included a variety of Australian HCSA workers,[30, 31] no studies were identified that assessed the prevalence of mental and emotional fatigue in Australian aged care, palliative care or disability support workers.

Based on international studies, three systematic reviews examined burnout in the aged care and palliative care settings (Table 6). Overall, the prevalence of burnout in these settings was approximately 18 per cent amongst nurses; 15 per cent in physicians; and up to 27 per cent in social workers.[49] Low personal achievement was reported in 33-41 per cent of aged care and palliative care staff.

Table 6. Key findings on the prevalence of mental and emotional fatigue in healthcare workers in aged care and palliative care settings

Healthcare setting (Reference) Country	Key Findings
Nursing home healthcare aides (Cooper 2016)[50] Canada	Individual factors that may buffer burnout: • Optimism: NS effect on emotional exhaustion, depersonalisation; but ↑personal achievement • Positive appraisal of job: ↓ emotional exhaustion; ↑personal achievement • Values: ↓ emotional exhaustion; ↓depersonalisation; ↑personal achievement Organisational factors that may buffer burnout: • Low work strain: ↓ emotional exhaustion; ↓depersonalisation; ↑personal achievement • Availability of training: ↓ emotional exhaustion; ↓depersonalisation; ↑personal achievement • Work environment (pleasant tasks, emotional reward, value/meaning of work): ↓ emotional exhaustion; ↓depersonalisation Organisational risks that may precipitate burnout: • Workload: ↑ emotional exhaustion; ↑depersonalisation Individual factors (sociodemographic, personal life, education): inconsistent or NS

Healthcare setting (Reference) Country	Key Findings
Healthcare staff in long-term care facility with dementia patients (Costello 2019)[51] UK	From meta-analysis of 4 studies (N=598): • High emotional exhaustion: 22.1-68.6% • High depersonalisation: 9.2-46% • Low personal achievement: 4-24.5% Mental health Quality of Life: (3 studies) overall lower vs age-matched controls
Healthcare workers in palliative care - nurses, physicians, social workers (Parola 2017)[49] Portugal	Burnout: 17.3% • Low personal achievement: overall 19.5% Nurses: • Burnout 18.6% • High emotional exhaustion 19.5% • High depersonalisation 8.2% Physicians: • Burnout 15.1% • Low personal achievement 41.2% Social workers: • Burnout 27% (small sample) Home care setting burnout 19.6% Hospice setting burnout 14.2%

Notes: CI = confidence intervals; NS = not significant; OR = odds ratio

5. WHAT ARE THE OUTCOMES OF FATIGUE FOR WORKERS?

Key points

Physical fatigue

- Working long hours (e.g. long shifts) and insufficient rest between shifts led to physical fatigue, which was typically improved with rest.
- Physical fatigue was often job- or task-specific (e.g. muscular fatigue in surgeons).
- Across occupations, physical fatigue was associated with: musculoskeletal disorders; poor physical health (long-term); decreased cognitive function; decreased clinical performance; sickness absenteeism/presenteeism; higher staff turnover; greater intent to leave the job; burnout; stress; poor mental health; job dissatisfaction; and poor work-life balance.

Mental and emotional fatigue

- Across occupations, mental and emotional fatigue was associated with: intrusive thoughts; irritability; poor mental health; job dissatisfaction; absenteeism; poor performance; intention to leave the profession; and career choice regret.
- Increased drug/alcohol use was commonly associated with mental and emotional fatigue; but these factors may be a cause or consequence of fatigue.

5.1 Outcomes of physical fatigue in healthcare workers

Physical fatigue impacts on healthcare workers' physical, psychological and behavioural outcomes (Table 7). While some of these outcomes co-occur or are associated with physical fatigue (e.g. burnout), there is not always a clear causal link. However, it was clear in the literature that working long hours (e.g. long shifts) and getting insufficient rest between shifts resulted in a state of physical fatigue, which was typically improved with rest.

Apart from general fatigue, the type of physical fatigue and where it is experienced in the body, was often job- or task-specific. For example, surgeons experienced muscular fatigue and associated decreased psychomotor performance as a consequence of long periods of operating and/or using surgical equipment.[52] In extensive operations, where proper attention and concentration must be maintained, both physical and mental fatigue may become a challenge for the surgeon. However, decreased psychomotor performance was not conclusively associated with physical fatigue in the literature; and support from others in the surgical/healthcare team may attenuate the impact of fatigue in surgeons. In addition, other factors may contribute to reduced performance. For example, one review showed greater psychomotor decrements in junior residents compared with senior residents, indicating that more years of training may enhance performance even when tired.[6]

Particular types of specialties, such as robotic or laparoscopic surgery, bring their own physical fatigue challenges and musculoskeletal complaints (e.g. in the neck, back, shoulders, hands) as a function of interacting with equipment.[14] For radiologists, visual fatigue resulted in eyestrain and blurred vision.[4]

For nurses, working long shifts resulted in drowsiness at work; and working more than 40 hours a week and/or having insufficient breaks were associated with higher levels of musculoskeletal

disorders and chronic fatigue.[16] Long-term physical fatigue was also associated with poorer physical health in physicians[5, 53] and emergency services medical personnel.[7]

Physical fatigue also affects health workers' ability to perform at their optimal cognitive function. Across the occupations reviewed, physical fatigue was associated with decreases in general cognitive performance, attentiveness, and healthcare workers' decision-making ability.[3, 5-7, 16, 53] Additionally, physical fatigue in physicians and nurses was associated with increased burnout and stress; and a decrease in mental health, work satisfaction, life satisfaction, and work-life balance.[5, 16]

In general, physical fatigue was associated with decreased clinical performance, including in terms of personnel safety (e.g. drowsy driving, and near or actual vehicle accidents),[5, 7, 16] and accuracy (e.g. diagnostic accuracy in radiologists).[4] It was also associated with an increased likelihood of sickness absenteeism, sickness presenteeism and higher staff turnover or intention to leave the job.[7, 54]

Physical fatigue, but not mental fatigue, was associated with an increased risk for sickness absenteeism in nurses and healthcare workers; but this was moderated by their health status.[54] Physical fatigue might also affect surgeons' choice of operative approach; and they might decrease their caseload to cope with the physical challenges of fatigue.[14]

A consistent shortcoming across the physical fatigue literature was the failure to consider or control for many other factors that may influence performance, including caffeine, naps, food intake, physical exertion and stress, which can all affect an individual's alertness.[6]

Table 7. Physical, psychological and behavioural outcomes related to physical fatigue by occupational group

Occupational group	Physical outcomes	Psychological outcomes	Behavioural outcomes
Nurses – all specialties[3, 16, 53, 54]	↑Shift length: Drowsiness at work Working ≥40hrs/week and insufficient breaks: ↑Musculoskeletal disorders Chronic fatigue	↓Decision-making ability ↓Attentiveness Working ≥40hrs/week: ↑Burnout ↑Mild emotional disorders	↑Sickness absenteeism ↑Sickness presenteeism ↑Shift length: ↑Drowsy driving ↑Motor vehicle accidents/near motor vehicle accidents ↑Intention to leave Working ≥40hrs/week: ↑Daily alcohol consumption
Emergency Medical Services Personnel[7]	Shifts ≥24 hours: ↓Sleep quality ↓Long term health ↓Reaction time	Shifts ≥24 hours: ↓ Cognitive performance	Shifts ≥24 hours: ↓Personnel performance ↓Safety (e.g. ↑vehicle accidents) ↓Retention/↑Turnover
Physicians – all specialities[5, 53]	↑Physical health problems	↓Decision-making ability ↑Burnout ↑Stress ↓Mental health	↑Car accidents ↑Sickness presenteeism

Occupational group	Physical outcomes	Psychological outcomes	Behavioural outcomes
		↓Work satisfaction ↓Life satisfaction ↓Work-life balance	
Laparoscopic surgeons[14]	↑Musculoskeletal disorders/physical complaints (neck, back, shoulders, hands) ↓Psychomotor performance	Not reported	Physical complaints affect choice of operative approach ↓Caseload
Radiologists[4]	↑Eyestrain and blurred vision	↑Decision fatigue and cognitive overload	↓Personnel diagnostic performance

5.2 Outcomes of mental and emotional fatigue (burnout)

A wide range of psychological, physical and behavioural outcomes were identified in the literature as being associated with mental and emotional fatigue (burnout). However, it has not been determined that burnout 'causes' these outcomes, only that there may be an association, which could be bi-directional. For example, burnout may not only lead to high anxiety, depression or substance use (outcomes), but these factors may also contribute to the development of burnout (determinants).

Burnout is discussed in the literature as both an outcome in itself and a predictor of outcomes. Williams et al.[48] proposed the concept of a "burnout cascade", which is characterised more as a process than an end-state. The authors suggested that the "loss spirals" within the Conservation of Resources (COR) theory may explain different stages of burnout, including symptoms of mental, emotional and physical fatigue, which lead to various physical, psychological and behavioural outcomes. In brief, the COR theory posits that workers try to maintain an adequate level of resources by preventing their loss and strategically investing efforts into acquiring more. Job resources include positive relationships with co-workers and effective equipment to complete tasks. Workers experience stress when job demands exceed the available resources. If lost resources are not replenished, losses increase in both frequency and magnitude (loss spiral), leading to worsening emotional, psychological and physical symptoms. Table 8 describes a theoretical model of the different stages of the burnout cascade and the potential outcomes (manifestations) for physicians.[48] It should be noted that the stages are not necessarily linear, and the potential manifestations are not inevitable, but rather examples of symptoms that may occur more commonly in some stages.

Table 8. Stages of the burnout cascade/loss spiral and manifestations for physicians

Loss spiral category	Order	Stage	Symptoms	Potential manifestations
Reduced activity	1	Hyperactivity	Devoting extra effort and creativity to achieve goals	Working more; extra-role behaviours to improve processes; taking time away from loved ones for work
	2	Exhaustion	Loss of energy; chronic fatigue	Performance less effective; fewer extra-role behaviours; effects on interpersonal interactions; may still have positive patient interactions but takes resources from other areas
	3	Reduced activity	Withdrawal; resignation; reduced empathy	Less communication; less initiative; less creative problem solving; less interest in connecting with patients; reduced empathy; turnover intentions
Distress (emotional, cognitive withdrawal)	4	Emotional reactions	Aggression; negativity; cynicism (depersonalisation)	Anxiety; negative interpersonal relationships; marital problems; depersonalisation of patients
	5	Breakdown	Reduced cognitive function, motivation and creativity	Medical errors; lack of initiative to solve problems; relationships deteriorate; depression increases
	6	Degradation	Emotional distress; social isolation	Absenteeism; tardiness; loss of productivity
Despair (physical problems, suicide)	7	Psychosomatic reactions	Sleep problems; gastro-intestinal disorders; cardiovascular disorders; susceptibility to infection; sexual disorders; intake of alcohol and drugs	Physical illness; substance abuse; actual turnover; leaving profession; suicidal ideation
	8	Despair	Chronic physical disorders; suicide	Serious illness; death

Source: Williams et al. (2019)[48]

For the most part, outcomes related to mental and emotional fatigue were identified, but few studies provided data. Table 9 provides a description of the physical, psychological and behavioural outcomes that have been associated with burnout and compassion fatigue in different nursing units in the systematic reviews included in this Evidence Review. Physical outcomes (e.g. musculoskeletal injuries, difficulty sleeping) were seldom reported in the studies. Psychological and behavioural outcomes were mostly in the middle stages of the burnout cascade, including intrusive thoughts, irritability, job dissatisfaction, absenteeism and intention to leave the profession. It is likely that individuals who had reached the later stages of the burnout cascade (despair) were not represented in studies due to sickness absenteeism or had left the profession. The concept of decision fatigue has also been described as an additional aspect of mental fatigue independent of sleep deprivation,[52] which can have detrimental outcomes in emergency situations where quick and accurate decisions are critical.[53]

Table 9. Physical, psychological and behavioural outcomes related to mental and emotional fatigue in nursing

Occupational group	Physical outcomes	Psychological outcomes	Behavioural outcomes
Emergency department nurses[18, 32, 33]	Difficulty sleeping (>50%)	Intrusive thoughts about patients Irritability/ mood swings Job dissatisfaction	Avoidance of patients Absenteeism
Mental health nursing[35]	Not reported	Not reported	Intention to leave profession
Obstetrics & gynaecology[34, 40]	High emotional exhaustion related to ↑musculoskeletal injuries	Not reported	Not reported

Table 10 summarises the key physical, psychological and behavioural outcomes reported by specialists and clinicians. Physical outcomes in specialists working in the area of oncology were mainly in the latter stages of the burnout cascade, including headaches and gastrointestinal upsets. Low job satisfaction and career choice regret were commonly reported across all specialties; and anxiety and depression were frequently reported in oncology units. Intention to leave the profession (quit, retire, change specialty) was a common behavioural outcome for specialists across different areas. Increased drug/alcohol use was also commonly associated with mental and emotional fatigue.

Table 10. Physical, psychological and behavioural outcomes related to mental and emotional fatigue in specialists and clinicians

Occupational group	Physical outcomes	Psychological outcomes	Behavioural outcomes
Specialists and residents in physical medicine and rehabilitation[43]	Not reported	↓career satisfaction Suicide/ideation Career choice regret (16.7% vs 14.1% in other medical residents)	Career discontinuation Substance abuse
Radiation therapists and oncologists[9, 46]	Headaches Insomnia Muscle tension Hypertension Gastrointestinal upsets	↓ job satisfaction Mood swings *Anxiety* *Depression*	Absenteeism Poor performance Low productivity/morale Intention to leave, change specialty, retire early, or reduce hours Staff turnover Low commitment to job *Substance use*
Orthopaedic surgeons[41]	Not reported	Career choice regret Anxiety about competency	*Alcohol and drug use*

Note: Outcomes highlighted in *italics* may also be risk factors for mental and emotional fatigue

In the aged care sector, one systematic review[51] suggested that healthcare staff experienced poor mental health, poor quality of life, high levels of stress (38%), and anxiety (23%) related to mental and emotional fatigue. High staff turnover, which was also assessed in one study in Costello et al.,[51] was associated with shift work, which may be a proxy for fatigue. In this study, the authors reported that "higher job demands and lower coping resources were directly associated with turnover."

One systematic review suggested that the level of burnout may change over time, depending on the stage of career, which is consistent with the different stages in the burnout cascade.[41] This may also explain some of the differences in outcomes between nurses and physicians.

6. IMPACT OF FATIGUE ON PATIENT SAFETY

Key points

- Poor patient outcomes and lower quality care were partially attributed to healthcare workers' physical fatigue, with less evidence attributed to emotional and mental fatigue.

Physical fatigue

- Physical fatigue in nurses and emergency medical workers due to long work hours and insufficient recovery time between shifts was associated with adverse patient outcomes, including medication errors and near misses.
- Physical fatigue affected performance and accuracy. For example, decreased diagnostic accuracy of radiologists due to visual fatigue led to false positives/false negatives and incorrect/delayed treatment for patients.
- For physicians and surgeons, evidence of an association between physical fatigue and patient outcomes was inconclusive.

Mental and emotional fatigue

- Few empirical studies assessed the relationship between burnout and patient outcomes; and the available evidence was weak and inconsistent.
- While physicians perceived that burnout led to poor quality of care or increased medical errors, medical reviews found no significant relationship between burnout and patient safety or quality of care.
- Patients' ratings of care showed mixed results. Limited evidence showed that physicians' emotional exhaustion and low sense of personal achievement were associated with poorer communication with patients.

6.1 Impact of physical fatigue on patient safety

The physical fatigue of healthcare workers in the workplace can have significant consequences for patient safety, including poor patient outcomes and lower quality care. Healthcare workers who are physically fatigued may experience physical or cognitive effects, thereby decreasing their ability to perform tasks safely and effectively. For example, the decreased task accuracy of laparoscopic surgeons experiencing muscular fatigue, pain, stiffness from operating equipment may indirectly impact on patient safety and outcomes.[14] For radiologists, visual fatigue affects their diagnostic accuracy, which has significant implications for patient care and outcomes.[4]

Similarly, evidence showed that physical fatigue impacted on cognition. One review identified fatigue as a factor affecting decision-making during stressful situations, such as resuscitation where it can affect the morbidity and mortality of patients.[53]

In nurses, a number of systematic reviews focused on the relationship between physical fatigue (including working long hours) and patient outcomes. One review found that working more than 40 hours per week and taking less than 10 hours off between shifts were significantly related to the incidence of adverse patient outcomes (errors and near misses).[16]

Medication administration accounts for 40 per cent of nursing clinical activity.[3] One study identified the main reason for medication errors was fatigue in 38.5 per cent of cases.[3] Medication errors

increased proportionally to the number of hours worked as nurses' attention, vigilance, concentration and judgment decreased. For every extra hour exceeding a 12-hour shift, the probability of administering the wrong drug or wrong dose increased by two per cent.[3]

Overall, evidence indicated that there was an inverse relationship between shift length (and associated physical fatigue) and health and safety outcomes for patients. While one review indicated a weak relationship to patient outcomes with shifts over 8.5 hours,[16] another found significantly increased rates of adverse events and medication errors in shifts longer than 12 hours per day.[3] This was also demonstrated in emergency medical workers, where shift duration of more than 24 hours had poorer patient outcomes (medical error, patient adverse events).[7]

For physicians, the evidence of a link between fatigue and poorer patient outcomes was inconsistent. One meta-analysis found no significant difference between sleep-deprived versus non-sleep deprived surgeons in patient mortality or post-operative complications.[5] Another review was discordant – three studies reported no significant difference as a result of sleep deprivation, whereas two studies found increases in complications/errors.[6] The lack of consistency in the data suggests that there may be a critical threshold, whereby compensatory mechanisms (e.g. safety protocols, extensive training/experience) may prevent adverse events; but beyond which surgical performance deteriorates to the point of impacting on patient safety.[52] For example, any potential poor patient outcomes may be identified early and corrected by the broader medical team. It is also plausible that fatigue-related surgical complications are under-reported/not captured, borne out of physicians' reluctance to admit such occurrences as a function of their fatigue, particularly in a culture where long hours are expected.[14] The most recent Australian and New Zealand Audit of Surgical Mortality national report (2017)[55] identified that the proportion of cases caused by an adverse event (i.e. caused by medical management rather than by disease progress) was 3.9 per cent (1,298/33,356) over the entire audit period (2009-2016). None of the medical management issues reported specifically identified fatigue as a contributing factor. Implementing an improvement-focused root-cause analysis protocol to identify system or process weaknesses that includes a focus on fatigue, rather than attributing blame, may engender more accurate reporting of near-misses as well as actual errors.

6.2 Impact of burnout and compassion fatigue on patient safety

Emotional and mental fatigue (burnout) is known to result in reduced emotional energy for job demands and detachment from the job.

It is widely suggested in the research literature that burnout from chronic work-related stress in healthcare workers leads to lower quality of care and poorer outcomes for patients. However, there are few empirical studies that have assessed this relationship in a rigorous and independent way.

One systematic literature review examined this relationship by assessing the extent to which burnout in physicians impacted on patient experiences, quality of care and medical errors.[17] The most salient finding from this review was that physicians *perceived* that burnout impacted negatively on their patients' quality of care; and that burnout led to increased medical errors. However, studies that included a review of clinical records found no significant relationship between burnout and patient safety/quality of care. Longitudinal studies reported that physicians with higher levels of burnout at baseline were more likely to report that they had made errors at follow-up points. Overall, results showed a discrepancy between physicians' perceptions of care quality and independent assessments of care quality.

Studies that assessed patients' ratings of care showed mixed results in Rathert et al.[17] For example, high levels of depersonalisation in healthcare staff were associated with more positive patient ratings in some studies and less positive ratings in others; whereas emotional exhaustion in healthcare staff was not associated with patient outcomes. Studies that examined physician-patient

communication found that emotional exhaustion and low sense of personal achievement were associated with poorer communication with patients.

In another systematic review, nurses identified overcrowding in the emergency department as stressful; and that patients' safety may be compromised in an environment where infection control was difficult to maintain;[18] but no data were provided.

Burnout and compassion fatigue may indirectly impact on patient care through staff turnover. For example, lower staff turnover is purported to be associated with higher quality of care for patients (i.e. lower risk of mortality, shorter hospital stay).[39]

The literature in this area is sparse and severely limited by small sample sizes, variability in measures and lack of accounting for potential confounders. For example, organisational attributes, such as staff support and resources may moderate the relationship between burnout, staff turnover and patient outcomes. In addition, medical errors may be under-reported in the medical records. For example, errors may be identified and corrected by others in the medical team before harm is done; and may not necessarily be recorded.

Overall, there is insufficient evidence to conclude that physician burnout does, or does not, lead to poorer patient outcomes or compromise patient safety. It is likely that the hospital safety standards, which involve multiple checks by individuals in medical teams, effectively prevent most fatigue-related errors. However, data on near-misses related to fatigue were not provided in included studies.

7. RISK FACTORS AND PREVENTIVE FACTORS

Key points

- Interventions to mitigate fatigue in the workplace are based on identifying risk factors and protective factors.

Work-related risk factors

- Workload, long hours, shift-work and inadequate rest between shifts were consistently identified as risk factors for physical fatigue and burnout across all healthcare professionals.
- Other risk factors for burnout included:
    - Lack of autonomy/control over the work environment (all healthcare workers)
    - Exposure to violence/aggression and critical incidents in ED and mental health nursing
    - Exposure to suffering, dying and ethical dilemmas
    - Bureaucratic job demands, risk of litigation and changing work environment in specialists and clinicians
- Poor ergonomic design of equipment was a risk factor for physical fatigue in surgeons.

Work-related protective factors

- Factors to prevent fatigue were generally the inverse of risk factors (e.g. restricting hours of work, adequate staffing levels).
- Additional factors included: provision of support for workers (e.g. clinical supervision, mentoring).

Individual risk and protective factors

- Demographic factors (age, gender, relationship status) were not significantly related to fatigue.
- Years of experience and/or level of education showed mixed results; and confounding factors were rarely accounted for (e.g. frequency of contact with patients).
- Mental health (anxiety, depression) and substance use were frequently associated with fatigue; but, these may be both a cause and consequence of fatigue.
- Additional individual protective factors noted in the reviews were: high levels of self-efficacy and resilience; a sense of humour; optimism; engaging in hobbies outside of work; social support; and valuing making a difference through work.

The systematic reviews described a number of potential risk factors for fatigue as well as factors that may mitigate the effects of fatigue and burnout. Both work-related and individual factors were identified. Although few studies formally measured the associations between specific factors and fatigue, there was a high degree of consistency across studies.

The most commonly reported work-related risk factors for physical fatigue and burnout are shown in Figure 2 and Figure 3. The identified workplace-related factors may provide insights into potential interventions to address fatigue in HCSA workers.

7.1 Work-related risk factors – physical, mental and emotional fatigue

Risk factors associated with fatigue were primarily organisational, workplace or systems-related.

Across the occupational groups, high workload/caseload was associated with physical fatigue,[3, 4, 14, 16, 53, 54] and emotional and mental fatigue.[18, 33, 34, 36, 42-44, 46] Related to this, but also identified as separate risk factors, were inadequate staffing levels and insufficient time to spend with patients.

Long hours (>40 hours/week), long shifts (>12 hours), night shifts, and inadequate breaks between shifts, were also frequently identified in the literature as risk factors for physical fatigue and burnout.[3, 16] In some areas, these were formally scheduled shifts (e.g. nurses) and in others (e.g. surgeons) they were part of the work culture.[6] For example, surgeons being on call the day before surgery was associated with fatigue and sleep deprivation.[6] Similarly, emergency medical workers working shifts in excess of 24-hours were at high risk for physical fatigue/sleep deprivation.[7]

In some healthcare areas (e.g. ED and mental health units), staff are at higher risk of exposure to violence/aggression or critical incidents that may contribute to mental and emotional fatigue in nurses.[18, 35] In others, such as aged care and palliative care, workers identified job strain, low job satisfaction and perceived poor home care environment as risk factors for burnout.[50, 51]

Across all specialties in nursing and amongst clinicians and specialists, lack of autonomy or lack of control over their environment, and exposure to suffering and ethical dilemmas was associated with high levels of burnout.

For some specialties, such as laparoscopic surgery or radiology, role-specific risk factors highlighted examples of occupation-specific physical fatigue. For example, in laparoscopic surgeons the ergonomic design of equipment, size of instruments in relation to glove size (instruments typically built in 'one-size-fits-all' style) and improper positioning of surgical set-up, were noted to affect their muscular fatigue/disorders[14] - this was less evident in robotic surgery where there were notably fewer muscular fatigue/complaints. For radiology, the increased luminance of ambient and monitor light contributed to visual fatigue/eyestrain.[4]

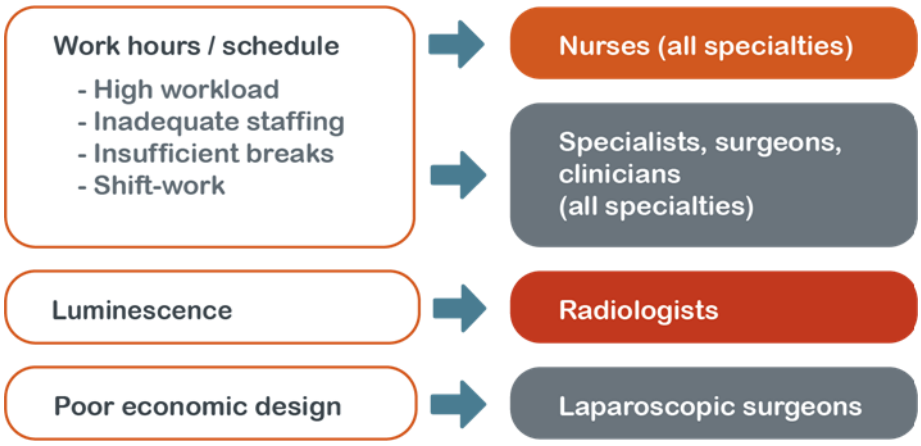


Figure 2. Diagram showing the key work-related risks for physical fatigue in HCSA workers

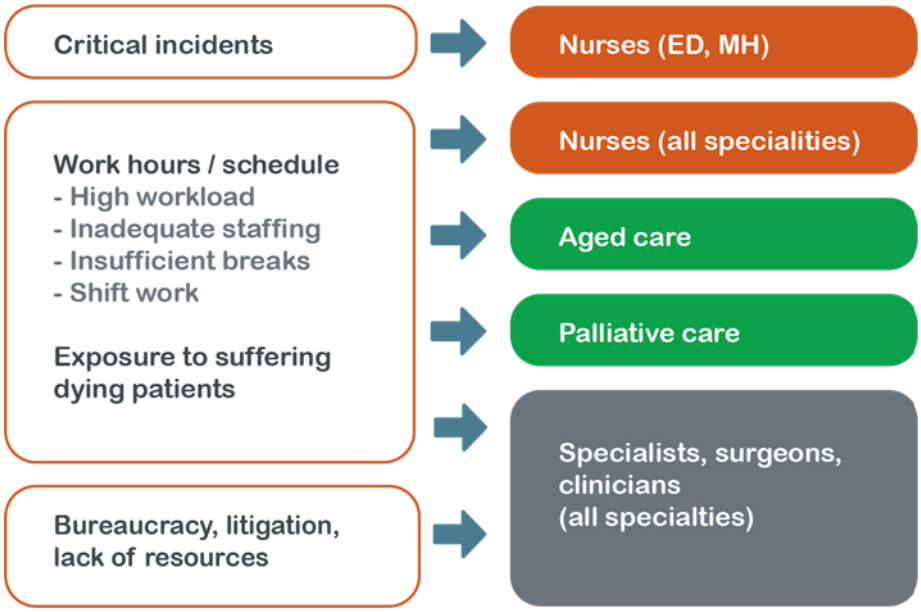


Figure 3. Diagram showing the key work-related risks for burnout in HCSA workers

7.2 Work-related protective factors for physical, mental and emotional fatigue

Identified protective factors were typically the inverse of risk factors. In relation to workload and associated physical fatigue, protective factors in nurses included having sufficient staff numbers to share the workload, and conducting work that was in line with expertise and function,[3] or reducing workloads (e.g. number of scans read in radiologists).[4] To address long work hours, protective factors included limiting work and shift hours,[3, 4, 6, 7, 16] and taking breaks at work,[14] including scheduled napping.[6]

Other protective factors that may mitigate the effects of burnout included having job stability;[35, 44] and access to various forms of support, such as peer support, training, supervision and mentoring.[9, 32, 34-37, 39, 41-44, 46, 50, 51]

Ergonomic training, appropriate ergonomic design and set-up were also identified as important for laparoscopic surgeons at risk of muscular fatigue. [14]

7.3 Individual risk and protective factors related to fatigue

7.3.1 Individual risk factors for fatigue

There were mixed effects reported for most individual risk factors (age, gender, relationship status) associated with fatigue (physical, mental and emotional) across all specialties.[9, 14, 35, 41-44, 46, 50, 51]

Evidence related to years of experience was mixed – positive, negative and non-significant associations were reported;[6, 14, 50, 51] and it was not possible to identify the differentiating factors in these contradictory studies. For example, in one review, years of experience had mixed mediating effects on physical fatigue in laparoscopic surgeons;[14] and in another review, surgeons (all specialties) with less experience were more likely to report physical fatigue.[6]

Similarly, a higher level of education was purported to reduce burnout.[39] However, there are several potential confounders related to level of education that may also impact on fatigue. For example, while knowledge may empower individuals, highly educated nurses may also have greater managerial roles and less contact with patients. Therefore, the level of exposure to stressful events may be a confounding factor. Workers with less experience may also feel that they have less

autonomy or control over environment; whereas more experience and technical ability were purported to moderate the effects of fatigue on performance in surgeons.[6]

Other individual factors that were identified in the literature, such as anxiety, depression, perceived stress, poor work-life balance and alcohol and drug use, [3, 5, 9, 16, 32, 34, 36, 37, 39, 41-43, 46, 50, 51, 53, 54] may have a bi-directional relationship with fatigue and burnout – that is, they are both risk factors and outcomes of fatigue/burnout.

Insufficient and poor quality sleep were identified as common individual risk factors for physical fatigue; however, these were mostly related to shift work, in particular night shifts[3] or long work hours;[5, 6, 53] and these have been addressed above in work-related factors.

7.3.2 Individual protective factors for fatigue

Individual protective factors were typically the inverse of risk factors, such as getting sufficient quality sleep, breaks and time for recovery.[3-6, 16, 53] Younger age in relation to shift/overnight work was also noted as a protective factor in radiologists (circadian processes are more flexible when younger).[4]

Similarly, with respect to moderating the effects of high workload, cognitive or decision aids in the workplace may be protective, particularly in high-stress environments.[4, 53]

Other individual protective factors that were identified in the studies included:

- Social support for mental health nurses,[35, 44] including workplace social support from co-workers[56]
- A good sense of humour and high level of resilience for all nursing areas[32, 34, 36, 37, 39]
- High levels of self-efficacy among specialists and clinicians[9, 41-43, 46]
- Taking time out for hobbies[9, 41-43, 46]
- Having a sense of optimism, job enjoyment and the feeling of making a difference amongst healthcare staff in aged care and palliative care sectors.[50, 51]

8. INTERVENTIONS AND PREVENTION STRATEGIES

Key points

- There was substantial heterogeneity across studies in the type of intervention, format, follow-up period and measures of effectiveness.
- Overall, preventive strategies (organisational focus) were more effective than ameliorative (individual focus) interventions for reducing fatigue and burnout.
- Effective organisational-level preventive strategies included: modifying work schedules, scheduled napping and sleep health/fatigue awareness training.
- Ameliorative interventions (mindfulness, meditation and resilience training) consistently reduced burnout and compassion fatigue, at least in the short term. Ongoing sessions may be required to maintain benefits over a longer period.
- The impact of interventions on worker performance or patient outcomes was inconclusive as the evidence was too sparse.
- A combination of strategies that use both a preventive approach (e.g. reduced workload, scheduled napping) and an ameliorative approach (e.g. mindfulness/meditation, resilience training) to manage fatigue in the workplace may be beneficial.

Workplace-based interventions and prevention strategies that address the adverse effects associated with fatigue amongst HCSA workers aim to change aspects of the psychosocial work environment. They do this by taking a proactive (preventive) approach that focuses on reducing the organisational stressors that lead to fatigue; or an ameliorative approach that focuses on changing individuals' behaviour and enhancing their ability to cope with fatigue-related workplace stressors.

Approaches to influence psychosocial work environments

Proactive (or preventive) strategies – organisational focus

- Focus on reducing the organisational stressors by changing work conditions, culture and environment.
- Examples include: modifying policies, processes, job roles or tasks; reducing workload; flexible work schedules and shift rotations; scheduled napping for shift-workers; and education to raise awareness about the potential negative effects of fatigue.

Ameliorative interventions – individual focus

- Focus on changing individuals' behaviour and enhancing workers' ability to cope with fatigue-related workplace stressors.
- Examples include: resiliency and coping skills training; support for workers (clinical supervision, mentoring); relaxation and lifestyle courses, such as mindfulness, meditation, yoga and exercise.

Table 17 (Appendix 2) provides a summary of the characteristics of the included systematic reviews that assessed interventions to mitigate fatigue. While the systematic reviews were moderate-strong in quality, they contained primarily uncontrolled pre/post studies and self-selected participants, which tends to over-estimate the effectiveness. In addition, most of the studies did not account for potential confounders that may influence fatigue, including caffeine, naps, food intake, physical exertion and stress, which can all affect an individual's alertness.

8.1 Preventive strategies for fatigue

Three systematic reviews specifically examined prevention strategies that focused on reducing the organisational stressors that lead to fatigue;[57-59] and three reviews included both organisational and individual-focused interventions to address fatigue in the workplace.[60-62] Table 11 provides a summary of the key findings of the effectiveness of preventive strategies for mitigating the impact of work-related fatigue.

Sleep health education and fatigue awareness training had significant positive effects on the quality of workers' sleep and reduced levels of burnout in the short term.[57] The effect of fatigue education on worker safety and performance (e.g. intubations, interpreting electrocardiograms) was inconclusive, with some studies reporting positive benefits, but mostly non-significant. For example, one study reported fewer incidents of drowsy driving or motor vehicle crashes after training; and another reported lower probability of filing an injury report after attending fatigue training (versus not attending). Two studies in this review that assessed the impact of fatigue training on patient outcomes reported significant decreases in the number of medical errors, both real and perceived. Overall, fatigue training was beneficial to worker and patient safety, but the evidence was limited.

Scheduled napping significantly reduced the level of sleepiness reported in healthcare shift workers compared with those who did not have naps.[58] However, these findings are limited by the poor quality of the available studies and wide variability in the duration of naps across studies.

Interventions involving modification of job tasks or work schedules to reduce the overall workload significantly reduced burnout in doctors.[60, 61] In contrast, one systematic review[59] that assessed the effectiveness of modifying workload on fatigue was inconclusive. However, the quality of included studies was very low and none of the studies provided data on worker or patient safety.

In addition, effective implementation of fatigue-mitigating strategies often relies on workers' ability to accurately assess their fatigue state. Subjective feelings of fatigue are not good indicators of performance ability as individuals tend to underestimate fatigue-related impairments when sleep-deprived or functioning under adverse circadian phase.[63] This may give healthcare workers the illusion of being in control and hinder uptake of effective fatigue-mitigation strategies. Thus, relying solely on individual workers' abilities to identify that they are fatigued, might be insufficient.

Innovations[64]

Real-time biomarkers and other measures for detecting and predicting alertness are being developed by the Australian Alertness Safety and Productivity Cooperative Research Centre. They are also working on developing dynamic scheduling systems and guidelines, as well as smart lighting solutions which have 'non-visual' physiological effects, including resetting the body clock and directly activating the brain to improve alertness and performance.

Table 11. Key findings of effectiveness of preventive strategies to reduce workplace-related fatigue

Area of specialty (Reference) Country	Intervention	Effectiveness of intervention
Preventive strategies		
Emergency medical services personnel and related shift workers (Barger 2018)[57] US	Fatigue and/or sleep health training Wide variation in fatigue training (from 1-hr lectures to 1-day workshops to more extended programs); variable formats (in-person/online, some with added modules)	Worker safety: inconclusive (NS or mixed effects) • Significant reduction in number of drowsy driving or motor vehicle accidents after training (↓20%, 80%, respectively, one study) • Lower probability of filing injury report in emergency services workers who attended fatigue training vs those not attending (OR 0.76, 95% CI 0.60, 0.98, *p*=0.03) Impact on patient safety: overall beneficial • Significant decrease in number of errors after fatigue training (p=0.01) • Significant decrease in medical residents' perception of potential errors (*p*=0.003) Worker performance: inconclusive • NS or mixed effects in physicians (e.g. intubation, or interpreting ECGs) Quality of sleep: overall beneficial • Results ranged from large significant effect to moderate but NS effect Worker burnout/stress: overall beneficial in short-term Worker general health: inconclusive (NS or mixed effects) Sleep quality (at 4-8 weeks FU) significant improvement: SMD −0.87 [95% CI −1.05, −0.69, *p*<0.00001] Overall positive short-term effects for patient/worker safety, sleep quality, performance
Emergency Medical Services Personnel and related shift workers (Martin-Gill 2018)[58] US	Scheduled napping (vs no-nap conditions)	Sleepiness (Naps vs no naps): Significant ↓ sleepiness SMD 0.4 [95% CI 0.09, 0.72, *p*=0.01] Reaction time: NS Limitations: wide difference in duration of naps (15-120 mins); small sample sizes; low quality evidence

Emergency Medical Services Personnel and related shift workers (Studnek 2018)[59] US	Modification of task load (i.e. perceived difficulty completing a task; subjective mental workload)	Effectiveness of task load interventions was inconclusive No studies assessed worker safety or patient safety Limitations: overall poor quality studies, with high risk of bias; high variability in definitions and measures of task load
Preventive or ameliorative strategies		
Primary care nurses (Duhoux 2017)[62] Canada	Interventions to promote/ improve mental health Individual: mindfulness, meditation, cognitive behavioural therapy Workplace: protocols for harassment/ violence, additional staff to decrease workloads, structured meetings to plan tasks and shifts, increased employee participation in planning/ decision-making Combined individual and workplace interventions	Burnout: • Individual-focused interventions (cognitive behavioural, mindfulness approaches and clinical supervision): overall effective for reducing burnout and stress • Workplace-based interventions: overall effective for reducing burnout • Combined interventions: improvements were reported post-intervention; however, there were too many different interventions implemented to determine which were effective Limitations: weak evidence with high probability of bias in most studies Variability across studies in the intensity and length of courses
Doctors (Panagioti 2017)[60] UK	Individual interventions (CBT, MBSR) Organisational interventions (scheduling; workload)	Burnout: Overall significant ↓ in burnout measures (emotional exhaustion, depersonalisation) Organisation-level interventions SMD −0.45 [95% CI −0.62, −0.28] significant improvement vs individual-level interventions SMD −0.18 [95% CI −0.32, −0.03], p=0.04 Limitations: variability in duration (2 weeks – 9 months) and FU (1 day – 18 months)
Doctors (West 2016)[61] US	Individual interventions (e.g. MBSR) Organisational interventions (e.g. scheduling)	Burnout: ↓ 54% to 44% [95% CI 5, 14; p<0.0001] Organisational interventions more effective vs individual-focused interventions (p=0.03)

CBT = cognitive based therapy; CI = confidence intervals; ECG = electrocardiogram; FU = follow-up; MBSR = mindfulness-based stress reduction; NS = not significant; OR = odds ratio; RCT = randomised controlled trial; SMD = standardised mean difference

8.2 Ameliorative interventions for fatigue

Thirteen systematic reviews assessed the effectiveness of interventions aiming to enhance workers' ability to manage fatigue-related stressors in the workplace. Mindfulness, meditation, exercise and cognitive behavioural therapy were the most commonly used interventions that consistently improved dimensions of burnout (reduced emotional exhaustion and depersonalisation, increased personal achievement).[60-62, 65-71] Table 12 provides a summary of the key findings of the effectiveness of ameliorative strategies for mitigating the impact of work-related fatigue.

Art and music therapy had mixed effects. Cocker et al.[65] suggested that music therapy was ineffective for reducing compassion fatigue in nurses and community care workers; whereas Hill et al.[68] reported significant improvements in psychological wellbeing of palliative care nurses after art or music therapy sessions.

Coping and resilience training significantly reduced burnout in nurses and community health workers.[65, 67, 70]

Social support in the workplace, which involves support from a worker's immediate supervisor and co-workers, reduced two dimensions of burnout (emotion al exhaustion, depersonalisation).[56] However, available data were limited and the quality of studies was very poor.

Aroma inhalation therapy significantly improved sleep quality in shift-work nurses.[72] Aroma inhalation therapy typically comprised one or more sessions of exposure to a blend of essential oils, which included lavender oil.[72] At the same time, the participant lay down to rest or received massage therapy. In contrast, while caffeine significantly reduced fatigue and improved psychomotor vigilance in shift-work nurses,[73] the nurses reported reduced sleep duration and quality. Therefore, the risk/benefit ratio of long-term caffeine use is not clear.

Barger et al.[57] recommended implementing a comprehensive strategy to mitigate fatigue and fatigue-related risks in the workplace, comprising six key elements:

1) Education and training on fatigue and sleep health
2) Compliance with hours of service regulations
3) Appropriate scheduling practices
4) Countermeasures that can be instituted in the work setting (e.g. scheduled napping)
5) Design and technology (e.g. automation, where possible)
6) Ongoing research to monitor fatigue.

This multi-modal approach may be useful for addressing the different stages of the burnout cascade.

Table 12. Key findings of effectiveness of ameliorative strategies to reduce effects of fatigue

Area of specialty (Reference) Country	Intervention	Effectiveness of interventions
Ameliorative interventions (individual-focus)		
Health professionals - nurses, doctors, psychologists, social workers, physiotherapists (Dharmawardene 2016)[66] US	Cognitively-based meditation training (6-8 weeks) Controls: waitlist Active control: leadership exercises/physical exercise No control (pre/post studies)	Burnout (at 8 weeks FU in controlled trials): • Significant ↓ emotional exhaustion effect size 0.37 [95% CI 0.04, 0.70] • Significant ↑ personal achievement effect size 1.18 [95% CI 0.10, 2.25] • Significant ↑ life satisfaction effect size 0.48 [95% CI 0.15, 0.81] In uncontrolled trials only: • Significant ↓ depersonalisation Patient safety events (aggression, falls, medication errors) ↓ in one study, but not analysed statistically Overall, cognitively-based meditation training provides a small to moderate benefit for health professionals for stress reduction Limitations: few controlled studies; small sample sizes
Nurses (Lee 2016)[70] Taiwan	Coping strategies education and practice (CBT, stress management, MBSR programs)	Burnout: (MBI) • High emotional exhaustion: mean difference (post-intervention) 2.43 [95% CI 1.33,3.54, p<.0001]; mean difference (at 1year FU) 3.07 [95% CI = 1.27, 4.86, *p*=0.0008] • High depersonalisation: mean difference (at 6-months FU) 0.59 [95% CI 0.01, 1.17, *p*=0.05]; mean difference (at 1 year FU) 1.36 [95% CI 0.2, 2.52, p=0.02] • Low personal achievement: mean difference (at 6-months FU) 1.58 [95% CI 0.41, 2.75, *p*=0.008] Limitations: high variability in intensity and duration of interventions across studies; long-term effects unknown

Area of specialty (Reference) Country	Intervention	Effectiveness of interventions
Nurses (Suileiman-Martos 2020)[71] Spain	Mindfulness training	Burnout: ↓emotional exhaustion in nurses (from medium-high, 42-69% to medium-low, 14–31%) Meta-analysis (2 studies, N=90) • ↓emotional exhaustion (mean difference 1.32 [95% CI −9.41, 6.78] vs control • ↓depersonalisation (mean difference 1.91 [95% CI −4.50, 0.68] vs control • ↑personal achievement (mean difference 2.12 [95% CI −9.91, 14.14] vs control
Shift-work nurses (Kang 2020)[72] South Korea	Aroma-inhalation therapy No results reported for other interventions (shift-rotation; physical-activity; CBT)	Sleep quality: Aroma therapy inhalation: significant ↑ sleep quality vs controls, mean difference 0.97 [95% CI 0.64, 1.29, p<0.01]
Nurses (Velando-Soriano 2020)[56] Spain	Social support in workplace	Burnout: • ↓emotional exhaustion • ↓depersonalisation • NS personal achievement
Nurses and community support workers (Cocker 2016)[65] Australia	Various individual-focused interventions (mindfulness, yoga, meditation, music therapy; building resilience, improving self-efficacy, and transcranial magnetic stimulation)	Compassion fatigue: Overall inconclusive (NS or mixed effects) Ineffective interventions: music therapy, grief resolution, social connection with colleagues, transcranial magnetic stimulation, mindfulness education Effective interventions –significant ↓in burnout: structured meditation, interactive group seminars with guided imagery exercises, resiliency educational resources Most promising interventions comprised education and training on building resilience: ↓ burnout, ↓ compassion fatigue; ↑ compassion satisfaction Limitations: small sample sizes; short follow-up period (<8 weeks); mostly uncontrolled pre/post studies

Area of specialty (Reference) Country	Intervention	Effectiveness of interventions
Oncology and palliative care nurses (Gillman 2015)[67] Australia	Strategies to promote coping: (psychoeducation; compassion fatigue resilience; stress inoculation therapy)	Burnout: Psycho-educational program (relaxation; guided imagery), 6 hours: significant ↓ burnout (from 4% pre-test to 0% post-training) Compassion fatigue resilience program, 5 weeks: significant improvement up to 6 months FU, p<0.05 Stress inoculation therapy (self-help stress management program, mobile phone app): • Significant ↓ anxiety after intervention; NS in control group, *p*=0.001 • Significant ↑ active coping in intervention; NS in control group, *p*=0.001 Limitations: small sample sizes, short FU
Palliative care nurses (Hill 2016)[68] UK	Psychosocial interventions with reflective/ experiential component (stress-reduction program; group-based music therapy; sleep intervention; psycho-existential intervention; art therapy)	Compassion fatigue, burnout, psychological wellbeing: Art therapy and music therapy: moderate improvements in psychological outcomes All other interventions: NS effect Limitations: large variability between interventions and tools used to measure psychological outcomes; high risk of bias in most studies
Emergency Medical Services Personnel and related shift workers (Temple 2018)[73] US	Caffeine (placebo)	Fatigue: • In 3/4 studies caffeine ↓acute fatigue, relative to placebo • In 3 studies caffeine ↑psychomotor vigilance and ↑reaction time at the end of shifts • In 2 studies caffeine favourable for personnel safety (e.g. driving) Caffeine ↓sleep quality and ↓sleep duration
Doctors (Jackson-Koku 2019)[69] UK	Mindfulness-based stress reduction (MBSR)	Burnout (MBSR): • Significant ↓emotional exhaustion • Significant ↓depersonalisation • Significant ↑personal achievement (p<0.05)

Area of specialty (Reference) Country	Intervention	Effectiveness of interventions
Preventive or ameliorative strategies		
Primary care nurses (Duhoux 2017)[62] Canada	Interventions to promote/ improve mental health Individual: mindfulness, meditation, cognitive behavioural therapy Workplace: protocols for workplace harassment and violence, additional staff to decrease workloads, structured meetings to plan tasks and shifts, increased employee participation in planning and decision-making Combined individual and workplace interventions	Burnout: • Individual-focused interventions (cognitive behavioural, mindfulness approaches and clinical supervision): overall effective ↓burnout and stress • Workplace-based interventions: overall effective ↓ burnout • Combined interventions: improvements were reported post-intervention; however, there were too many different interventions implemented to determine which were effective Limitations: weak evidence with high probability of bias in most studies; variability across studies in the intensity and length of courses
Doctors (Panagioti 2017)[60] UK	Individual interventions (CBT, MBSR) Organisational interventions (scheduling; workload)	Burnout: Overall significant ↓ in emotional exhaustion, depersonalisation Organisation-level interventions SMD −0.45 [95% CI −0.62, −0.28] significant improvement vs individual-level interventions SMD −0.18 [95% CI −0.32, −0.03], p=0.04 Limitations: variability in duration (2 weeks – 9 months) and FU (1 day – 18 months)
Doctors (West 2016)[61] US	Individual interventions (e.g. MBSR) Organisational interventions (e.g. scheduling)	Burnout: ↓ 54% to 44% [95% CI 5, 14; p<0.0001] Organisational interventions more effective vs individual-focused interventions (p=0.03)

CBT = cognitive based therapy; CI = confidence intervals; FU = follow-up; MBSR = mindfulness-based stress reduction; NS = not significant; OR = odds ratio; RCT = randomised controlled trial; SMD = standardised mean difference

9. PRACTICE GUIDELINES FOR MANAGING FATIGUE

Key points

- There are numerous recommendations and opinions related to managing fatigue in workplaces, but few formal practice guidelines specifically for the healthcare industry are publicly available. Fourteen were identified in a worldwide desktop scan.
- Fatigue risk management systems are emerging in the healthcare industry as a comprehensive method for mitigating the causes of fatigue and reducing the impact fatigue has on patient safety.
- Common themes from the guidelines and policies largely reflected the evidence reported in the systematic reviews: design of work schedules, education / information, facilities and services, and workplace safety culture.

Occupational health and safety policies acknowledge healthcare workers' rights to having a safe and healthy workplace, including being free from the risks associated with fatigue. For example, the Australian Nursing & Midwifery Federation policy states that, "nurses, midwives and assistants in nursing have a right to a safe and healthy workplace environment and to perform their work free from fatigue-related health and safety risks".[74]

There are numerous recommendations and opinions related to managing fatigue in workplaces, but few formal practice guidelines specifically for the healthcare industry are publicly available. In Australia, there has been a parliamentary inquiry into sleep health awareness, which included a focus on fatigue and impaired alertness in the workplace.[75] One of the recommendations from the report released in April 2019 was for Safe Work Australia and the Cooperative Research Centre for Alertness, Safety and Productivity (Alertness CRC) to provide updated evidence-based guidelines on optimal shift structures and other workplace practices that promote alertness, productivity and ensure worker safety.

Healthcare is recognised as a sector that relies on shift work. In response to the Queensland Nurses and Midwives' Union (QNMU) call for rostering guidelines, Queensland Health has agreed to introduce a new industrial entitlement for Queensland's public sector nurses and midwives. For example, from 25 September 2018, each time a nurse or midwife is recalled to the workplace for any period between rostered shifts, that recall triggers a fresh ten-hour break before they can recommence duty.

There is an increasing awareness of the need to address burnout and build resilience in the medical workforce, especially now and beyond COVID-19. In May 2019, in recognition of the importance of mental and emotional wellbeing, the World Health Organization (WHO) added burnout to its International Classification of Diseases (ICD) list, which is used globally as a benchmark for health diagnosis. WHO also announced that it would embark on the development of evidence-based guidelines on mental wellbeing in the workplace.

9.1 Fatigue Risk Management System (FRMS)

Research has shown that restriction of work hours alone has not been successful in reducing the risk of fatigue-related medical errors. An existing industry-developed approach to manage fatigue is the aviation industry's fatigue risk management system (FRMS) that employs multi-layered defensive

strategies in their practices. It has evolved from organisational risk management and is being used not just in the aviation industry but also in healthcare, transportation and other industries.

FRMS is defined by the International Civil Aviation Organization (ICAO) as ”a data-driven means of continuously monitoring and managing fatigue-related safety risks, based upon scientific principles and knowledge as well as operational experience that aims to ensure relevant personnel are performing at adequate levels of alertness”.[76] FRMSs are scalable and flexible, and can be tailored to suit the complexity of various industries.

According to Pennsylvania Patient Safety Authority, FRMSs are emerging as a more scientific and comprehensive method for mitigating the causes of fatigue and reducing the impact fatigue has on patient safety. Typically, a FRMS will include education for staff and leadership on the effects of fatigue, risk mitigation strategies for monitoring and managing fatigue-related risk, and a process for monitoring and evaluating any fatigue-related events.

9.1.1 Queensland Health – an example of the FRMS approach

One of the most well-documented healthcare models of a comprehensive FRMS is that of Queensland Health. They first implemented the Medical Fatigue Risk Management Policy in 2011 to minimise the risk of patient harm caused by fatigue and aimed to keep employees and the work environment healthy and safe.

Its fatigue risk management approach uses the ‘Defences in Depth’ model (Figure 4, Appendix 3) that encompasses five levels of fatigue-related hazards and their associated controls. At each level, staff and the leadership team gather data and determine what controls, if any, need to be implemented to alleviate fatigue.

9.2 Guidelines and policies

Table 13 contains a list of current guidelines for managing fatigue and supporting the mental and emotional wellbeing of the healthcare workforce.

Table 13. Policies and guidelines on managing fatigue in the healthcare industry

Organisation	Title	Description
Australia		
Australian Medical Association (AMA)	National Code of Practice - Hours of Work, Shiftwork and Rostering for Hospital Doctors (2002, revised 2016)[77]	Provides practical guidance on how to manage fatigue and eliminate or minimise the risks associated with shift-work and extended working hours. The AMA suggests that this should be adopted as the minimum standard by all States and Territories.
Australian Nursing & Midwifery Federation (ANMF)	Fatigue prevention[74]	ANMF’s policy on fatigue prevention for nurses, midwives and assistants, including care workers.
Australian and New Zealand College of Anaesthetists (ANZCA)	Guideline on Fatigue Risk Management in Anaesthesia Practice (2019)[78]	Provides recommendations on how to prevent the onset and reduce the impact of fatigue at individual, departmental and organisational levels.
Queensland Health	Fatigue risk management (2014)[79]	Queensland Health’s Human Resources Policy establishes a proactive model of 5 ‘levels of control’ to manage fatigue related risks and hazards. (See Appendix

Organisation	Title	Description
		3) The policy applies to employees working for the Department of Health and non-prescribed Hospital and Health Services.
Hunter New England Health	Fatigue Risk Management Education Toolkit (2019)[80]	Based on a Fatigue Risk Management System (FRMS) that was implemented across Queensland Health in 2009, as well as learnings from global mining and aviation sectors.
Canada		
Canadian Medical Association (CMA)	Statement on physician health and wellness (2017)[81]	Identifies key factors that promote healthy training and practice environments with the view to enhancing physicians' sense of fulfilment and engagement.
Registered Nurses' Association of Ontario (RNAO)	Preventing and Mitigating Nurse Fatigue in Health Care Healthy Work Environments Best Practice Guideline (2011)[82]	Contains recommendations using the key concepts of the Healthy Work Environments Framework.
United Kingdom (UK)		
Association of Anaesthetists	Fatigue and Anaesthetists (2004, revised 2014)[83]	Provides recommendations on how to anticipate and mitigate the effects of fatigue for anaesthetists in the workplace.
British Medical Association (BMA)	Fatigue and Facilities Charter[84]	Outlines simple steps that can be taken to improve facilities and reduce fatigue for doctors and other clinical staff.
	The mental health and wellbeing of the medical workforce – now and beyond COVID-19 (2020)[85]	Contains ten recommendations for a long-term strategy to protect the health and wellbeing of staff.
United States (US)		
American Nurses Association (ANA)	Addressing Nurse Fatigue to Promote Safety and Health (2014)[86]	Registered nurses and employers in all care settings are advised to collaborate to reduce the risks of nurse fatigue and sleepiness associated with shift work and long work hours.
American Medical Association (AMA)	Steps forward (2018)[87]	Outlines nine steps to create the organisational structures that can result in more satisfied and productive physicians and other health professionals.
American Hospital Association Physician Alliance	Physician Well-Being Playbook (2019)[88]	A guide on wellbeing tailored specifically for health system leaders to address burnout in their organisations. It contains seven key steps for success and provides real-world case examples of successful interventions deployed in various health system settings to illustrate the steps.

Organisation	Title	Description
Europe		
European Commission	Occupational health and safety risks in the healthcare sector: Guide to prevention and good practice (2011)[89]	Contains technical and scientific knowledge in the prevention of the most significant risks in healthcare, including physical fatigue and burnout, and outlines practical instruments to support employers in identifying the risks.

Common themes could be identified from the guidelines and policies, and they largely reflected the evidence reported in the systematic reviews:

Design of work schedules

- No more than 12 hours scheduled within a 24-hour period, and no more than 50 hours scheduled per seven-day work week
- Minimum breaks between shifts to enable doctors a minimum 8 hours continuous sleep before resuming duty

Education / information

- Fatigue, its causes, mitigating factors and impact on health
- Sleep disorders, sleep hygiene and non-pharmacological approaches to insomnia
- A wellbeing strategy

Facilities and services

- Rest areas where healthcare staff can take short breaks from duty
- Locker rooms and showers
- Access to suitable catering facilities providing nutritional food and beverages

Workplace safety culture

- Leadership as well as peer support
- Regular review and monitoring of workload and workflow (the schedule of actual hours worked)
- Checklist to self-assess fatigue and fitness to work
- Include self-care in the organisation's code of ethics

9.3 Case examples

At the time of writing this Evidence Review, several healthcare organisations had implemented workplace strategies to address fatigue. These are described in the case examples below; however, no outcome data were available at this time.

Austin Health and Monash Health (Australia)[90]

Austin Health and Monash Health intensive care unit doctors are taking part in the trial led by the Cooperative Research Centre for Alertness, Productivity and Safety (Alertness CRC) as part of an ongoing effort to further improve workplace alertness, safety and health for staff and patients. 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.

Walsall Healthcare (UK)[91]

Staff at Walsall Manor Hospital are able to take short power naps at energy pods that are being trialled for six months. Walsall Healthcare NHS Trust encourages staff at all levels of the organisation to take some time out during their busy, and often challenging, shifts.

Novant Health (US)[92]

At Novant Health, a family physician's experience of burnout led to a self-leadership program promoting resiliency and leadership development. Called the Novant Health Leadership Development Program, the three-day program helps physicians, physician assistants, nurse practitioners and nurse leaders achieve work-life balance, recommit to their profession and prevent burnout. Results from the program show staff more engaged with organisational initiatives, take stronger leadership stances, and many have a renewed relationship with the organisation.

Geisinger Health System (US)[87]

The neurology department introduced a three-step initiative, involving a survey, a discussion on findings, and the development of metrics to track progress toward addressing the problems causing burnout. Staff members agreed to focus on two specific issues: time to room patients and support staff structure. The group came to consensus on a small number of metrics. Several years into the effort, Geisinger's initiative has resulted in care redesign, system transformation and culture change.

Geisinger Health System was one of the 22 healthcare organisations recognised by the American Medical Association (AMA) as the first recipients of the inaugural Joy in Medicine™ Recognition in September 2019. These healthcare organisations have committed to efforts that improve physician satisfaction and reduce burnout.

10. CONCLUSIONS AND IMPLICATIONS

10.1 Implications

There are some common stressors across all areas of the HCSA workforce that are reported to lead to fatigue and burnout, particularly if sustained over time. These include staff shortages and high workloads, where staff output exceeds maximal workforce capacity. For others, there are specific stressors that may be unique or exacerbated in a particular specialty. For example, in oncology and palliative care, healthcare staff routinely encounter death and dying, ongoing suffering, ethical dilemmas around treatment decisions, and complex inter-professional decision-making that overstretches their finite resources. Depletion of resources is one of the key contributing factors to the 'burnout cascade'.

Organisationally structured supports, including modifying workloads/schedules, scheduled breaks and a work culture that optimises health and wellbeing, should be encouraged. Workplace initiatives such as meditation, mindfulness and resilience training are also effective and well-accepted interventions for reducing burnout in the short term. To maximise impact, consideration should be given to offering these to complement other standard workplace-based support activities. However, they should not be the only support option as these types of activities rely on individuals' motivation to participate. Training around the Stages of Burnout Cascade (see Table 8), particularly the early indicators of hyperactivity, exhaustion, reduced activity and emotional reactions, would be helpful markers for managers and staff to recognise and proactively address mental and emotional fatigue. Sleep hygiene and fatigue awareness training is also effective, and generally heightens awareness around the impact of fatigue. However, fatigue-mitigating strategies that rely solely on workers' ability to accurately assess their own level of fatigue may be insufficient for effective implementation.

Given the significant impacts of fatigue on the health and wellbeing of the HCSA workforce and the impact on patients, it is important that leaders and senior management in all areas of healthcare recognise the need to shift cultural attitudes that accept long hours, inadequate social support and high workloads as standard. Instead, the following behaviours should be endorsed: finishing on time; staff support; non-blaming/just culture; reporting of fatigue, errors, and near misses; normalising of mental health challenges; good work-life balance; and interest in hobbies and activities outside the workplace. Re-thinking the optimisation of the health and wellbeing of the workforce is required. This could be tailored to different work environments and include close consultation with staff to ensure maximum participation and uptake. By including health and wellbeing as key performance indicators for management staff, a cultural shift can also be realised. Further research that considers the economic costs and impacts is likely to harness greater organisational motivation to effect these necessary cultural changes.

10.2 Conclusions

In keeping with evidence from the published literature and recommendations in practice guidelines, we conclude that the best strategy to combat fatigue and burnout in HCSA workers is to implement a multimodal upstream approach, with a strong emphasis on organisational preventive strategies. This includes appropriate modification of work schedules, provision of sufficient opportunities for rest between shifts, scheduled breaks during long work hours and adequate rest areas and facilities in the workplace. Alongside the organisational strategies, access to ameliorative interventions that enhance the workers' ability to cope with fatigue (e.g. relaxation courses, resilience/coping training) may provide additional benefit.

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12. APPENDIX 1

Definitions of terms

Table 14. Definitions and characteristics of terms related to mental and emotional fatigue

Item ***Example Measures***	Definition	Characteristics
Secondary traumatic stress (STS) Compassion fatigue (CF, used interchangeably with STS) *Compassion fatigue self-test (CFST)* *Secondary traumatic stress scale (STSS)* *Professional Quality of Life (ProQOL)*	STS: "natural, consequent behaviors and emotions resulting from knowledge about a traumatizing event experienced by a significant other. It is the stress resulting from helping or wanting to help a traumatized or suffering person" (Figley 1995, cited in[43]) CF: stress resulting from exposure to a traumatised individual, not direct exposure to a traumatic event itself	• Intrusion: negative intrusive thoughts about patients' trauma; difficulty separating work from personal life • Avoidance: feelings of dread working with some patients • Arousal: hypervigilance Individuals may also experience lowered frustration tolerance, anger outbursts, depression, self-destructive self-soothing behaviours (e.g. alcohol/drug use), decreased feelings of work competence, low sense of career satisfaction, and loss of hope. May occur suddenly
Burnout *Maslach's Burnout Inventory (MBI)* *Copenhagen Burnout Inventory (CBI)*	"State of physical, emotional, and mental exhaustion caused by long term involvement in emotionally demanding situations"[43] A syndrome conceptualized as resulting from chronic workplace stress that has not been successfully managed (ICD-11 definition)	3 dimensions of burnout: • Emotional exhaustion • Depersonalisation • low personal achievement Develops over time
Vicarious traumatisation *Vicarious Trauma Scale*	"Transformation in the inner experience of the therapist that comes about as a result of empathic engagement with clients' trauma material"[43]	Individuals, particularly in healthcare and mental health professions, experience disturbances in their self-identity, world-view, and cognitive frame of reference.

APPENDIX 2

Tables of study characteristics

Table 15. Characteristics of included systematic reviews on the prevalence and outcomes of physical fatigue

Reference, Year Country	No. of databases (Years searched)	No. of primary studies	Population of interest	Key outcomes measured Primary (P); Secondary (S)	Quality rating[1]
Alleblas 2017[14] Netherlands	6 (Up to 15 April 2016)	35 cross-sectional studies (N=7,112)	Surgeons conducting minimally invasive (e.g. laparoscopic/ robotic) surgery	Physical fatigue (P) Musculoskeletal injury (P) Surgical performance (S) No patient outcomes	Moderate
Bae 2014[16] US	7 (January 2000 - March 2013)	24 studies (20 cross-sectional; 4 longitudinal) (N=72,935)	Nurses - all specialties	Nurse overtime/long work hours (P) Nurse and patient outcomes (P)	Moderate
Brborović 2017[54] Croatia	3 (1950 – December 2016)	13 cohort studies (N=143,405)	Nurses and healthcare workers	Physical fatigue (P) Sickness absenteeism No patient outcomes	Moderate
Di Muzio 2019[3] Italy	4 (1992 – August 2017)	19 studies (17 cross-sectional; 1 longitudinal; 1 case study) (N=45,376)	Nurses - all specialties	Physical fatigue (P) • Sleep quality Patient safety (P) • Medication errors • Near misses	Moderate

Reference, Year Country	No. of databases (Years searched)	No. of primary studies	Population of interest	Key outcomes measured Primary (P); Secondary (S)	Quality rating[1]
Gates 2018[5] Canada	5 (2000 – November 2017)	47 (2 RCTs; 34 cross-sectional; 6 cohort; 3 before-after; 1 time-series; 1 non-comparative) (N=60,436)	Physicians - all specialties	Physical fatigue (P) Sleep duration (P) Burnout (P) Mental health (P) Work satisfaction (S) Work performance (S) Presenteeism (S) Patient outcomes (medical errors)	Strong
Groombridge 2019[53] Australia	3 (Up to 13 April 2019)	16 studies (including 5 RCTs; 6 prospective observational; 5 cross-sectional) (N=570)	Decision makers in medicine (doctors, paramedics, nurses)	Sleep quality (P) Factors that influence decision-making (P)	Moderate
Patterson 2018[7] US	6 (January 1980 – September 2016)	100 (25 experimental and 75 observational studies) (N not reported)	Emergency Medical Services Personnel (and related shift workers)	Physical fatigue (P) Patient and personnel safety (P) Sleep quality (S) Staff retention/turnover (S) Burnout/stress (S)	Strong
Stec 2018[4] Canada	1 (May 2000 – January 2017)	27 (13 primary studies and 14 reviews) – study design not reported (N not reported)	Radiologists	Physical fatigue (P) Decision errors (S) No patient outcomes	Weak

Reference, Year Country	No. of databases (Years searched)	No. of primary studies	Population of interest	Key outcomes measured Primary (P); Secondary (S)	Quality rating[1]
Sturm 2011[6] Australia	10 (Up to 1 June 2009	16 studies (2 RCTs, 5 non-randomised comparative studies, 9 case studies) (N=21,105)	Surgeons - all specialties	Fatigue (P) Surgeon performance (P) No patient outcomes	Moderate

Table 16. Characteristics of included systematic reviews on the prevalence of mental and emotional fatigue

Reference, Year Country	No. of databases (Years searched)	No. of primary studies	Population of interest	Key outcomes measured Primary (P); Secondary (S)	Quality rating[1]
Bartholemew 2018[8] US	3 (1980 to July 2015)	16 cross-sectional studies (N=3,581)	Surgeons Various specialties	Burnout (P) No patient outcomes	Moderate
Bateman 2019[43] US	3 (to March 2019)	5 cross-sectional studies (N=1,886)	Specialists in Physical medicine; and Rehabilitation	Burnout (P) No patient outcomes	Moderate
Beck 2011[32] US	3 (1981-2011)	7 cross-sectional studies (N=1,079)	Nurses – all specialties	Compassion fatigue (P) *used interchangeably with STS No patient outcomes	Weak
Cooper 2016[50] Canada	5 (to August 2013)	8 cross-sectional studies 2 pre/post intervention studies (N=1,794)	Nursing home healthcare aides	Risk factors for burnout (P) Preventive factors for burnout (P) No patient outcomes	Strong

Reference, Year Country	No. of databases (Years searched)	No. of primary studies	Population of interest	Key outcomes measured Primary (P); Secondary (S)	Quality rating[1]
Costello 2019[51] UK	4 (2009 to August 2017)	17 cross-sectional studies (N=9,194)	Healthcare staff in long-term care facility with dementia patients	Burnout (P) Psychological distress (S) No patient outcomes	Moderate
De la Fuente [34] Spain	6 (to May 2019)	14 cross-sectional studies (N=464)	Nurses in Obstetrics/ Gynaecology	Burnout (P) Psychological stress (S) No patient outcomes	Moderate
Guerra 2019[9] Portugal	3 (to September 2016)	11 cross-sectional studies (N=1,741)	Radiation therapists (oncology)	Burnout (P) No patient outcomes	Moderate
Hui 2019 [41] Hong Kong	1 (to March 2018)	14 cross-sectional studies (N=1,753)	Orthopaedic surgeons	Burnout (P) No patient outcomes	Weak
Li 2018[33] China	4 (1997-2017)	11 cross-sectional studies (N=1,981)	Emergency department nurses	Burnout (P) No patient outcomes	Strong
Lopez lopez 2019[35] Spain	8 (1984 to Jan 2018)	14 cross-sectional studies; 1 cohort study (N=3,433)	Mental health nurses	Burnout (P) No patient outcomes	Moderate
Low 2019[42] Singapore	4 (to March 2018)	47 cross-sectional and observational studies (N=22,778)	Medical and surgical residents	Burnout (P) No patient outcomes	Strong

Reference, Year Country	No. of databases (Years searched)	No. of primary studies	Population of interest	Key outcomes measured Primary (P); Secondary (S)	Quality rating[1]
McDermid 2019[18] Australia	3 (2006 – 2018)	16 cross-sectional studies; 4 qualitative studies (N=46,230)	ED nurses	Staff turnover rates in EDs (P) No patient outcomes	Moderate
Molina-Praena 2018[36] Spain	7 (to Feb 2018)	35 cross-sectional studies; 3 longitudinal studies (N=6,092)	Medical nurses	Burnout (P) No patient outcomes	Strong
Monsalve-Reyes 2018[37] Spain	7 (to Sep 2017)	8 cross-sectional studies (N = 1,110)	Primary care nurses	Burnout (P) No patient outcomes	Strong
O'Connor 2018[44] Ireland	5 (1997 – 2016)	57 cross-sectional studies; 5 longitudinal studies (N = 9,409)	Mental health professionals	Burnout (P) No patient outcomes	Strong
Parola 2017[49] Portugal	4 (1975-Janurary 2016)	8 cross-sectional studies (N=1,406)	Healthcare workers in palliative care (nurses, physicians, social workers)	Burnout (P) No patient outcomes	Strong
Pradas-Hernandez 2018[38] Spain	6 (to July 2017)	34 cross-sectional studies (N=9,074) 12 studies in meta-analysis	Paediatric nurses	Burnout (P) No patient outcomes	Strong

Reference, Year Country	No. of databases (Years searched)	No. of primary studies	Population of interest	Key outcomes measured Primary (P); Secondary (S)	Quality rating[1]
Rathert 2018[17] US	3 (to May 2017)	24 cross-sectional studies; 4 longitudinal or cohort studies (N=18,188 physicians; N=>80,000 patients)	Physicians	Medical errors (P) Quality of care (P) Burnout measured as a predictor of patient outcomes	Moderate
Rotenstein 2018[47] US	5 (1991 to July 2018)	176 cross-sectional studies; 6 longitudinal studies (N=109,628)	Physicians (excl. physicians in training)	Burnout (P) No patient outcomes	Strong
Rotstein 2019[45] Australia	3 (to April 2018)	11 cross-sectional studies (N=1,659)	Psychiatrists	Burnout (P) No patient outcomes	Moderate
Welford 2018[40] UK	7 (2007-2017)	4 cross-sectional studies (N not provided)	Midwives	Risk factors for Burnout (P) No patient outcomes	Weak
Williams 2019[48] US	3 (to Sep 2018)	41 cross-sectional studies; 1 longitudinal; 1 qualitative study (N=44,940)	Physicians	Physician outcomes (reduced activity, distress, despair) (P) No patient outcomes Burnout measured as a predictor of physician outcomes	Moderate
Yates 2019[46] UK	4 (1995 to 2017)	26 cross-sectional studies (N=5,768)	Oncologists	Burnout (P) No patient outcomes	Strong

Reference, Year Country	No. of databases (Years searched)	No. of primary studies	Population of interest	Key outcomes measured Primary (P); Secondary (S)	Quality rating[1]
Zhang 2018[39] China	4 (timeframe not stated)	21 cross-sectional studies (N=7,996)	Nurses – all specialties	Burnout (P) Compassion fatigue (P) Compassion satisfaction (P)	Moderate

Table 17. Characteristics of included systematic reviews on interventions and prevention strategies to mitigate fatigue in healthcare workers

Reference, Year Country	No. of databases (Years searched)	No. of primary studies	Population of interest	Intervention	Key outcomes measured Primary (P); Secondary (S)	Quality rating[1]
Barger 2018[57] US	5 (January 1980 – September 2016)	18 (13 quasi-experimental; 4 RCTs; 1 observational)	Emergency medical services personnel (and related shift workers) (N not provided)	Fatigue and/or sleep health education Wide variation in fatigue training (from 1-hr lectures, to 1-day workshops to more extended programs); variable formats (in-person/online, some with added modules)	Worker safety (P) Worker sleep quality (P) Worker performance (S) Patient safety (S)	Strong
Cocker 2016[65] Australia	6 (January 1990 to December 2015)	13 (10 pre-post studies; 2 RCTs; 1 quasi-RCT)	Nurses and community support workers (none identified on emergency workers) (N=671)	Various individual focused interventions (mindfulness, yoga, meditation, music therapy; building resilience, improving self-efficacy, transcranial magnetic stimulation)	Compassion fatigue (P)	Moderate

Reference, Year Country	No. of databases (Years searched)	No. of primary studies	Population of interest	Intervention	Key outcomes measured Primary (P); Secondary (S)	Quality rating[1]
Dharmawardene 2016[66] US	4 (Up to 17 November 2013)	27 (12 on health professionals; 6 controlled trials; 6 pre-post studies) 15 studies on informal caregivers not included	Health professionals (nurses, doctors, psychologists, social workers, physiotherapists) (N ranged from 8-93)	Cognitively-based meditation training (control: waitlist; active control (e.g. leadership exercises/physical exercise) and no control)	Burnout (P)	Strong
Duhoux 2017[62] Canada	5 (2000 – November 2015)	7 uncontrolled pre-post studies	Primary care nurses (N=29,020)	Interventions to promote/ improve mental health (stress reduction, mindfulness, CBT)	Burnout (P)	Moderate
Gillman 2015[67] Australia	11 (1980 – 2013)	20 quantitative and qualitative studies 3 studies evaluated effectiveness of interventions (2 pre/post studies; 1 RCT)	Oncology and palliative care nurses (N=291 in effectiveness studies)	Strategies to promote coping	Burnout (P) Coping and resilience skills	Moderate
Hill 2016[68] UK	4 (Up to 13 March 2015)	9 (7 pre-post studies; 2 RCTs)	Palliative care nurses (N=547)	Psychosocial interventions with reflective/ experiential component (support group, stress-reduction program, CBT, sleep intervention, art/music therapy)	Burnout (P)	Strong

Reference, Year Country	No. of databases (Years searched)	No. of primary studies	Population of interest	Intervention	Key outcomes measured Primary (P); Secondary (S)	Quality rating[1]
Jackson-Koku 2019[69] UK	4 (Up to August 2017)	14 (12 cross-sectional; 2 pre-post studies)	Doctors (N=4,641)	Mindfulness training	Burnout (P)	Moderate
Kang 2020[72] South Korea	6 (1991 - August 2018)	13 (7 RCTs; 6 pre-post studies; 6 used in meta-analysis)	Shift-work nurses (N =665)	Aroma-inhalation therapy; shift-rotation Interventions; physical-activity interventions; CBT	Sleep quality (P)	Strong
Lee 2016[70] Taiwan	6 (1979-2014)	5 RCTs; 2 quasi-experimental; 7 used in meta-analysis	Nurses (N=1,521)	Coping strategies education and practice, such as CBT, stress management, MBSR programs, and team-based support group	Burnout (P)	Strong
Martin-Gill 2018[58] US	5 (January 1980 – September 2016)	13 controlled studies (randomised, non-randomised and quasi-experimental)	Emergency Medical Services Personnel (and related shift workers) (N not provided)	Scheduled napping (vs no-nap conditions)	Worker safety (P) Sleepiness (S) Sleep quality (S) Reaction time (S)	Strong
Panagioti 2017[60] UK	5 (Up to 31 May 2016)	19 (17 RCTs; 2 pre-post studies)	Doctors (N=1,550)	Individual (CBT, MBSR) Organisational (scheduling; workload)	Burnout (P)	Strong

Reference, Year Country	No. of databases (Years searched)	No. of primary studies	Population of interest	Intervention	Key outcomes measured Primary (P); Secondary (S)	Quality rating[1]
Studnek 2018[59] US	5 (January 1980 – September 2016)	5 (4 prospective cohort studies; 1 observational study	Emergency Medical Services Personnel (and related shift workers) (N not provided)	Task load (i.e. perceived ability to complete tasks)	Fatigue (P) Personal performance (S)	Strong
Suileiman-Martos 2020[71] Spain	7 (Up to June 2019)	17 (8 RCTs; 9 quasi-experimental)	Nurses (N=632)	Mindfulness training	Burnout (P)	Strong
Temple 2018[73] US	5 (January 1980 – September 2016)	8 controlled studies; 4 used in meta-analysis	Emergency Medical Services Personnel (and related shift workers) (N not provided)	Caffeine (placebo)	Fatigue (P) Sleep quality (P) Reaction time (S) Personal performance (S)	Strong
Velando-Soriano 2020[56] Spain	5 (Up to December 2017)	19 (17 descriptive cross-sectional; 2 longitudinal)	Nurses (N=6,779)	Social support in workplace	Burnout (P)	Moderate
West 2016[61] US	6 (Up to 15 January 2016)	52 (15 RCTs; 37 cohort studies)	Doctors (N=3,630)	Individual (MBSR) Organisational (scheduling)	Burnout (P)	Strong

CBT = cognitive based therapy; MBSR = mindfulness-based stress reduction; RCT = randomised controlled trial

APPENDIX 3

Defences in depth framework

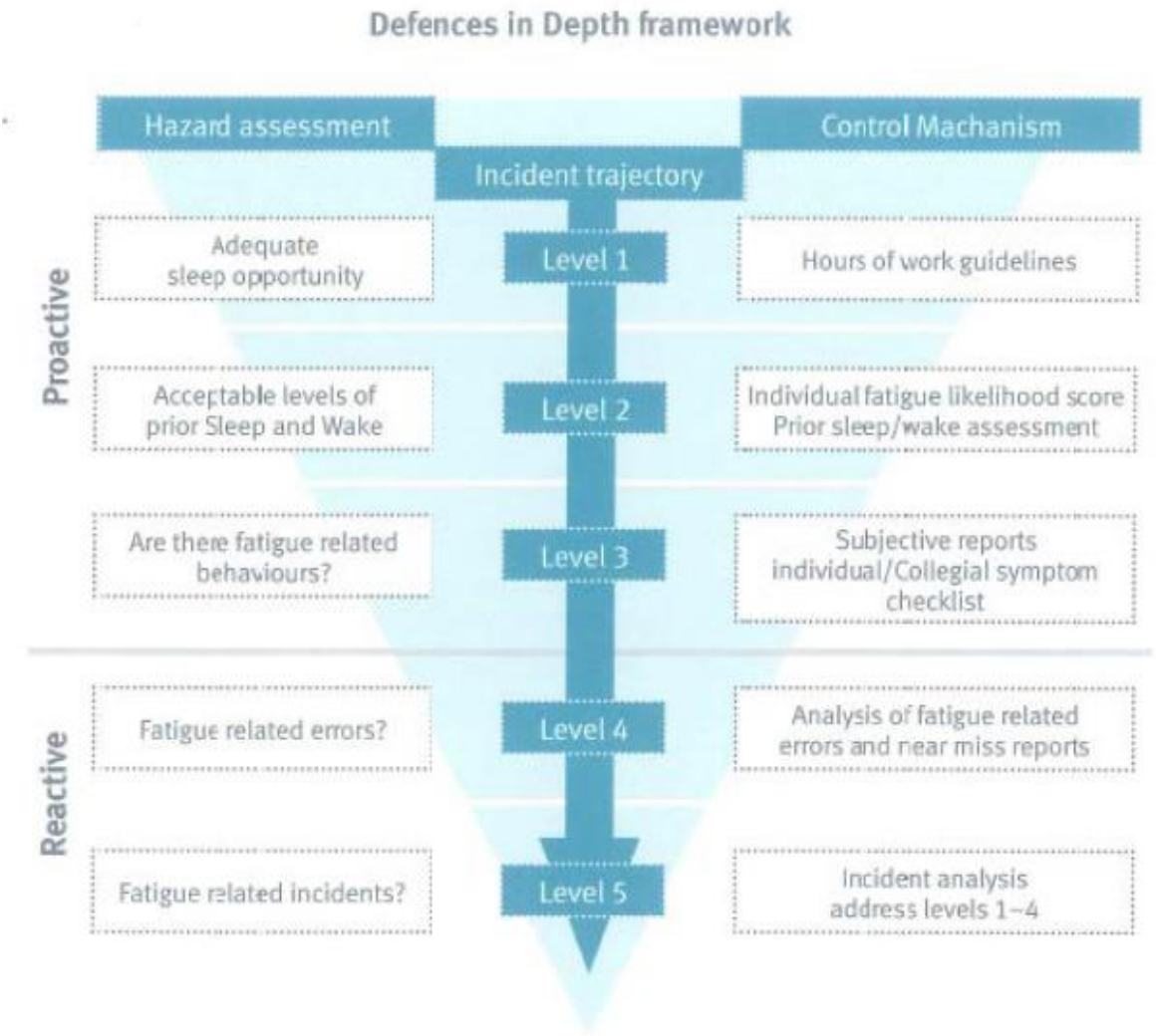

Figure 4. Defences in Depth framework

Source: Appleton Institute, Queensland Health[79]