

# Systematic reviews of interventions for preventing sleep-related injuries

## SLEEPINESS AS A RISK FACTOR FOR INJURY

Sleepiness is an important risk factor for injury. Insufficient sleep leads to a deterioration of performance, attention, motivation, mental concentration and intellectual capacity,<sup>1</sup> which leads to an increased risk of error and injury. The potential consequences of such errors vary enormously; many will be inconsequential and easily compensated for without any adverse effects, whereas others can have devastating effects.

A consensus statement endorsed by an international group of sleep experts states that "fatigue (sleepiness, tiredness) is the largest identifiable and preventable cause of accidents in transport operations (between 15% and 20% of all accidents), surpassing that of alcohol or drug related incidents in all modes of transportation".<sup>2</sup> One survey in England found that sleep-related incidents comprised 16–20% of all police-attended motor vehicle crashes.<sup>3</sup> Occupational injuries are also associated with sleepiness, with observational studies having found that workers with higher levels of sleepiness have a greater risk of experiencing an occupational injury than those with the lower levels of sleepiness.<sup>4,5</sup>

A further area of concern is the sleepiness of healthcare providers, which has been identified as an important cause of medical errors.<sup>6–8</sup> There is evidence for a relationship between medical errors and insufficient sleep: a meta-analysis found that sleep deprivation of 24–30 h reduced clinical performance by 1.5 standard deviations,<sup>9</sup> and shifts of  $\geq 24$  h duration have been found to be associated with increased risk of medical errors.<sup>10</sup> Medical errors have also been shown to occur more frequently during night shifts.<sup>11–13</sup>

## CAUSES OF SLEEPINESS

The main causes of sleepiness and the associated impairment in alertness experienced by healthy individuals are inadequate nocturnal sleep and patterns of activity that do not conform to the circadian sleep-wake cycle (eg, night work).<sup>14</sup> However, people can experience sleepiness despite having obtained adequate sleep—mental fatigue can occur after or during prolonged periods of demanding cognitive activity which requires sustained mental efficiency,<sup>15</sup> and there are time-of-day fluctuations in our alertness, which are dictated by our circadian rhythm and occur independently of sleep history.<sup>16</sup>

## INJURY PREVENTION INTERVENTIONS

There is no substitute for the restorative effects of sleep; obtaining an adequate amount of good-quality, natural sleep is by far the most effective and safe measure for preventing the detrimental effects of lack of sleep, including injury and error. However, we live in an increasingly 24-hour society, with a need and demand for services outside the conventional nine-to-five working hours. The identification of effective and safe interventions is essential to ensure that those who need to operate while experiencing sleepiness can do so safely without putting their health, or indeed the health of others, at risk. The Cochrane Injuries Group (CIG) is therefore preparing systematic reviews of the evidence in this area.

## CIG'S SYSTEMATIC REVIEWS IN PROGRESS

The reviews currently underway are including randomised trials assessing the effects of interventions for preventing the occurrence of injury or error associated with sleepiness. Separate reviews are being prepared for studies focusing on people who are sleep

deprived, those working shifts or experiencing jet-lag, and those who are not sleep deprived. A broad range of interventions are eligible in the reviews ranging from pharmacological stimulants (to promote wakefulness), pharmacological sedatives (to encourage daytime sleep), non-pharmacological interventions (including shift patterns, bright light, rest breaks) and error-prevention systems (such as alarms). The outcomes of interest are the occurrence of injuries and error, as well as cognitive performance.

To the best of our knowledge these will be the first systematic reviews aimed at assessing the effects of any intervention designed to prevent injuries caused by sleepiness, and we hope that they will serve as resources for all sectors that seek to address the burden of such harm.

The protocols for these reviews are published in the *Cochrane Database of Systematic Reviews*,<sup>17–19</sup> and work is under way on the reviews. These reviews are funded through the NHS Cochrane Collaboration Programme Grant Scheme, National Institute for Health Research, UK.

For more information about the work of the CIG, please visit the website at <http://injuries.cochrane.org/en/index.html>. All CIG's protocols and reviews are published in the *Cochrane Database of Systematic Reviews* accessed at [www.thecochranelibrary.com](http://www.thecochranelibrary.com).

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