

## We should work less at night

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There is growing amount of evidence that doctors' performance is poorer if they work for over-prolonged duties or at night. These working patterns decrease the standard of care and increase the health care expenses. Furthermore, night workers have serious health risks due to their non-physiological work shifts. Effective ways to reduce the overall consequences of fatigue and night work include

minimising the amount of work carried out at nighttime and setting up rules for maximal hours for each work shift.

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PHYSICIANS cannot adapt themselves better than any other humans to work at night or for over-prolonged duties. Irrespective of their career level or speciality physicians are unable to maintain the same level of high standard of care at nighttime or during an extended working period as they can during day time or during a normal working pattern. It is somehow odd that physicians are deeply aware of the condition of their patients but simultaneously neglect their own health or performance.

### Humans are day time creatures

All living organisms have their typical internal rhythms. Some rhythms last for seconds (heart rate), hours (hunger, thirst), a day (sleep), a month (menstrual cycle) or a year (animal reproduction and migration). These rhythms allow them to maintain the best possible performance and survival conditions and reproductive functions for these organisms. Humans are clearly day time creatures as our performances follow our internal body temperature. Human activities are at their brightest from early morning till mid-afternoon and at their minimum at nighttime. We cannot change this typical circadian pattern in short or even in long periods.<sup>1</sup>

Most of us recognise that when we become tired and fatigued our reaction times become longer, accuracy in repeated tasks deteriorates, ability to concentrate weakens, perception lapses increase, decision-making capacity deteriorates and fulfil-

ment of required tasks diminishes. Also when fatigued our capacity to solve unexpected situations decreases, communication skills deteriorate, motivation weakens, irritability worsens with weakened empathy.

If a person has worked for 24 consecutive hours his performance mirrors that of a person who has a blood alcohol level of 0.8–1.0%.<sup>2</sup> Furthermore, if a person sleeps 2 h less than he normally does each night for a week also his performance is deteriorated like after 24 h of wakefulness.<sup>3</sup> A recent meta-analysis showed that one of the best ways to counteract the fatigue produced by a whole night work is to take naps.<sup>4</sup> This could be organised in hospitals by enhancing the collaboration between different night workers.

### Performance of a fatigued doctor

There are numerous studies, which conclude that our performance becomes significantly impaired if we work for the whole night or if we are on-call and awakened several times during the night. The documentation consists of studies on both junior and senior doctors and doctors working in different fields: intubation becomes slower and more erroneous,<sup>5</sup> labour epidurals produce more unintentional dural punctures,<sup>6</sup> laparoscopic performance becomes slower with more errors,<sup>7</sup> and there is a higher failure rate and patient mortality when senior cardiologists dilate coronaries in acute myocardial infarction.<sup>8</sup>

According to a large prospective randomised study junior doctors working in the coronary or medical intensive care unit had 36% more severe medical errors, 21% more severe medication errors and 5.6 times more severe diagnostic errors if working time patterns allowed a maximum of 34 consecutive working hours instead of 16 h.<sup>9</sup> This study changed the specialising programmes of American registrars towards decreasing weekly working hours and hours for each work shift.

A recent meta-analysis showed that registrars perform at -1.54 standard deviation level if they have worked 30 consecutive hours.<sup>10</sup> This result becomes clearer if we think about Gaussian distribution curves and standard deviations. Minus 1.54 standard deviations mean that after having worked for excessive hours half of these registrars work at a low level, which normally exists only in 6% of the registrars. In other words it means that half of the individual performances are as bad as normally only 6% of these performances would be.

These numerous studies require us to ask why we as physicians, our patients and the hospitals accept this kind of poor performance produced by lack of rest. We should definitely strive for reducing the dangerous consequences of fatigue and organise night work and night duties properly.

The risks of a night worker do not disappear when he or she leaves his working place. A study comprising 2700 registrars and 17,000 monthly reports of working hours and work shifts of an extended duration documented motor vehicle crashes, near-miss incidents and incidents involving involuntary sleeping.<sup>11</sup> Extended work shifts of longer than 24 h were related to a 2.3-fold risk of motor vehicle crash and with a 5.9-fold risk of near-miss incident. Furthermore, risks of falling asleep while driving or stopping in traffic lights were also significantly increased when working extended shifts.

### Health of a night worker

There are growing amount of evidence that night work has serious consequences to our health. The risk for duodenal ulcer is fourfold greater among shift workers compared with day-time workers.<sup>12</sup> Shift work increases the incidence of cardiovascular diseases by 40%.<sup>13</sup> Rotating shift workers have a 2.3 times greater incidence of ischaemic heart disease than day-time workers.<sup>14</sup> Occupational health authorities have calculated that in Finland (five

million inhabitants) we have annually more than 250 coronary deaths due to night work.<sup>15</sup> This number is close to the annual number of deaths caused by traffic accidents in Finland. Why do we discuss about the latter so much and almost completely neglect the risks of night work?

Female rotating shift workers have a 50% increased risk of having a breast cancer when compared with day-time workers.<sup>16</sup> The aetiology for the increased risk may be linked to low melatonin and high oestrogen levels produced by artificial light at nighttime. In Finland it has been estimated that we have annually more than 100 breast cancers caused by rotating night work. Every female is aware of risks of hormonal substitution therapy but does not realise the risks of night work.

Anaesthetists are the doctors who have more night duties than any other specialist. A recent study showed that stress symptoms, burnout and exhaustion of anaesthetists are correlated with the on-call work load.<sup>17</sup> The on-call workload was also associated with suicidal tendencies of anaesthetists. Another recent study showed that burnout and low mental quality of life predicted suicidal ideation among American medical students.<sup>18</sup> These results may give one explanation to the high suicide rate of anaesthetists in different western countries.

Also many other health problems have been shown to associate with night work or extended working periods. There is evidence for increased risk of male lymphatic malignancies, metabolic disorder and diabetes. Night work has also been shown to have serious effects on reproductive health, e.g. on premature births, miscarriages and infertility.

### What can we do?

Numerous studies have identified significant adverse events produced by night work. However, we have to cover certain amount of night work in many hospital specialities. Therefore, the ways to minimise the described untoward effects is to reduce the amount of night work as much as possible and to organise night work based on best-established practices.

In Helsinki all emergency operations are classified as red, yellow or green ('traffic lights') based on the need to be operated within 6, 24 or 72 h.<sup>19</sup> Only a senior surgeon can classify a patient to be red and he or she has to be in the hospital when the

red case is to be operated. With this procedure we have succeeded to decrease the late evening and nighttime operations by over 50%. Traffic lights have also reduced numbers of re-operations, standardised several procedures and diminished, e.g. annual numbers of appendectomies.

Operation theatre staff (nurses, surgeons and anaesthetists) has less severe work-related exhaustion and fatigue than the before described traffic light system was put into effect.<sup>19</sup> Even residents are more satisfied with their current senior-supervised surgical practices than before. Therefore, we regard that patients, the staff and the hospital managers have all gained from the traffic light system.

Another approach to balance between untoward effects of night work and positive outcome of a new organisation is to think the possibilities of the European working time directive. Several European medical organisations have expressed that all time the doctor has to stay in the hospital for his on-call should be counted as work.\* This criteria would mean that each worker would have a minimum of 9–11 h of daily rest in his or her working schedule. If this would be a general rule, then nobody could any more work, e.g. for a continuous 24-h shift.

Even though shortening of extended working sessions would improve the quality of doctor's life, it would not as such reduce the work performed at nighttime. Therefore, we should get local employers to support our procedures when we aim to reduce the nighttime work load in the hospitals. This reduction would clearly improve quality of care and well-being of whole staff at the same time it reduces the health care expenses.

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\*[http://cpme.dyndns.org:591/adopted/2008/CPME\\_AD\\_Brd\\_140608\\_141\\_EN.pdf](http://cpme.dyndns.org:591/adopted/2008/CPME_AD_Brd_140608_141_EN.pdf) Web-site last assessed: 4 December 2008.