# European Working Time Directive: systematic review for evidence based decision making

UEMS Section of Occupational Medicine

**SUMMARY REPORT - October 2011**

## Research question

Do long working hours (eg. more than 48 hours per week) increase morbidity and mortality in doctors?

## Methods

Electronic and manual search of the literature (PubMed), study selection, quality appraisal and data extraction were systematically carried out by independent pairs of researchers who used pre established and agreed criteria all along the process of the review. Semi-quantitative synthesis was undertaken.

Search strategy was a combination of Mesh terms and key words: ("Workload"[Mesh] OR "Work Schedule Tolerance"[Mesh] OR "Sleep Deprivation"[Mesh] OR "working hours" OR "working time" OR "overwork*") AND ("Internship and Residency"[Mesh] OR "Physicians"[Mesh] OR physician* OR doctor* OR surgeon*) AND (health OR morbidity OR mortality OR disease OR illness* OR accident* OR death OR suicide*).

## Results

Eight studies of intermediate or high quality were identified that met the inclusion criteria, after reviewing nearly 3,000 citations and 59 full articles (figure 1). Most of the eight studies had been carried out in the United States (n=5), 2 in the United Kingdom and 1 in Canada. All except 3 studies included medical residents, junior doctors or house officers only. The other three included a comparison group of other health care workers, consultants of the same speciality and a historical group. Health outcomes were injuries (3 studies), mood disorders (6 studies), burnout (1 study) and general health (1 study) (table 1). Seven studies analysed the health effects of working more than 70 hours, only one measured the effects of working less than 60 (56 hours).

Using semi-quantitative synthesis, we found moderate evidence of an association of long working hours in young physicians with injuries, insufficient/moderate evidence for mood disorders, and the evidence is insufficient for burnout and general health (table 2).

## Discussion and conclusions

Based on currently available scientific evidence, there is moderate to insufficient evidence that working for long hours is harmful for the health of junior doctors.

To our knowledge, this is the first systematic review on the effects on physicians' health of long working hours. Limitations of the review were: 1) the source of evidence was restricted to indexed



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journals; 2) lack of control of confounding variables in most studies; 3) none of the studies analysed the potential effect of modifying factors, such as attitudes, motivation, job requirements, demands and content, organisational climate, social relationships at work, work satisfaction, lifestyles, etc.; 4) lack of evidence of a dose-response relationship and of a threshold number of extended hours above which there is a significantly higher risk; 4) the cross sectional design of some studies; 5) the heterogeneity of included studies has not allowed a more quantitative synthesis (meta analysis) so far. Therefore, future prospective or retrospective longitudinal studies are needed to define the nature and level of health risks on junior and senior physicians.

Despite these limitations we can conclude that the currently available evidence raises concerns about the risks to health and safety of long working hours in physicians. Other issues such as patient safety and sleep deprivation have been planned to be addressed by the group shortly.

Based on this systematic review of the best available scientific evidence, the UEMS Section of Occupational Medicine (Lake Bled, Slovenia, 24th September 2011) agreed that there are no scientific grounds for regulating doctors' hours separately from other professional groups. Also, that there is a growing body of scientific evidence suggesting that LWH increase morbidity and mortality in the general population and the available research to date about LWH in doctors points in the same direction. Unfortunately it is not possible at this stage to set a number of hours safe for the health of doctors, but there is no scientific evidence either for saying that this number of hours should be different than those set for other professions.

**Implications for policy makers**

This literature review did not examine the evidence which was used to support the EWTD. Neither did it consider important aspects such as patient safety, shift work or sleep deprivation. What was clear from the review was that working beyond 70-80 hours per week, or doing shifts greater than 16 hours duration were potentially harmful to doctors.

However, it is not the case that less hours working are always better, and there is a substantial body of evidence to show that in the general population worklessness is much worse for health than being employed (Waddell and Burton, 2007). While excessive working hours can be harmful, it is noteworthy that internationally the country with the longest working hours, Japan, also has the longest life expectancy. There is also evidence to show that the quality of health care is positively correlated with the number of doctors available to deliver that care (Dr Foster).

So we have the reality that excessive working hours (eg. beyond 70-80 hours per week) can be detrimental to the health of doctors, but a lack of medical resource can be detrimental to the health of patients. Concerns have been raised by some training institutions about the adequacy of training when there are reduced hours for that training, and by others about the adequacy of, and continuity of care when few doctors are available.

In the countries represented in the UEMS Section of Occupational Medicine the number of doctors per capita in a country can vary by a factor of 2 and the emphasis of the group was appropriately the protection of the health of doctors. However, given the present economic situation in Europe with all public sectors under resource constraints, the UEMS may wish to take into account the wider issues of patient care and the training of doctors.

Some of the group considers that short periods of up to 60 hours per week can be safe, provided that there are adequate rest breaks and sleep that shift patterns meet best practice, and the doctor works in a supportive psychosocial environment.

**Figures and tables**

Figure 1. **Search on the evidence in PubMed and list of references of reviewed articles (June 2011)**

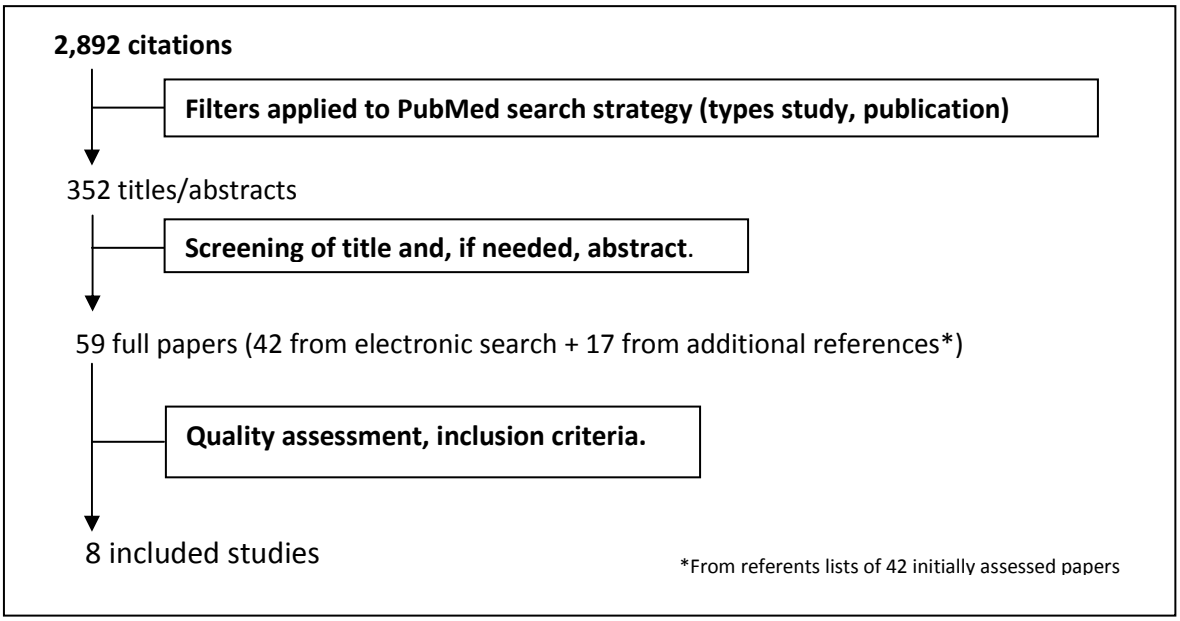

**Table 1.** Available scientific evidence on the health problems associated with long working hours: data extraction of included studies.

| Health outcome | Magnitude of the association (IC 95%[$]) | Reference | Type of study | Quality score |
|---|---|---|---|---|
| Injuries | Motor vehicle crashes:<br>2,737 residents first postgraduate year (interns), average 70.7±26.0 hrs/week.<br>• After extended shift (> 24hrs) vs. non extended shift:<br>• Crashes = RR 2.3 (1.6-3.3)<br>• Near miss accidents = 5.9 (5.4–6.3) | Barger 2005 | Cohort, prospective | High |
| | Per-cutaneous injuries:<br>350 health workers: 109 (31%) medical trainees (worked median 70 hours/week vs. 40 hours/week other HCW (P<0.001).<br>• No. of past injuries, median (range) = 1 (0-10) vs. 1 (0-24) p=0.17<br>Ever injured (%) = 63 (57) vs. 130 (54) p=0.66<br>% injuries reported, median (range): 37 (0-100) vs. 100 (0-100) p=0.001<br>• Association between fatigue and injuries: IRR, 2.94 [95% CI, 1.71-5.07] | Fisman 2007 | Case-crossover study | High |
| | Percutaneous injuries:<br>2,737 interns in postgraduate residency programs.<br>OR (95% CI) Injuries during extended vs. non extended periods:<br>• All percutaneous injuries: 1.61 (1.46-1.78)<br>• Injuries reported to OH: 1.83 (1.48-2.28)<br>• Injuries in the ICU: 1.87 (0.69-5.04)<br>• Injuries in the operating room or labour and delivery: 1.77 (1.49-2.09)<br>• Injuries in the ICU, non-ICU, or ED: 2.17 (1.56-3.00) | Ayas 2006 | Case-crossover study | High |
| Mood disorders<br>(GHQ, Symptoms Check list Depression scale, other) | 170 junior house officers, GHQ-12 (case: score ≥2) and SCLDS:<br>No association was found between number of hours worked in a week and depression. | Firth Cozens 2001 | Cohort, prospective | High |

| Health outcome | Magnitude of the association (IC 95%[$]) | Reference | Type of study | Quality score |
|---|---|---|---|---|
| | 32 male junior doctors, GHQ:<br>• GHQ-12 scores baseline vs. intervention (working night 56 hrs/week): 0.5±0.3 vs. 2.3±0.5 (p=0.005).<br>GHQ-12 scores baseline vs. control (normal working hours ?hrs/week): 0.5±0.3 vs. 1.8±0.5 (p=0.02) | Smith 2006 | Before and after cross sectional evaluation | Intermediate |
| | General surgery residents, 4 different hospitals (public, private, university, non university/urban, rural); comparison group: societal/historic group of 332 college students.<br>Hours per week: general surgery residents 78.9 (11.5 SD) vs. all specialities combined 55.8 hours.<br>• Symptom Checklist-90 (SCL-90-R):<br>• Mean psychological distress score, surgery residents vs. controls= 59±13 vs. 50 ±10) (p <0.0001)<br>• 38% surgical residents scored above 90th percentile of controls; 72% surgical residents scored above the 50$^{th}$ percentile of controls | Zare 2004 | .<br>Cross sectional | Intermediate |
| | Orthopaedic surgery residents: 7 standard call and 9 night float.<br>SF-36:<br>• Mental health score (p=0.72):<br>Standard vs. night, baseline = 65.71 (7.61) vs. 57.33 (22.63)<br>Standard vs. night, follow up = 60.80 (11.45) vs. 52.00 (15.49)<br>• Mental health component summary score (p=0.39):<br>Standard vs. night, baseline = 40.21 (7.61) vs. 34.84 (14.06)<br>Standard vs. night, follow up = 42.40 (6.23) vs. 30.15 (10.71)<br>• Regression analysis: increased number of hours in hospital correlated with significantly lower SF-36 scores in almost all domains. | Zahrai 2011 | Cohort, prospective | High |
| | Orthopaedic surgeons, GHQ-12 (case: score ≥4):<br>Residents (70.24±20.39hrs/week) vs. consultants (62.8 18.2hrs/week) = 16% vs. 19% (ns) | Sargent 2009 | Cross sectional | Intermediate |

| Health outcome | Magnitude of the association (IC 95%[$]) | Reference | Type of study | Quality score |
|---|---|---|---|---|
| Burnout (MBI) | Orthopaedic surgeons: Residents (70.24±20.39hrs/week) vs. consultants (62.8±18.2hrs/week):<br>Emotional exhaustion = 32% vs. 28.4% (p<0.04)<br>Depersonalization = 56% vs. 24.8% (p<0.001) | Sargent 2009 | Cross sectional | Intermediate |
| General Health | Orthopaedic surgery residents, comparison groups:<br>7 standard call: (57.1% did >80hrs/week at baseline; 80%% at follow-up)<br>9 night float: (77.8% did >80hrs/week at baseline; 71.4% at follow-up);<br><br>SF-36:<br>• General health score (p=0.41):<br>Standard vs. night, baseline = 77.57 (24.25) vs. 62.11 (17.47)<br>Standard vs. night, follow up = 84.20 (16.50) vs. 56.43 (24.89)<br>• Physical health component summary score (p=0.015):<br>Standard vs. night, baseline = 52.01 (13.33) vs. 46.16 (13.15)<br>Standard vs. night, follow up = 56.15 (2.18) vs. 39.32 (9.80) 0.015<br><br>• Vitality score (p=0.20):<br>Standard vs. night, baseline = 51.43 (15.74) vs. 51.67 (14.58)<br>Standard vs. night, follow up = 51.00 (10.84) vs. 48.57 (14.92) 0.20 | Zahrai 2011 | Cohort, prospective | High |

ns = non statistical

- Spurgeon A, Harrington JM. Work performance and health of junior hospital doctors: a review of the literature. Work and Stress 1989;3:1 17-28.
  "Many studies have shown stress problems and poor mental health in junior hospital doctors, an occupational group in which extended hours have long been the norm" (Spurgeon 1989)

Table 2. **Available scientific evidence on the health problems associated with long working hours: synthesis of the evidence.**

| **Health outcome** | **Degree of evidence*** | **Magnitude of the association**** | **Studies** |
|---|---|---|---|
| • Injuries | ++ | ++/+++ | Barger 2005; Fisman 2007; Ayas 2006 |
| • Mood disorders | +/++ | +/++(?) | Firth Cozens 2001; Smith 2006; Zare 2004; Zahrai 2011; Sargent 2009 |
| • Burnout | + | - | Sargent 2009 |
| • General health | + | - | Zahrai 2011 |

* Strong evidence (+++): consistent results in more than 2 studies of high quality; Moderate evidence (++): consistent results in one high quality study and one intermediate, or between some studies of intermediate quality; Insufficient evidence (+): identification of only one study or inconsistent results across studies; Evidence of no association (-): consistent results of a non association two or more studies.