

Journal Meeting

時間：2011年06月25日

指導醫師：主治醫師 蔡同堯

報告醫師：PGY 黃仁華

BMJ

RESEARCH

Impact of reduction in working hours for doctors in training on postgraduate medical education and patients' outcomes: systematic review

S R Moonesinghe, consultant and honorary senior lecturer in anaesthesia,¹ director,² J Lowery, specialty trainee, anaesthetics,³ N Shahi, specialty trainee, surgery,⁴ A Millen, specialty trainee, surgery,⁵ J D Beard, honorary professor of surgical education and consultant in vascular surgery⁶

Introduction

- There has been a progressive reduction in the working hours of doctors in training in Europe and North America over the past 20 years.
- Code 405 was implemented by the New York State Department of Health in 1989 and limited doctors in that state to working an average of 80 hours a week.
- This was followed by national guidelines recommended by the US Accreditation Council for Graduate Medical Education (ACGME) in 2003.

Introduction

- In the UK, a progressive reduction in junior doctors' working hours has resulted from the New Deal negotiated by the British Medical Association and the European Working Time Directive (93/104/EC).
- The aim => to improve working conditions and safety.
- The medical profession has raised concern about the potentially adverse effects on postgraduate training for junior doctors and the provision of high quality care for patients.

Methods

- MOOSE (Meta-Analysis of Observational Studies in Epidemiology) guidelines.
- Previously published recommendations for systematic reviews of observational studies.

Methods - Data Sources

- 1st January 1990 => 20th December 2010
- Medline, Embase, Google Scholar, the Educational Resources Information Centre (ERIC), the System of Information on Grey Literature in Europe (SIGLE).
- No language restriction.
- 49,084 articles.

Methods - Search Strategy

- Medline
MeSH terms :
“Medical Staff, Hospital”, “Personnel Staffing and Scheduling” or “Workload” or “Time Factors”
“Education, Medical, Continuing” or “Education, Medical, Graduate” or “Specialization” or “Education, Medical” or “Internship and Residency”.
- We searched the following keywords separately:
“medical training” and “European Working Time Directive”.

Methods - Search Strategy

- Medline : 39 / 16,132
- Embase : 7 / 8,556
- Google Scholar : 27 / 18,155
- SIGLE : 0 / 6,210
- ERIC : 0 / 31

Methods - Study Selection

- the impact of a **change in duty hours**, with details reported of what change had been implemented,
- an **objective measure of outcome** related to postgraduate medical training,
- **patient safety**,
- **clinical outcome**.

Methods - Study Selection

- **subjective measures**, such as surveys or questionnaires, unless the results included an objective externally validated measure, such as case numbers or results of assessments.
- **assessing** the effect of changes in duty hours on **medical staff** (for example, measures of fatigue, physical or psychological wellbeing) as opposed to patients.



Methods - Data Extraction

- 2 reviewers (from SRM, JL, NS, and AM)
- Using standardised data extraction forms.

Methods - Data Extraction

For studies of training outcomes

- number of participants,
- study design,
- institutional setting, source,
- method of data collection;
- the study was single or multicentre;
- overall institutional activity was included in studies that used case volume as an outcome measure;
- statistical analysis.

Methods - Data Extraction

For studies of patients' outcomes

- number of participants, study design,
- institutional setting,
- source and method of data collection,
- the study was single or multicentre,
- the study included a control group,
- outcomes were risk adjusted,
- comparison of patients' characteristics at baseline,
- statistical analysis.

Results

Table 7 | Summary of changes and recommendations in duty hours

Variable	Code 4051 (New York State, 1989)	ACGME recommendations ² (US, 2003)	IOM recommendations ³ (US, 2009)
Maximum duty hours/week	80 hours, averaged over 4 weeks	80 hours, averaged over 4 weeks	80 hours, averaged over 4 weeks
Maximum shift length	24 hours with 3 hour transition period	30 hours (admitting patients up to 24 hours, then 6 additional hours for transitional and educational activities)	30 hours (admitting patients for up to 16 hours, plus 5 hour protected sleep period between 10 pm and 8 am, with remaining hours for transitional and educational activities)
Minimum rest period between shifts	8 hours. At least one 24 hour period off duty/week	10 hours after day shift	10 hours after day shift; 12 hours after night shift; 14 hours after any extended duty period of 30 hours, not returning until 6 am next day

Results

New Dealers (UK, 1996)	EWTDs (UK, 2004)	EWTDs (UK, 2009)
56 hours, averaged over 26 weeks	56 hours averaged over 26 weeks	48 hours averaged over 26 weeks
No restriction	13 hours	13 hours
8 hours between shifts, 24 hours every 7 days or 48 hours every 14 days	11 hours between shifts	11 hours between shifts

Results - Medical Training

- 41 studies of postgraduate medical training.
- All were "before and after" cohort studies.
- ✓ 28 in surgery or surgical subspecialties (22 in US, 6 in UK)
- ✓ 5 in OBS or GYN, or both (4 in US, 1 in UK)
- ✓ 6 in anaesthesia (all from the UK)
- ✓ 1 US study was in paediatrics
- ✓ 1 UK study was of medical trainees

Results - Medical Training

- 2 showed an **improvement** in training outcomes after a reduction in working hours
- 12 reported a **deterioration**
- 27 showed **no change** or a combination of positive and negative results

Results - Medical Training

Improvement : 2

- 1 UK medical trainees
- 1 US surgical residents
- Both were of low methodological quality as they did not report statistical analyses of the results.

Results - Medical Training

Deterioration : 12

- 3 UK surgery
2 UK anaesthesia
1 UK GYN
6 US surgery
- Eleven of these reported **operative caseload** as an outcome measure.
- One UK study used **continuity of care** by neurosurgical trainees as an outcome.

Results - Medical Training

No change : 27

- 4 US OBS and GYN
16 US surgery
4 UK anaesthesia
3 UK surgery
- 20 US studies, 12 used **operative caseload** as an outcome measure, 2 analysed postgraduate **examination** results, and 6 used both.
- Only 4 reported both the actual number of hours worked by trainees before and after rota changes and the shift patterns worked.

Results - Medical Training

Postgraduate training results according to outcome measures analysed

- Training Opportunities
- Examination scores
- Caseload

Results - Medical Training

Training Opportunities

- 6 studies used measures of training opportunities (such as supervised **operating lists** or **teaching sessions**).
- ✓ 1 UK, internal medicine, improvement in attendance at training sessions
- ✓ 1 UK, anaesthetists, deterioration in the number of training opportunities in obstetric anaesthesia
- ✓ 4 UK, anaesthetics, no change

Results - Medical Training

Examination scores

- 9 studies, all originating from the US, measured changes in examination scores for cohorts of trainees before and after duty hour reforms.
- ✓ 2 found an improvement in scores
- ✓ 7 found no difference

Results - Medical Training

Caseload (operative caseload)

- 37 studies included caseload as an outcome measure.
- ✓ 1 study, US, increase in caseload.
- ✓ 11 studies, reduction in operative caseload.
6 US, 2 UK, surgery
1 UK, GYN
2 UK, anaesthesia
- ✓ 25 studies, no change in operative caseload.
14 US, 3 UK, surgery
4 US, OBS and GYN

Results - Medical Training

Caseload (operative caseload)

- Schneider et al's 2007 study in US surgical residents was the only paper to report an increase in caseload after a reduction in working hours.
- It also found an improvement in postgraduate examination scores.
- This was a **single centre** study of **low methodological quality**, however, as there was **no statistical analysis** conducted on the results.

Results - Medical Training

Reduction in Hours

- 72 → 48 hrs/week (UK surgery)
- 58 → 54 hrs/week (UK surgery)
- 60 → 56 hrs/week (specialist paediatric)
- 72 → 58 hrs/week (obstetric anaesthesia)

Results - Medical Training

- Most papers found no difference in caseload associated with a reduction in working hours.
- 4 US papers examining surgical training analysed **large multicentre cohorts**.
- The **actual working hours** of the residents was **not reported** and so compliance with duty hour recommendations could not be assessed.

Results - Patients' Outcomes

- 34 papers documented the impact of reducing the working hours of doctors in training on patient outcomes.
- "before and after" cohort studies, one was a randomised controlled trial.
- Most studies reported clinical outcomes such as **morbidity and mortality** or measures of resource use such as **length of stay**.
- 7 reported on patient safety indicators such as rates of **adverse events** or **medical errors**.
- 1 used **continuity of care** in paediatrics.

Results - Patients' Outcomes

Studies showing

- Improved : 4
- Worse : 2
- No difference : 28

Results - Patients' Outcomes

Improved outcomes : 4

- One RCT of high methodological quality => critical care units + coronary care units
- Patient safety indicators including **medical and diagnostic error rates** were compared and found to be improved.

up to 37 continuous duty hours
77-81 hours / week

eliminated extended shifts
60-63 hours / week

Results - Patients' Outcomes

Improved outcomes : 4

- Only one of the remaining three cohort studies was a large multicentre study.
- Trauma admissions, a 4-year period. teaching hospitals V.S. non-teaching centres
- The authors found improvements in mortality and length of stay in intensive care in teaching departments that were not seen in the control hospitals.

Results - Patients' Outcomes

Worse outcomes : 2

- Two large studies in trauma and orthopaedics, both from the US, found that rates of complications, but not mortality, worsened with a reduction in working hours.
- Browne et al's multicentre analysis, surgery for hip fracture.
=> 9 postoperative complications was worse in teaching hospitals (but not in control nonteaching hospitals).

Results - Patients' Outcomes

Worse outcomes : 2

- Salim et al's study of trauma patients showed an increase in complication rates in a large single centre cohort over four years.
(two before and two after duty hour reform)
- Furthermore, though the differences in complication rates were significant, they were small.
(total complication rate 5.64% vs 7.28%)
- Therefore the clinical relevance of these changes could be questioned.

Results - Patients' Outcomes

No difference : 28

- McIntyre et al examined outcomes of emergency medical admissions over a two year period and found similar mortality, length of stay in hospital, and 30 day readmission rates.
- Several of these analysed relatively small or single centre cohorts of patients and might have been underpowered to detect changes in some of the outcomes reported.
- These included studies in critical care, obstetrics, neonatology, paediatrics, trauma, surgery, and internal medicine.

Results - Patients' Outcomes

No difference : 28

- In Veterans Affairs hospitals, outcomes for medical patients improved with duty hour reforms in hospitals of higher "teaching intensity"; for surgical patients, however, there was no significant change in outcome associated with the reduction in working time.
- In the study of Medicare hospitals, however, there was no apparent change in outcome in either medical or surgical patients.

Discussion

- When duty hours are reduced to below 56 or 48 hours a week, in accordance with European legislation, we could not draw conclusions on the impact on patients outcomes or medical training because of conflicting results from different institutions and specialties and the poor quality of some of the studies evaluated.

Discussion - Study Limitations

- The heterogeneity of the included studies does not permit meta-analysis of the results.
- The included studies varied considerably in quality.
- The outcome measures used in the individual studies varied.
- Publication bias could have affected our results.

Discussion - Scope and Limitations of Publish Literature

- Duty hour regulations : in the US occurred in 1989 and 2003, in **Europe more recent**.
- Unable to identify any European studies that fulfilled our inclusion criteria and were conducted **outside the UK**.
- Most studies of postgraduate education analysed cohorts of doctors in training in "**craft specialties**" that have an emphasis on technical competence.
- There is a much **larger** body of literature originating from the **US** compared with the UK.

Discussion - Impact on Patients' Outcomes

- Working fewer hours => less tired, making fewer errors, and that patients' outcomes should improve.
- But in different healthcare systems indicate that **other influences** might be at least as important.
 - ✓ the number and quality of **clinical handovers**
 - ✓ the level of **supervision** of doctors in training
 - ✓ the **continuity** of care provided by the entire multidisciplinary team
 - ✓ the standard of **nursing care**
 - ✓ many **other** differences within and between institutions in delivery of healthcare

Discussion - Impact on Educational Outcomes

- **Insufficient data** from studies of high methodological quality to be able to draw firm conclusions on the impact of the European Working Time Directive or New Deal in the UK.
- When interpreting these findings, one should consider that, alongside the reduction in working hours, **other changes** in postgraduate medical education and provision of healthcare might influence the quality of training.

Discussion - Impact on Educational Outcomes

- In the UK, training has moved away from an apprenticeship model to **a time limited programme**, with greater emphasis on clinical supervision.
- Concurrently, and consequently, there has been a **change in the role** of the junior doctor in healthcare service delivery.

Discussion - Impact on Educational Outcomes

- One of the difficulties in evaluating the effects of changes in working hours is the **lack of validated measures** for assessing the outcome of training.
- We chose to focus on studies that reported **objective measures**, such as **operative case numbers** or **clinic attendances**, as these are less likely to be biased than subjective surveys of the profession's opinion.
- 100 simple cases V.S. 10 complex procedures

Discussion - Impact on Educational Outcomes

- Furthermore, quantitative measures such as procedural volume must be differentiated from measures of **knowledge, skill, attitude, and behaviour**, all of which are essential attributes for the independent medical practitioner.
- Use of **other assessments** of procedural skill, such as cumulative sum (CUSUM) analysis, and evaluating the association of the outcomes of these assessments with patients' outcomes also requires further evaluation.

Conclusions and Policy Implications

- In this review, studies reporting patient safety and clinical outcome measures examined only the **immediate effect** of reductions in duty hours on care of patients.
- However, the **potential impact** of such changes can be fully evaluated only some **years after** duty hours reforms.

Conclusions and Policy Implications

Suggestions

- A **consensus** should be reached by the medical profession on appropriate measures **to assess** the quality of postgraduate medical training.
- Once assessment measures have been agreed, they are confidentially **reported to the organisations** responsible for the quality assurance and regulation of training.
- We recommend the conduct of **longitudinal studies**, evaluating the relation between postgraduate training and objective measures of outcomes in the first few years of independent practice.

Conclusions and Policy Implications

- It has been stated that "training is patient safety for the next 30 years."
- We have **highlighted the need** for a more systematic approach to evaluating the impact of legislative changes of duty hours and the challenges of conducting high quality audit and research in this area.

Conclusions and Policy Implications

- In the future, it will only be through the conduct of **large, collaborative, multicentre** evaluations of training and outcome that both the public and the profession can be reassured that the standard of medical training, and therefore of future care of patients, is of the **highest possible quality** and will be **maintained or improved** over time.

Thanks for your listening.