Mortality in a teaching hospital during junior doctor changeover: a regional and national comparison

Concerns about whether the junior doctor changeover in the UK is associated with an increased risk of death have been reawakened by a retrospective study (Jen et al, 2009). Examination of overall mortality data has consistently failed to demonstrate any increase in mortality during the changeover. However, regional and national trends may mask this increase, so a study was undertaken to compare mortality in a busy London teaching hospital with regional and national trends. No evidence of an increase in mortality in August was found for any of the time periods examined, even after comparison with regional and national trends. The authors conclude that examination of overall mortality data is a blunt and impractical instrument for settling the question of whether an increase in morbidity and mortality occurs. Preventable morbidity and mortality should be audited.

Concerns about whether the junior doctor changeover in the UK is associated with an increased risk of death have been reawakened by a recent retrospective study. Examination of overall mortality data has consistently failed to demonstrate any increase in mortality during the changeover. However, regional and national trends may mask this increase, so a study was undertaken to compare mortality in a busy London teaching hospital with regional and national trends.

Introduction

It is a common perception that the period immediately following the first Wednesday in August, when new junior doctors begin their first jobs, is an unsafe period to be admitted to hospital in the UK; this has been dubbed 'the killing season'. These concerns were heightened by the introduction of the European Working Time Directive and a new computerized recruitment system. A similar phenomenon has been observed in the USA where it is referred to as the 'July phenomenon'.

Studies looking at mortality alone showed little evidence for an increase in mortality in August (Aylin and Majeed, 1994). However, a retrospective cohort study demonstrated that patients admitted during the first week of August had an 8% greater adjusted odds of death than patients admitted during the last week in July; in absolute terms this amounted to 45 extra deaths in approximately 300 000 admissions (Jen et al, 2009). This is 45 too many, but needs to be interpreted in the context of the total number of deaths seen. It is also unclear whether the deaths in this study were preventable.

There are well-documented seasonal trends in mortality which should be accounted for to place the junior doctor changeover period in context. The authors therefore undertook a study to look at mortality in a London teaching hospital, and compare it to regional and national trends. The aim was to determine whether regional and national trends mask an increase in mortality during the junior doctor changeover.

Methods

The authors examined three time periods during which there were paradigm shifts in both working patterns and recruitment methods: 1990–3 (pre-Calman), 2000–3 (introduction of European Working Time Directive) and 2007–9 (completion of European Working Time Directive implementation and introduction of Modernising Medical Careers). For each time period, daily mortality during July and August and monthly mortality throughout the year were examined.

Dr Vijay Sharma *is Specialist Registrar in the Department of Pathology, Aberdeen Royal Infirmary, Aberdeen AB25 2ZD and Honorary Clinical Lecturer in the Division of Applied Medicine, School of Medicine and Dentistry, University of Aberdeen, Aberdeen,* **Dr Ian Proctor** *is Clinical Lecturer and Honorary Specialist Registrar in Histopathology and* **Dr Alison Winstanley** *is Consultant Pathologist in the Department of Pathology, University College London Hospital, London*

Correspondence to: Dr V Sharma (Vijay.Sharma1@nhs.net)

Table 1. Monthly mortality data* for a London teaching hospital, London and nationally over the periods 1990–3, 2000–3 and 2007–9

	1990–3			2000–3			2007–9		
	Hospital	London	National	Hospital	London	National	Hospital	London	National
January	82	6722	56 639	98	5507	56 337	65	4956	50 111
February	79	5869	48 693	89	4848	44 264	59	4258	42 731
March	80	5878	49 234	90	5138	46 643	62	4360	43 769
April	70	5596	46 447	78	4836	43 770	62	4097	41 317
May	72	5392	45 162	91	4568	42 845	54	3939	39 906
June	72	5130	42 771	78	4261	40 589	48	3739	37 354
July	64	5080	42 802	79	4348	41 419	49	3767	37 919
August	67	5052	42 120	78	5105	40 726	44	3644	37 227
September	61	4973	41 761	86	4226	40 003	55	3626	36 860
October	73	5581	46 700	85	4801	43 639	52	3987	40 722
November	67	5809	48 476	83	4839	44 608	47	4157	41 308
December	69	6527	53 654	90	5262	49 605	61	4834	49 237

*Data are rounded to the nearest whole number

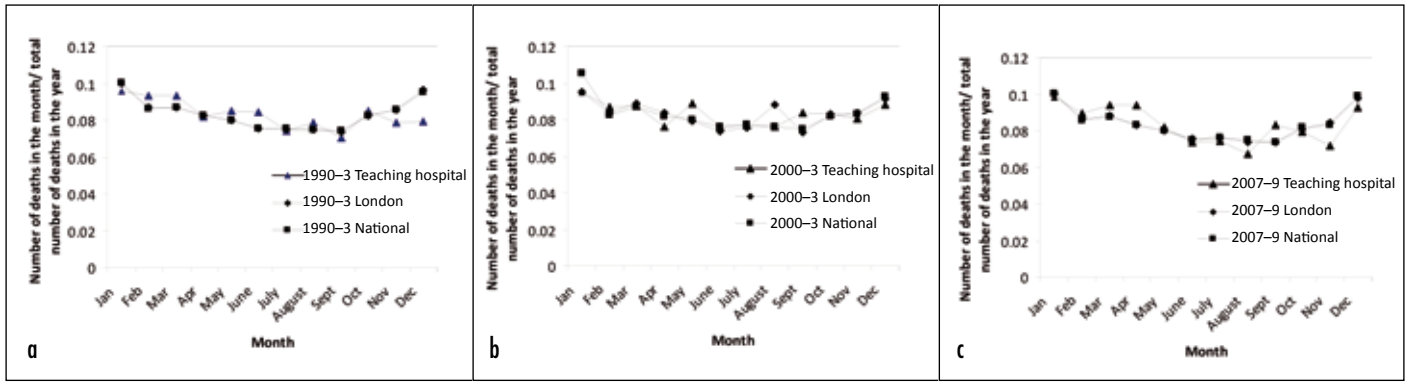


Figure 1. Monthly mortality rates for the periods (a) 1990–3, (b) 2000–3 and (c) 2007–9, normalized to the total number of deaths in the year.

Mortality data from the London teaching hospital were obtained from records of death certification. For 1990–3 and 2000–3, these included deaths which occurred at other affiliated regional hospitals which had closed by 2007. Mortality data for the London region and England and Wales were obtained from the Office of National Statistics. Data on regional and national admission rates were unavailable so it was not possible to examine trends in mortality rates.

Daily and monthly mortality data were normalized to the total number of deaths in the year for monthly data or to the total number of deaths in July and August for daily data. The normalized data for the London teaching hospital, the London region and England and Wales over time were then compared with each other using a repeated-measures ANOVA with Bonferonni post-hoc test, searching for a significant interaction between time and region. Statistical analysis was performed using SPSS.

Results

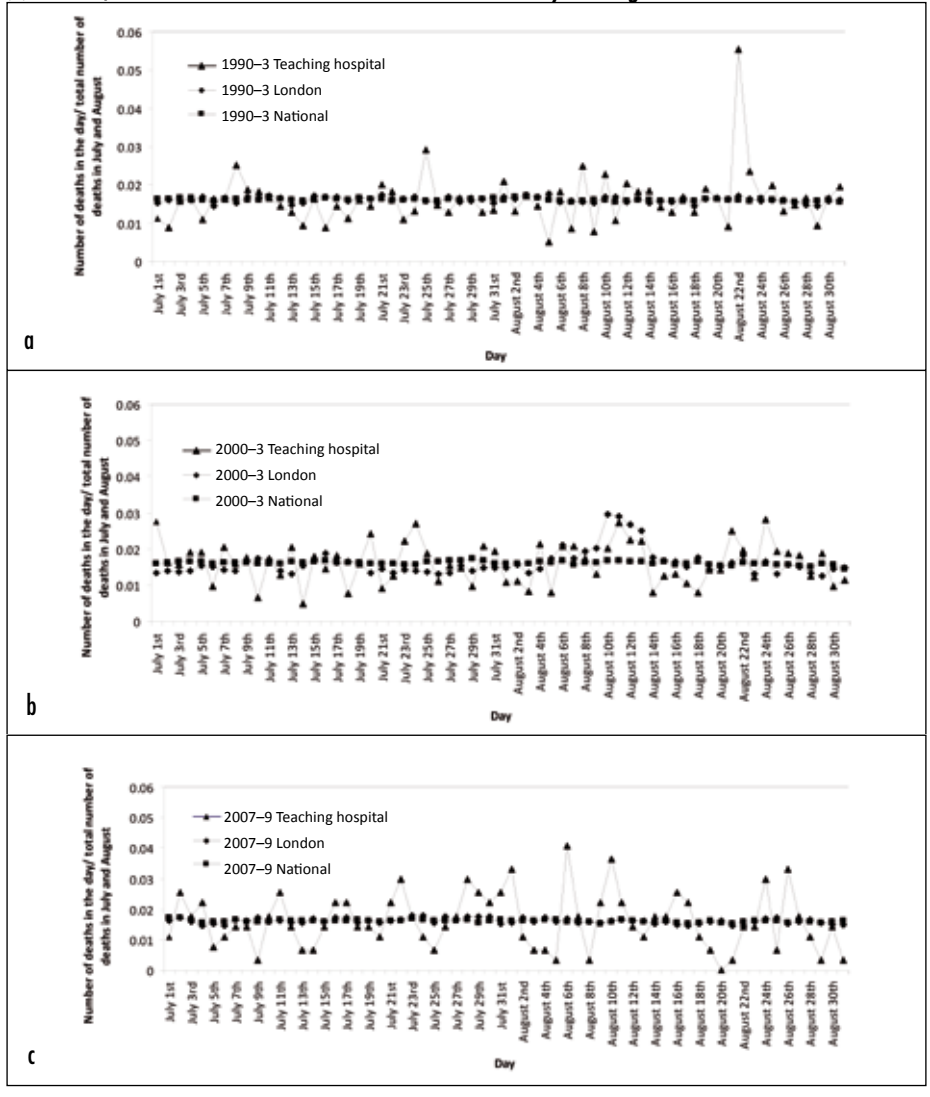
Mortality rates for the London teaching hospital showed no evidence of an increase in mortality in August for any of the time periods examined (*Table 1*) (*Figure 1*). Furthermore, examination of daily mortality rates over July and August did not reveal any significant spikes that might have been masked in the monthly data for any of the time periods (normalized data in *Figure 2*; absolute figures not shown).

Examination of the trends showed that the mortality trends at the London teaching hospital followed the regional trends with no statistically significant interactions between time and the London teaching hospital region for either monthly (1990–3, P=1.0; 2000–3, P=1.0; 2007–9, P=1.0; *Figure 1*) or daily mortality (1990–3, P=0.61; 2000–3, P=1.0; 2007–9, P=1.0; *Figure 2*). The regional trends followed the national trends, with the exception of the 2000–3 period in which there was a transient increase in deaths in the London region in August.

Discussion

To the authors' knowledge, this is the first study to compare hospital mortality with

Figure 2. Daily mortality rates during July and August for the periods (a) 1990–3, (b) 2000–3 and (c) 2007–9, normalized to the total number of deaths over July and August.



regional and national mortality trends. The trends were consistent across all time periods examined, with the exception of a peak in deaths in August in the London region for 2000–3 during which the national mortality rate remained constant. This indicates that seasonal mortality trends are not masking an increase in deaths over the junior doctor changeover period. Furthermore, reforms to the health system which have occurred since 1990 did not exacerbate or introduce a detectable killing season. This is consistent with the general pattern emerging in the literature, which is that the increase, if present, is too small to be detected in overall mortality data. It is therefore too small to be referred to as a killing season.

There remains considerable concern within the medical profession about the August changeover. In a survey of over 700 doctors, the majority felt that the single August changeover day for junior doctors has a negative effect on patient care (Vaughan et al, 2011). The possibility of an increased risk of death during the junior doctor changeover was raised by the previous retrospective cohort study and this concern is not assuaged by these data. The requirement for very large numbers to observe a statistically significant increase in the risk of death means that examination of overall mortality data will only reveal the harmful effect being sought after many years. This makes examination of overall mortality data a blunt and impractical tool to settle the question of whether a clinically significant increase in morbidity and mortality occurs during the junior doctor changeover. Furthermore, this approach is clearly impractical if preventable deaths are to be detected and practice changed in real time.

The authors' recommendation is that further studies should not examine overall mortality data, but should instead focus on the detection of preventable morbidity and mortality. It would be worth carrying out a multicentre study looking at preventable morbidity and mortality across all wards on which new junior doctors are working. Although this could be undertaken in a retrospective study, a properly powered prospective study would be preferable. The study should also determine whether incidents of preventable morbidity or mortality occurred because of the actions of inexperienced new doctors. The criteria for making such a determination will require careful thought, and there may be some value for the investigators in providing a weighting to their belief that the incident would have been averted by a more experienced doctor (e.g. probably, possibly, unlikely). This would allow the true scale of the problem to be assessed. In addition, centres should regularly audit morbidity and mortality during the changeover period to allow any problems to be identified and rectified as they occur. Only with a specific focus on preventable morbidity and mortality can the issue of increased mortality during the junior doctor changeover be definitively addressed and laid to rest.

Conclusions

Regional and national trends do not mask an increase in deaths during the junior doctor changeover. Although this finding does not assuage concerns raised about the risk of death during this period, which was demonstrated using larger numbers of patients over a longer period, it does highlight that any such increase is too small to be referred to as a killing season. Future studies and ongoing audit should focus on preventable morbidity and mortality and should include an assessment of the extent to which adverse events were related to the actions of inexperienced doctors. BJHM

LEARNING POINTS

- Regional and national mortality trends do not mask an increase in mortality during the junior doctor changeover.
- No increase in mortality during the junior doctor changeover is apparent in overall mortality figures. Any increase that might be present is therefore subtle and too small to be referred to as a 'killing season'.
- Concerns about the increased risk of death during the changeover are not assuaged by these data, as these were determined using larger numbers of patients over a longer time period.
- Future studies and ongoing audit should focus on preventable morbidity and mortality. These should include an assessment of the extent to which adverse events were related to the actions of inexperienced doctors, and the likelihood that they could have been prevented by a more experienced doctor.

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Conflict of interest: none.

Aylin P, Majeed FA (1994) The killing season--fact or fiction? *BMJ* **309**: 1690

Jen MH, Bottle A, Majeed A, Bell D, Aylin P (2009) Early in-hospital mortality following trainee doctors' first day at work. *PLoS One* **4**: e7103

Vaughan L, McAlister G, Bell D (2011) 'August is always a nightmare': results of the Royal College of Physicians of Edinburgh and Society of Acute Medicine August transition survey. *Clin Med* **11**: 322–6