Mortality among male anaesthetists in the United Kingdom, 1957-83

H A W NEIL, J G FAIRER, M P COLEMAN, AMANDA THURSTON, M P VESSEY

Abstract

A cohort of 3769 male anaesthetists resident in the United Kingdom between 1957 and 1983 was followed up for a total of 51 431 person years of observation. All subjects were fellows of the Faculty of Anaesthetists and held full registration with the General Medical Council. With all men in social class I being taken as the standard, the standardised mortality ratio among anaesthetists for all causes of death was 68 (95% confidence interval 59 to 77) and the standardised mortality ratio for all cancers was 50 (95% confidence interval 36 to 67). There was no significant excess mortality from lymphomas or leukaemias, but 16 of the 221 deaths in anaesthetists were due to suicide, giving a standardised mortality ratio of 202 (95% confidence interval 115 to 328). When anaesthetists were compared with all doctors the standardised mortality ratio for suicide was only 114, a non-significant excess.

These findings confirm that the risk of suicide among anaesthetists is twice as high as among other men in social class I but suggest that the risk does not differ significantly from that among doctors as a whole. There was no evidence of a significant excess risk of cancer, and, in particular, the small excess of cancer of the pancreas reported previously could not be confirmed.

Introduction

Several studies have drawn attention to the possible occupational hazards associated with anaesthesia, and these have been reviewed elsewhere.[1,2] Most studies have looked for evidence of carcinogenicity and fetotoxicity, but four have examined the pattern of mortality. The three North American studies[3-5] found an excess risk of suicide among anaesthetists both as compared with life insurance policyholders[3,4] and as compared with all doctors.[5] The earliest of these studies also found an excess mortality from lymphomas and reticuloendothelial tumours.[3] A cohort study of British doctors during 1951-71 compared mortality among anaesthetists with mortality among all doctors.[6] It detected a small but significant excess risk of cancer of the pancreas but no significant excess mortality from suicide, lymphomas, reticuloendothelial tumours, or other causes.

A recent report has described five deaths from suicide among anaesthetists in training.[7] This together with the North American findings prompted our study. Our aim was to investigate mortality among all male anaesthetists practising in the United Kingdom between 1957 and 1983. Though the number of women anaesthetists has increased substantially in recent years, there were too few in the period as a whole for there to be a reasonable chance of detecting any plausible risk among them.

Department of Community Medicine and General Practice, University of Oxford, The Radcliffe Infirmary, Oxford OX2 6HE

H A W NEIL, MSC, MRCP, clinical lecturer
AMANDA THURSTON, research assistant
M P VESSEY, FFCM, FRCGP, professor of social and community medicine

Imperial Cancer Research Fund, Cancer Epidemiology and Clinical Trials Unit, The Radcliffe Infirmary, Oxford OX2 6HE

M P COLEMAN, MSC, MFCM, clinical research fellow

Department of Anaesthetics, British Military Hospital, Munster, West Germany

J G FAIRER, FFARCS, consultant anaesthetist

Correspondence to: Professor Vessey.

Subjects and methods

The cohort consisted of male anaesthetists who were fellows of the Faculty of Anaesthetists of the Royal College of Surgeons between 1 October 1957 and 31 December 1982. To be eligible they had to be fully registered with the General Medical Council and domiciled in the United Kingdom for all or part of the period from 1 October 1957 to 31 December 1983. The cohort was identified initially from the official list of fellows of the faculty for 1957, which was published for the first time in that year. It was then successively updated from FFARCS examination pass lists for each year between 1958 and 1982. Dates of birth were provided by the GMC for most subjects and a postal questionnaire was sent to the remainder.

We excluded anaesthetists trained overseas who despite having full GMC registration neither lived nor practised in Britain after gaining the FFARCS and those who held the fellowship but never obtained full GMC registration. Overseas trained anaesthetists, however, who were resident in the United Kingdom, had full GMC registration, and held the fellowship were included. Subjects aged 65 or more at entry to the study were excluded. Exit from the cohort occurred on emigration or death. Subjects were censored from the study at age 75 because national mortality rates for men in social class I, which were used for some of the comparisons, are not available after that age.

The names of those anaesthetists not known to have emigrated or died and who could not be traced in the yearly list of fellows for 1983 were compared with a list of deaths compiled from the records of the faculty, supplemented by GMC records and obituary notices. The names of anaesthetists still unaccounted for were then sent to the National Health Service Central Register to identify any additional deaths. Death certificates were coded by the Office of Population Censuses and Surveys to the underlying cause of death using the revision of the International Classification of Diseases current at the time of death (seventh, eighth, or ninth revision).

The data were analysed with a computer program, applying standard methods for cohort studies.[8] Person years at risk were calculated within five year age groups and five year calendar periods. Expected numbers of deaths for causes of interest were calculated by applying the age and calendar period specific death rates for men in the reference population to the person years accumulated by men in our cohort. We used three reference populations: (*a*) all men in England and Wales, (*b*) social class I men, and (*c*) the male British doctors studied by Doll and Peto.[6] The measure of risk derived was the ratio of the number of deaths observed to the number expected. Expressed as a percentage, this ratio is the standardised mortality ratio. 95% Confidence intervals for the standardised mortality ratio were calculated assuming a Poisson distribution for the observed frequency in the numerator,[9] with the mean equal to the expected frequency. The test of significance used was a two sided Poisson probability of observing the number of deaths that occurred given the expected number of deaths.

Results

The cohort consisted of 4348 male anaesthetists, of whom 579 (13·3%) were excluded. Of these, 449 (10·3%) were overseas trained anaesthetists who did not practise anaesthesia in the United Kingdom after being awarded the FFARCS, 82 (1·9%) had unknown dates of birth (these included 37 who had emigrated), a further 8 (0·2%) had provided the GMC with implausible dates of birth that could not be corrected, and 40 (0·9%) were aged 65 or more at entry to the study. The remaining 3769 anaesthetists were included in the analysis and contributed 51 431 person years at risk. By 31 December 1983, 11 (0·3%) had emigrated, 8 (0·2%) were untraced, and 223 (5·9%) had

died before their 75th birthday (the age of censoring); details of the cause of death were incomplete for two subjects. Of the 221 deaths analysed, 180 (81·4%) occurred in subjects who had entered the cohort between 1957 and 1959; these subjects were much older than those entering the cohort subsequently.

Table I shows that the overall mortality was significantly lower among anaesthetists than among men in the general population (standardised mortality ratio 53) or among men in social class I (standardised mortality ratio 68). From the age of 45 the age specific mortality within 10 year age groups was also significantly lower than among men in social class I (data not shown). The mortality from all cancers combined and from gastrointestinal disease, respiratory disease, ischaemic heart disease, and motor vehicle accidents was also significantly lower than among men in social class I (table II). Table III shows the observed and expected numbers of deaths from different cancers relative to social class I men; mortality from lung cancer was significantly low (standardised mortality ratio 36). There was no excess mortality from lymphomas, and the slightly increased mortality from leukaemias (standardised mortality ratio 155 (based on five deaths)) was not significant. Mortality among anaesthetists was significantly lower than among British doctors as a whole (standardised mortality ratio 59) and mortality from cancer of the pancreas did not differ significantly from the rate for all doctors (four deaths observed against 4·44 expected; standardised mortality ratio 90, 95% confidence interval 25-231) or from the rate for all men in the general population (4·87 deaths expected).

Table II also shows that there was a significant twofold increase in suicide among anaesthetists relative to men in social class I (standardised mortality ratio 202). The same excess mortality from this cause was apparent in comparison with the general population (table IV). By contrast, the 14% excess deaths from suicide compared with all doctors was not significant. The number of suicides was too small to permit useful examination either of time trends or of differences in death rates by age. Nevertheless, 12 of the 16 anaesthetists who committed suicide were under 55. The death certificates showed that 10 of the anaesthetists had used a drug overdose to commit suicide, and of the six cases in which the drug was specified, five had used barbiturates and one curare. We also examined the 17 death certificates in the category labelled "other accidents, poisoning, and violence (excluding suicide)" (see table II). This category included deaths for which an accidental or open verdict may be recorded by the coroner. We concluded that 10 of the 17 deaths for which there was such a verdict may well have been due to suicide.

TABLE I—*United Kingdom male anaesthetists aged 25-74: observed and expected deaths from all causes, 1957-83*

Reference population	No observed	No expected	Standardised mortality ratio†	95% Confidence interval
England and Wales	221	417·43	53***	46 to 60
Social class I	221	326·82	68***	59 to 77
Male doctors	221	372·69	59***	52 to 68

*** p<0·001.
† Reference population=100.
‡ Mortality rates for entire 1951-71 period[6] applied to 1957-83.

TABLE II—*United Kingdom male anaesthetists aged 25-74: mortality by cause relative to social class I, 1957-83.*

Cause of death	No observed	No expected	Standardised mortality ratio	95% Confidence interval
All cancers	43	86·28	50***	36 to 67
Gastrointestinal disease	3	9·23	33*	7 to 95
Respiratory disease	13	24·07	54*	29 to 92
Cerebrovascular disease	18	26·36	68	40 to 108
Ischaemic heart disease	84	120·42	70***	56 to 86
Motor vehicle accidents	2	7·85	25*	3 to 92
Other accidents, poisoning, and violence (excluding suicide)	17	13·19	129	75 to 206
Suicide	16	7·93	202*	115 to 328
Other causes	25	31·49	79	51 to 117
All causes	221	326·82	68***	59 to 77

* p<0·05; *** p<0·001.

TABLE III—*United Kingdom male anaesthetists aged 25-74: mortality from cancer relative to social class I, 1957-83*

Site or type of cancer†	No observed	No expected	Standardised mortality ratio	95% Confidence interval
Lung	9	25·30	36***	16 to 68
Oesophagus	3	2·55	118	24 to 344
Stomach	3	6·29	48	10 to 139
Bladder	0	3·08	0	0 to 120
Prostate	1	3·90	26	1 to 143
Leukaemia	5	3·22	155	50 to 362
Lymphoma	4	4·22	95	26 to 243
Other cancers	18	37·72	48***	28 to 75
All cancers	43	86·28	50***	36 to 67

*** p<0·001.
† Specific results for cancer of pancreas not given: death rates for social class I not published for this cause of death.

TABLE IV—*United Kingdom male anaesthetists aged 25-74: mortality from suicide, 1957-83*

Reference population	No observed	No expected	Standardised mortality ratio†	95% Confidence interval
England and Wales	16	7·80	205*	117 to 333
Social class I	16	7·93	202*	115 to 328
Male doctors‡	16	13·99	114	65 to 186

* p<0·05.
† Reference population=100.
‡ Mortality rates for entire 1951-71 period[6] applied to 1957-83.

Discussion

Anaesthetists are exposed to several possible occupational hazards, in particular the effects of inhalational anaesthetic agents. Other studies have suggested that anaesthetists might be at increased risk of developing lymphomas and reticuloendothelial tumours[3] and cancer of the pancreas.[6] The evidence for an excess mortality from lymphomas and reticuloendothelial tumours was reported in a cohort study of members of the American Society of Anesthesiologists for the period 1947 to 1966.[3] That study had methodological shortcomings,[1] and the findings were not confirmed by a five year prospective study covering the period 1967 to 1971.[4] In the study of mortality among British doctors from 1951 to 1971[6] there was no excess of lymphomas or reticuloendothelial tumours, but a small excess of cancer of the pancreas was noted.

The mortality from all causes among male anaesthetists in our cohort was significantly lower than for men in social class I and the mortality from all cancers combined was half the comparable rate for social class I. We found no excess mortality from lymphomas, and the very low mortality from lung cancer compared with men in social class I would be expected in view of the even lower prevalence of smoking among doctors than among other men in social class I. Comparison between our results for United Kingdom anaesthetists and members of the American Society of Anesthesiologists (table V) showed a similarly low mortality from all cancers combined, cerebrovascular disease, and ischaemic heart disease.[4] By contrast, there was a higher mortality from leukaemia among United Kingdom than North American anaesthetists (standardised mortality ratios 155 *v* 40), but the excess among United Kingdom anaesthetists compared with men in social class I was not significant, and this discrepancy is probably due to chance. Mortality from suicide was lower, though not significantly so, among United Kingdom than North American anaesthetists. Comparison may also be made between mortality among anaesthetists and that among a cohort of United Kingdom pathologists.[10] The overall mortality

experienced by pathologists closely resembled the results from our study (table VI). The standardised mortality ratios for all cancers and for ischaemic heart disease were also broadly similar to those in our study. The pathologists had a slightly higher death rate from suicide than anaesthetists, but the difference between the standardised mortality ratios was not significant.

TABLE V—*Comparison of standardised mortality ratios for United Kingdom and North American male anaesthetists*

	United Kingdom 1957-83*	United States and Canada[4] 1967-71†
Cerebrovascular disease	68	89
Ischaemic heart disease	70	85
All cancers	50	64
Leukaemia	155	40
Lymphoma	95	82
Suicide	202	298
All causes (No of deaths)	68 (221)	75 (197)

* Reference population = 100 social class I.
† Reference population = 100 Metropolitan Life Insurance policy holders.

TABLE VI—*Comparison of standardised mortality ratios for anaesthetists and pathologists*

Cause of death	Anaesthetists 1957-83	Pathologists 1955-73
All cancers	50	58
Ischaemic heart disease	70	67
Cerebrovascular disease	68	72
Suicide	202	265
All causes	53	60

We compared anaesthetists with the doctors studied by Doll and Peto[6] and found that anaesthetists appeared to have a significantly lower overall mortality than doctors as a whole. This contrasts with a recent British study of consultant anaesthetists,[11] which found a small but non-significant increase in mortality during employment (standardised mortality ratio 123) in comparison with consultants in four other hospital specialties. These data, which were restricted to two thirds of all eligible anaesthetists, showed that they were more likely to retire early for health reasons than were consultants in other specialties. The study, however, excluded deaths after retirement, whether from ill health or from other causes, and therefore would be likely to have underestimated their mortality, particularly from chronic diseases. In our analysis comparing anaesthetists with all doctors we used a single set of average death rates for the period 1951-71 derived from the data in Doll and Peto's study[6] (rates for separate time periods were not available) and applied these rates to the entire period of observation for our cohort (1957-83). During this period, however, the all causes mortality of doctors was in all probability declining at least as fast as that of social class I as a whole,[12-15] and we may therefore have overestimated the number of deaths to be expected among anaesthetists by using this procedure. Our standardised mortality ratio of 59 for all causes mortality among anaesthetists by comparison with all doctors may therefore be somewhat low. Calculations based on secular trends in mortality in social class I for the period 1951-71 suggest that the deficit may be about 20% and that a more appropriate standardised mortality ratio for all causes mortality by comparison with all doctors would be about 74.

We were unable to compare mortality from cancer of the pancreas among anaesthetists with that in social class I men because national data are not available. When a comparison was made with all doctors no excess mortality was detected. We found that anaesthetists had a higher, though not significantly higher, mortality from suicide than all doctors. Despite the use of a single set of death rates applied to our cohort this is unlikely to be a biased underestimate of the true risk of suicide among anaesthetists compared with all doctors. This is because during the observation period for the cohort there was no general decline in mortality from suicide in social class I and no clear evidence of a decline among doctors in particular; the standardised mortality ratios for suicide among male doctors in England and Wales around the time of the last four censuses were 226 (1951), 176 (1961), 335 (1971), and 172 (1981), in each case compared with all men in the same period.[12-15]

Our decision to exclude anaesthetists whose dates of birth had not been traced could not have had any important influence on our estimate of suicide risk, as the only death that occurred in that group was not due to suicide. Nevertheless, underreporting of suicide in official statistics is well recognised, and it has been suggested that a wider definition of suicide should be used for epidemiological purposes, which would include deaths recorded as "suicide," "undetermined," "accidental poisoning by drugs," and so on.[16] We found a non-significant increase in mortality among anaesthetists from accidents, poisoning, and violence (excluding motor vehicle accidents and suicide) compared with social class I men, and examination of the death certificates suggested that some of these deaths were due to suicide. It seems improbable, however, that there is systematic underreporting of suicide in anaesthetists compared either with other medical specialties or with social class I men (though there may be systematic underreporting in comparison with the general population). The small excess suicide risk among anaesthetists compared with all other doctors is therefore unlikely to be subject to bias from underreporting.

Our results confirm that, in common with other doctors, male anaesthetists have a significantly higher mortality from suicide than either men in the general population or men in social class I. Nevertheless, the risk of suicide did not differ significantly between anaesthetists and doctors as a whole and there was no evidence of a significant excess mortality risk from cancer.

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