MEDICAL PRACTICE

Occasional Survey

Mortality study of pathologists and medical laboratory technicians

J M HARRINGTON,   H S SHANNON

Summary

Membership lists of professional bodies were used to establish study populations of British pathologists (1955-73) and medical laboratory technicians (1963-73). The standardised mortality ratio (SMR) for pathologists was 60 and for medical laboratory technicians 67. Twenty-seven of the 310 deaths were due to suicide. These numbers gave SMRs of 250 for pathologists and 243 for medical laboratory technicians. Suicide was the commonest cause of death in female technicians. Access to lethal chemicals at work is a possible factor explaining the high proportion of suicide by poisoning compared with the general population. Suicide rates for pathologists exceed those of all medical practitioners; similarly medical laboratory technicians have higher rates than all laboratory technicians. Excess deaths from lymphatic and haemopoietic neoplasms were noted in English male pathologists (observed 8, expected 3·3; P<0·01). This difference is not due to Hodgkin's disease or leukaemia and remains unexplained. No other neoplastic diseases were noted as causing excess mortality in either occupational group but a small, possibly spurious, excess number of deaths was noted for aortic aneurysm in male pathologists (observed 4, expected 1·8).

TUC Centenary Institute of Occupational Health, London School of Hygiene and Tropical Medicine, London WC1E 7HT

J M HARRINGTON, MSC, MRCP, lecturer in occupational medicine
H S SHANNON, MSC, FSS, statistician

Introduction

Medical laboratory workers are frequently exposed to occupational hazards and most examples cited relate to microbiological risks.[1-4] Tuberculosis,[5] serum hepatitis,[6][7] and arbor virus diseases[8] figure prominently but toxicological hazards such as mercury vapour[9] are less frequent. Occupationally induced cancer has been postulated in medical staff, particularly from exposure to dyestuffs such as α- and β-naphthylamine, benzidine, and O-toluidine[10] but few studies have been undertaken. Anthony and Thomas[11] in a study of 4030 urological outpatients noted an excess of dye workers, and medical and paramedical staff among those suffering from bladder neoplasia. Professional chemists in the United States of America are reported to have an excess mortality from lymphoma and carcinoma of the pancreas,[12] and conceivably pathology workers may be exposed to similar chemicals. The possibility of links between virology workers and occupational cancer remains unsubstantiated, though a group of American physicians has a relative mortality risk of 1·8 for Hodgkin's disease compared with the general population of New York.[13]

Reid[5] studied the mortality of British pathologists in the course of investigating the incidence of tuberculosis among medical laboratory workers. His analysis of 300 deaths occurring between 1905 and 1954 showed an excess mortality from suicide, three times that expected for social class I. A slight excess mortality from tuberculosis was noted when the study was restricted to people actively engaged in pathology. Medical laboratory technicians do not appear to have been investigated specifically apart from their inclusion in occupational category 313 of the Registrar General's decennial supplements on occupational mortality.[14]

Methods

Membership lists of professional organisations representing path-

ologists and medical laboratory technicians were used to establish the populations for study.

PATHOLOGISTS

The Royal College of Pathologists and the Pathological Society of Great Britain allowed access to their membership lists. The Pathological Society records were examined and a list of pathologists alive on 1 January 1955 was compiled. These were traced through successive year books and new members included up to 31 December 1973. The Pathological Society does not include all pathologists and their lists were compared with those of the Royal College of Pathologists, which has lists from 1963 onwards and additional names added. Records were obtained of all such persons who have been included in either list between 1 July 1963 and 31 December 1973. The names of 2079 pathologists were listed as alive and active at some time between 1 January 1955 and 31 December 1973. The General Medical Council (GMC) co-operated in supplying any missing dates of birth. During the study period 156 pathologists had died. With the help of the GMC, the NHS Central Register in Southport and in Edinburgh, and the Office of Population, Censuses and Surveys (OPCS), copies of the death entry were obtained in 151 (97%).

TECHNICIANS

Similar techniques of data collection were used to establish a population of medical laboratory technicians with the co-operation of the Council for Professions Supplementary to Medicine. Through the good offices of the secretary it was possible to list 12 944 technicians who had registered with the Council between its inception in August 1963 and 31 December 1973. During that period 154 technicians had died and copies of all the death entries were obtained.

TRACE RATE

Failure to trace an individual from first inclusion in a professional list to death, or the end of the study period, occurred for 199 technicians (1·5%) and 13 pathologists (0·6%). Possibly failure to trace these persons could bias the results: therefore an analysis was made of the incomplete information available on the 199 technicians.

Of this group 144 were alive at the end of 1968 (less than five years before the end of the study period), suggesting that most were probably alive in 1973. This was supported by the fact that 79% of the 199 were under 35 years old at the end of 1973. A retrospective inquiry of health and safety in British laboratories 1971-3 (to be published) showed that 65% of technicians were under 35 years old. The higher proportion of young technicians in the untraced group suggests that emigration or resignation from membership, rather than death, may be the reason for failure to trace. This is supported by anecdotal evidence from the officers of the laboratory technicians' organisations. A further possible

bias, however, is that the NHS Central Register tends to overestimate the number of persons alive (by a factor of up to 10%). This will inflate the "expected" numbers of deaths.

ANALYSIS

With the date of birth and last known date alive or date of death, the number of years of life was calculated by sex, five-year calendar periods, and five-year age groups. By applying the age and calendar period death rates for England and Wales or Scotland, as appropriate, obtained from the Registrar General's annual statistical reviews of mortality[15] it was possible to calculate the expected numbers of deaths from all causes. The data was analysed using a specially designed man-years computer program based on the same conceptual model as that of Hill.[16]

Control population data were not available for 1973 at the time of analysis and we thought that little error would be incurred if the 1973 mortality figures were assumed to be the same as those for 1972. In an attempt to improve the control population's comparability to the pathologists and technicians, the Registrar General's occupational mortality data for 1959-63[14] for medical practitioners (category 280) and laboratory assistants/technicians (category 313) were used for specific causes of death. Deaths were all coded to International Classification of Diseases (ICD).[17]

Results

Pathologists—During the study period 156 pathologists died, whereas the expected number of deaths from all causes was 259 (table I). The general pattern of observed to expected deaths showed that pathologists had a lower mortality than the general population. This was particularly applicable to lung disease: chronic bronchitis, emphysema, and asthma (ICD 490-493) claimed four times as many deaths in the general population, and cancer of the lung, bronchus, and trachea (ICD 162) three times as many. The exceptions were suicide (E950-959) and neoplasms of the lymphatic and haemopoietic tissue (200-209). Though the numbers are small, nine suicides in male pathologists occurred in England and Wales compared with an expected 3·4. For lymphomata and leukaemias eight male English pathologists died against an expected 3·3. No excess was noted for Hodgkin's disease (201) or leukaemia (204-207), which left lymphomata, multiple myeloma, and polycythaemia rubra vera. With the cumulative Poisson distribution the observed:expected differences were statistically significant at the P<0·01 (suicide) and P<0·05 (lymphatic and haemopoietic neoplasms) levels.

Technicians—One hundred and fifty-four deaths were analysed by cause, sex, and domicile (table II). The expected number of deaths in this group was 231. The observed number of deaths was lower than expected in all categories except suicide, of which nine English male and six female technicians died compared with an expected 4·7 and 1·5 respectively. For English female technicians suicide was the

TABLE I—*Analysis of cause of death by sex and domicile for pathologists aged 20-74 in 1955-73. Expected deaths are given in parentheses*

Cause of death	ICD	England and Wales		Scotland		Total
		Men	Women	Men	Women	
Infective and parasitic	001–136	0 (2·9)	0 (0·1)	0 (0·5)	0 (0·0)	0 (3·5)
Neoplasms:	140–239	32 (55·1)	2 (3·8)	6 (7·3)	0 (0·7)	40 (66·9)
Ca of digestive tract and peritoneum	150–159	9 (17·5)	0 (1·1)	3 (2·3)	0 (0·3)	12 (21·2)
Ca of lung, trachea, bronchus	162	8 (24·2)	1 (0·4)	2 (3·2)	0 (0·1)	11 (27·9)
Ca of bladder	188	0 (1·9)	0 (0·1)	1 (0·2)	0 (0·0)	1 (2·2)
Lymphoma and haematoma	200–209	8**(3·3)	0 (0·2)	0 (0·5)	0 (0·0)	8* (4·0)
Hodgkin's disease	201	1 (0·6)	0 (0·0)	0 (0·1)	0 (0·0)	1 (0·7)
Leukaemia	204–207	1 (1·3)	0 (0·1)	0 (0·2)	0 (0·0)	1 (1·6)
Cerebrovascular	430–438	13 (18·1)	1 (1·7)	1 (2·6)	0 (0·5)	15 (22·9)
Ischaemic heart disease	410–414	45 (67·1)	2 (2·3)	5 (10·3)	2 (0·8)	54 (80·5)
Aortic aneurysm	441	3 (1·7)	0 (0·1)	1 (0·1)	0 (0·0)	4 (1·9)
Bronchitis, asthma and emphysema	490–493	4 (16·4)	0 (0·4)	0 (1·8)	0 (0·1)	4 (18·7)
Oesophagus, stomach, and duodenum	530–537	1 (2·4)	0 (0·1)	0 (0·4)	0 (0·0)	1 (2·9)
Cirrhosis of liver	571	0 (0·9)	2 (0·1)	0 (0·2)	0 (0·0)	2 (1·2)
Motor vehicle accidents	E810–819	3 (3·2)	0 (0·1)	0 (0·6)	0 (0·0)	3 (3·9)
Suicide	E950–959	9**(3·4)	1 (0·2)	0 (0·4)	0 (0·0)	10**(4·0)
Other causes		18 (+3 unstated)		(2 unstated)		23
Total deaths		131 (214·2)	8 (12·1)	15 (29·9)	2 (3·0)	156 (259·2)
Man-years' exposure		19 725·7	1466·1	2679·7	248·2	24 119·7

*P <0·05 ⎫
**P <0·01 ⎭ Cumulative Poisson

TABLE II—*Analysis of cause of death by sex and domicile for laboratory technicians aged 20-74 in 1963-73. Expected deaths are given in parentheses*

Cause of death	ICD	England and Wales		Scotland		Total
		Men	Women	Men	Women	
Infective and parasitic	001–136	0 (1·9)	0 (0·5)	0 (0·3)	0 (0·6)	0 (3·3)
Neoplasms:	140–239	27 (43·6)	5 (9·6)	4 (5·7)	1 (0·9)	37 (59·8)
Ca of digestive tract and peritoneum	150–159	7 (12·9)	0 (1·7)	2 (1·6)	0 (0·2)	9 (16·4)
Ca of lung, trachea and bronchus	162	12 (18·3)	0 (0·7)	1 (2·3)	0 (0·9)	13 (22·2)
Ca of bladder	188	1 (1·3)	0 (0·1)	0 (0·1)	0 (0·0)	1 (1·5)
Lymphoma and haematoma	200–209	3 (3·8)	0 (1·1)	0 (0·5)	0 (0·1)	3 (5·5)
Hodgkin's disease	201	0 (1·0)	0 (0·3)	0 (0·2)	0 (0·1)	0 (1·6)
Leukaemia	204–207	1 (1·4)	0 (0·5)	0 (0·2)	0 (0·1)	1 (2·2)
Cerebrovascular	430–438	11 (11·8)	2 (2·2)	1 (1·8)	0 (0·2)	14 (16·0)
Ischaemic heart disease	410–414	49 (52·2)	1 (2·1)	4 (7·5)	0 (0·2)	54 (62·0)
Aortic aneurysm	441	2 (1·2)	0 (0·1)	0 (0·1)	0 (0·0)	2 (1·4)
Bronchitis, asthma and emphysema	490–493	5 (10·4)	0 (0·9)	0 (0·2)	0 (0·1)	5 (11·6)
Oesophagus, stomach and duodenum	530–537	0 (1·6)	0 (0·1)	0 (0·3)	0 (0·2)	0 (2·2)
Cirrhosis of liver	571	0 (0·9)	0 (0·1)	1 (0·2)	0 (0·2)	1 (1·4)
Motor vehicle accidents	E810-819	2 (6·6)	1 (1·4)	0 (1·4)	0 (0·1)	3 (9·5)
Suicide	E950-959	9* (4·7)	6**(1·5)	1 (0·6)	1 (0·2)	17***(7·0)
Other causes		16	2	2	1	21
Total deaths		121 (171·8)	17 (31·4)	13 (24·8)	3 (2·96)	154 (231·0)
Man-years' exposure		37 160·8	27 674·2	5414·9	2775·7	73 025·6

*P <0·05 ⎫
**P <0·01 ⎬ Cumulative Poisson
***P <0·001 χ² ⎭

TABLE III—*Comparison of Standardised Mortality Ratio (SMR) of pathologists and medical laboratory technicians in study population with SMRs for medical practitioners and laboratory assistants/technicians in Registrar General's Decennial Supplement on Occupational Mortality (1959-63)—Males*

Occupational group	All causes	All neoplasms	Ischaemic heart disease	Bronchitis, emphysema, asthma	Suicide
Pathologists (1955-73)	60	58	67	24	265
Medical practitioners (1959-63)	89	73	113	23	176
Medical laboratory technicians (1955-73)	70	62	94	48	191
Technicians (1959-63)	87	87	163	65	69

commonest cause of death. The cumulative Poisson distribution showed these differences to be statistically significant at the P<0·05 level (men) and P<0·001 (women).

COMPARISON WITH OTHER CONTROL GROUPS

Establishing Standardised Mortality Ratios (SMRs) for pathologists and technicians using the general population's mortality as a control has many shortcomings. Occupational groups are "survivor" populations and are likely to be healthier than the general population. In addition pathologists are social class I according to the Registrar General and medical laboratory technicians social class II. The *Decennial Supplements on Occupational Mortality of the Registrar General*[14] afford a better comparison but only a few disease groupings are cited. The relevant professional categories are all medical practitioners (category 280) and all laboratory assistants/technicians (category 313) (table III).

Discussion

Not surprisingly technicians and pathologists working in pathology laboratories have a lower mortality risk than the general population. Any occupational group should have a lower death rate compared with the whole population, as the former is a working population and the latter includes individuals who are permanently disabled, sick, or dying. The male SMRs* for social classes I and II are 76 and 81 respectively[14] and in the present study the SMRs for pathologists and medical laboratory technicians are 60 and 70 respectively. Some allowance can be made for socioeconomic differences between the study population and the general population by comparing the pathologists' mortality for 1955-73 with the latest available SMRs for medical practitioners (1959-63). Similar comparisons can be made for the study population of medical laboratory technicians with all

$$*SMR = \frac{\text{observed deaths}}{\text{expected deaths}} \times 100.$$

laboratory assistants/technicians (table III), though in both cases only a limited number of disease groupings can be compared.

The SMRs for the study population are mostly lower than the SMRs for the broader occupational national groups, but there is closer agreement than with the general population. This suggests that some of the differences noted in tables I and II can be explained on socioeconomic and occupational grounds. Nevertheless, the difference in SMRs for suicide is the reverse. It could be postulated that this underlines an occupational factor in the pathologists' and technicians' high rates. Suicide rates have fallen in the past decade for all occupational groups but in this survey an SMR of 265 for male pathologists in England and Wales was noted and for technicians of similar domicile the SMRs were 191 (men) and 400 (women). For years doctors have been known to have high suicide rates.[5 14] A recent survey[18] cites high levels of psychiatric disease in doctors but the data were collected in an uncontrolled way and are therefore potentially unreliable. The present study is part of a three-year research project and anecdotal evidence collected during that time suggested that cyanide was frequently used in suicide by pathologists. Analysis of the mortality data for method of suicide revealed that 66% of male and 100% of female pathologists committeed suicide by taking "solid or liquid substances (ICD E950)." For technicians and percentages were 80% (men) and 71% (women). A comparison with the national figures showed that 28% of men and 53% of women killed themselves by this method. These figures suggest that laboratory staff are more likely to poison themselves than to use other methods of self-destruction such as firearms, strangulation, or gassing. The most likely explanation is ready access of poisonous chemicals, which in the group studied included cyanides as well as hypnotics. There was no evidence either way about the psychiatric state of laboratory staff. American studies of suicide in physicians suggest that 38% of men and 63% of women use drugs,[19] which is higher than the rates for other professional groups with equal access to drugs such as pharmacists and dentists.[20]

The mortality study does not prove that occupational hazards affect mortality. No excess deaths were noted from infective conditions. Death rates from cancer of the bladder too were lower than those in the general population. Access to lethal chemicals may be construed as an occupational factor leading to high suicide rates. The increased risk of lymphomata in English male pathologists is not explained. The possibility of this being an artefact due to more accurate diagnosis is offset by a failure to show excess deaths in conditions requiring similar diagnostic expertise, such as Hodgkin's disease and leukaemia. A prospective study should be established to obtain a larger study group in order to assess whether the small number noted in this study has contributed to a spurious result. Aortic aneurysm was noted specifically in the study after an anecdotal report of increased incidence[21] but an observed:expected ratio of 4:1·8 (male pathologists) and 6:3·3 (male technicians) is not explained.

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Contemporary Themes

200 injuries caused by playground equipment

CYNTHIA ILLINGWORTH,   PATRICIA BRENNAN,   ANN JAY,   FADHILA AL-RAWI,
MARY COLLICK

Summary

Two-hundred children with injuries caused by playground equipment were studied. Whereas only about 9% of the total casualty attendances are for fractures, 26·5% (53) of these children had fractures. The climbing frame and the slide seemed to be associated with more severe injuries than the swing or other equipment, but more cases need to be studied to confirm this. The youngest children were at particular risk on equipment such as the wooden rocking horse or roundabout, when the speed of operation could be controlled by older children. Many of the injuries to the very youngest children occurred when they were walking behind a moving swing. Faulty equipment did not seem to be a major factor in causing accidents, but the use by older children of apparatus designed for young ones led to accidents. There was supervision, either at home, in a school playground, or in a park, in 62% of the cases. Many of the accidents were the result of the normal desire of children for experimentation and adventure.

Paediatric Accident & Emergency Department, Children's Hospital, Sheffield S10 2TH
CYNTHIA M ILLINGWORTH, MB, MRCP, consultant in paediatric accident and emergency
PATRICIA BRENNAN, MB, DCH, part-time registrar
ANN JAY, MB, CHB, senior house officer
FADHILA AL-RAWI, MRCP, DCH, part-time registrar
MARY COLLICK, medical student

Introduction

Numerous articles have been written about childhood accidents, but very little has been written about injuries caused by play equipment. Such injuries were not mentioned in a recent symposium on childhood accidents.[1] Certain dangers connected with swings are mentioned briefly in the excellent booklet by the Portsmouth Junior Chamber of Commerce[2]; the dangers of rotting of a wood seat and of standing on a seat were noted. The National Association of Ladies' Circles made a report on children's playgrounds.[3] This gave more information about the