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Hospitalization in Winnipeg, Canada due to Occupational Disease: A Pilot Study

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Background *The objectives of this study were to identify the extent of occupational exposures to hazardous substances amongst male medical inpatients and to determine the extent to which these exposures may have contributed to the development of medical conditions.*

Methods *A random sample of 297 male who were admitted from outside the hospital to the medical wards to a large tertiary care hospital, were between age 18–75 and could communicate in English completed an occupational history questionnaire. This information was merged with an inpatient database which contained patient demographics, admission diagnoses, and co-morbidity data. A specialist in occupational medicine and internal medicine determined whether the medical conditions the participants had were related to their exposures.*

Results *One individual had a condition causing admission that was related to his work and 12 others (4%) had a condition that was possibly related to their work which had caused symptoms. One additional individual was found to have asymptomatic asbestos related pleural fibrosis. Fourteen of 37 possible harmful occupational exposures were reported by more than 10% of the study participants. On average each participant reported 5.5 exposures.*

Conclusions *Occupational exposures to male medical inpatients are common. For 4.4% (13/297) of male admissions to the general medical wards from the emergency room occupational factors may have played a role in the development of medical conditions which led to admission or to major co-morbidities. Detailed occupational histories will likely lead to more suspected cases of work related medical admissions.* Am. J. Ind. Med. 52:372–379, 2009. *© 2009 Wiley-Liss, Inc.*

KEY WORDS: occupational diseases; epidemiology; inpatient medical wards; occupational exposures; Canada

INTRODUCTION

Occupational diseases have been estimated to cause considerable morbidity and mortality in Canada [Kraut, 1994] and other developed countries [Nurminen and Karjalainen, 2001; Leigh et al., 2003; Steenland et al., 2003]. The cost of these diseases is significant [Leigh et al., 2003]. In Finland, it has been estimated that 3.7% of all mortality is related to occupational factors, 6.4% for men and 1.0% for women [Nurminen and Karjalainen, 2001]. The above mentioned studies [Kraut, 1994; Nurminen and Karjalainen, 2001; Leigh et al., 2003; Steenland et al., 2003] used an attributable risk per cent model to identify the portion of disease in the population thought to be work related. This methodology identifies the burden of disease thought due to occupational factors and multiplies it by the prevalence of the condition to determine the occupational attributable portion of disease. This method does not identify individual cases thought to be work related. The limitations

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of this methodology have been by illustrated by some commentators [Coggon, 2001; Hernberg, 2001]. Although the exact extent of disease due to work may be debated, it is generally agree that this group of conditions represent a significant amount of potentially preventable morbidity in modern societies.

Identifying individual cases of occupational disease as work related is difficult due to multifactorial nature of disease and by the lack of recognition by physicians. Although some diseases such as mesothelioma in an asbestos insulator, are relatively easy to diagnose as work related based on the work history and the diagnosis, many other potential diseases due to work have no pathognomonic findings and non-workplace factors can cause similar disease presentations. The diagnosis of work-relatedness of these conditions is based on the occupational history.

Many patients hospitalized on internal medicine wards may have had significant occupational exposures. Schwartz et al. [1991] found that 75% of internal medicine outpatient clinic patients in Iowa City reported occupational exposure to at least one potentially toxic agent and 30% claimed exposure to at least four potentially toxic agents. The extent that these occupational exposures play in the development of conditions causing hospitalization has not been extensively evaluated. In a study of medical inpatients in the United States, 66 of 101 patients had diseases for which the authors felt an occupational etiology merited consideration. In these cases 68% had a relevant occupational exposure which may have contributed to their disease [Brancati et al., 1993]. Work from Belgium has shown that about 10% of admissions to an internal medicine unit were thought to be probably or possibly related to occupational exposures [Gennart et al., 1991]. Comparable data is not available for Canada.

The purposes of this study were to:

1. identify the extent of occupational exposures to hazardous substances and some work conditions among a sample of male medical inpatients at a tertiary care hospital in Winnipeg, Manitoba, Canada,
2. identify the extent to which these exposures may have caused or contributed to the development of the condition leading to the hospitalization or other conditions.

METHODS

Study Setting

Winnipeg is the capital of the Province of Manitoba, Canada and its population of approximately 700,000 people accounts for about 60% of the population of the province. Winnipeg and Manitoba have diverse economies with manufacturing, agriculture, construction, sales and service being prominent contributors. Manufacturing is the largest sector, accounting for over 12% of total GDP of the province [Government of Manitoba, 2008]. This study took place in the largest hospital in the province in the core of Winnipeg which is also the major tertiary care referral center for the province. This hospital has over 4,000 medical admissions per year.

Study Instruments

The Department of Internal Medicine at the University of Manitoba has created a comprehensive database of all patients that are admitted to internal medicine wards in five hospitals in Winnipeg. This study utilizes the database for the largest of these hospitals. Data including demographic information, past medical history, morbidity measures, complications, length of stay, and admission diagnoses are collected and coded on each admission by trained data collectors. The data is collected at and during admission. In the data set the admission diagnosis could be modified from the admitting diagnosis based on information obtained during the course of the hospitalization. Occupational data is not routinely collected in this data set. This dataset was merged with a questionnaire collected by a trained interviewer which contained information on the occupational history including job titles, use of protective equipment and exposures to a variety of occupational hazards. Both self reported exposure information and job title were collected as these two sources of data may be independently useful in identifying work related conditions.

Patient Recruitment

Three hundred men admitted from outside the hospital to the general medical wards of the hospital were asked to participate in the study. To be considered for the study an individual had to be male, age 18–75, and be able to communicate in English. To spread the admissions out over the calendar year and to control for season and day of the week admission bias, only one admission was included each day. Patients were recruited from July 23, 2006 until November 14, 2007. All potential participants were identified on a daily basis including weekends from the admission sheets prepared by the admitting department, except for periods when the interviewer was off work. A random number was generated and the individual whose last two digits of his hospital number were closest too and greater than this number was asked to participate. If this person did not meet the study criteria or did not agree to participate the individual with the next largest last two digits was asked to participate. After ''99'' the process was repeated beginning at ''00'' until an individual was identified who agreed to participate or no individual was left to contact. Only men were studied due to the higher likelihood that they will develop occupational illnesses [Nurminen and Karjalainen,

2001]. Individuals were informed that their participation was voluntary and would not in any way affect the care that they received in the hospital. Informed consent was obtained from the participants. An individual could only participate in the study once and individuals who were readmitted for the same or different problem were not re-contacted. Analysis after data collection revealed that three individuals were included in the study whose initial admission to the hospital was to the Intensive Care Unit (ICU) and they were not included in the study, leaving 297 charts to be reviewed. Table I describes the reasons that 110 individuals that were approached did not participate in the study.

Assessment of Occupational Causation

Each worker could have up to their last three jobs coded according to the Canadian National Occupational Classification (NOC) scheme [Human Resources and Social Development Canada, 2008]. Jobs were coded to the three digit level. A specialist in occupational medicine and internal medicine (AK) reviewed the occupational information and exposures along with the admission diagnoses and determined whether the diagnosis was certainly or possibly related to one or another of the exposures in question. In this analysis, occupational causation was defined as a condition where work definitely led to the development of the disease. For a case to be defined as definitely work related, epidemiologic or clinical evidence had to strongly support causation and the association be generally accepted in the medical community. No other confounding factors would be felt to be a more likely cause of the condition. Possibly work-related causation was used for conditions which may have been caused by workplace factors, but the evidence for causation was not sufficient to say that it was definitely due to occupational factors. Possibly work related conditions would include those cases where occupational exposures have been associated with elevated risks of the condition in question (attributable risk less than 50%) or where there were significant confounding factors that would make the occupational exposure a less likely cause of the condition. An admission for a condition such as work exacerbated asthma, where an occupational exposure could have worsened an underlying non-work related condition leading to hospitalization would have been classified as definitely occupationally caused in this analysis. When required the hospital chart was reviewed and/or the patient interviewed to obtain additional information. Each individual was given the opportunity to receive their individual assessment should they desire. No information was given to the patient's current or previous employer, union or the Worker's Compensation Board without the individual's approval.

TABLE I. Reasons for Non-Participation in the Study

Reason	Number
Declined	42
Too sick/confused	30
Unavailable for interview	14
Discharged prior to interview	11
Difficulty communicating	4
Previously interviewed	4
Unable to speak English	2
Left against medical advice	2
Mental impairment	1
Total	110

Analysis

The data was analyzed using SPSS [SPSS Inc, 2008]. Frequencies of exposures were tabulated along with the percentage of admission diagnoses thought to be work related.

Ethics

The project was approved by both the hospital and University of Manitoba institutional ethics boards.

RESULTS

Table II describes the basis demographic data for the men who participated in the study. The mean age of study participants was 55.1 ± 12.7 years and the majority were married. The study population tended to be less educated than the general population of Manitoba. Only 30.6% of the study

TABLE II. Demographic Variables of Study Participants

Variable	Study n = 297	Manitoba population
Age mean (s.d.)	55.1 ±12.7	
Married, n (%)	169 (56.9%)	
Education, n (%)[a]		
Grade 9 or lower	84 (28.3%)	146,577 (16.9%)
High School Grade 10–12	136 (45.8%)	311,457 (35.8%)
Some post graduate	77 (25.7%)	411,280 (47.31%)
Employment status, n (%)		
Employed[b]	91 (30.6%)	318,700 (72.1%)
Not working but could work	12 (4%)	
Not working because of sickness or disability	97 (32.7%)	
Retired	94 (31.6%)	
Student	2 (0.7%)	
Missing	1 (0.3%)	

[a]Based on Manitoba population from 2001 census both male and female [Statistics Canada, 2008b].
[b]Male employment in Manitoba age >15, 2007 [Statistics Canada, 2008a].

participants were employed at the time of admission compared to 72.1% of the male population of the province over age 15. Almost 1/3 of the study population was not working because of sickness or disability.

The six most common admission diagnoses were community acquired pneumonia 24 (8%), congestive heart failure 21 (7%), upper gastrointestinal bleed 18 (6%), acute coronary syndrome 18 (6%), cellulitis 15 (5%), and myocardial infarction 15 (5%). The most common jobs were trades helpers (n = 60), drivers (n = 34), laborers (n = 31), cleaners (n = 14), and auto technicians (n = 13). The trades helpers worked in a variety of construction, manufacturing, utility and service companies assisting skilled tradespersons.

One admission, a man with sepsis as a long term complication following occupational traumatic paraplegia, was definitely ultimately related to occupational factors. Another man had asbestos related pleural fibrosis but this condition did not play a role in his admission. In an additional 12 cases (4.0%) work was thought to be a possible cause of one of the medical conditions the person had. These cases are summarized in the Table III. In six cases the possible work related condition was the reason for admission and in six it was a major co-morbidity. Appendix gives a brief summary of all of these cases.

The discharge status of individuals in the study group was compared to that of the 1,329 individuals who could have been in the study but were not. Approximately 2% of the study participants died or were transferred to the ICU versus 8% of men who met the criteria for study participation during the study period ($P < 0.001$).

The cases of possible occupational diseases came from three broad diagnostic categories; cancer, most commonly lung cancer, COPD, and interstitial fibrosis. Amongst the

TABLE III. Summaries of Cases Where Occupational Exposures Definitely or Possibly led to the Development of the Condition Causing Admission or Other Co-Morbidity

Case	Admission diagnosis	Occupational disease/condition	Occupational hazard	Occupation	References
Definite occupationally related					
1	Sepsis	Traumatic paraplegia	Trauma	Construction worker	Ekong and Tator [1985]
Possible work related causation—condition led to admission					
2	Acute myelogenous leukemia	Leukemia	Radiation, overexposure due to faulty equipment	Dentist	Descatha et al. [2005]
3	Ileus due to cancer treatment	Lung cancer	Painting	Painter	Brown et al. [2002]
4	Interstitial pulmonary fibrosis	Interstitial pulmonary fibrosis	Silica, other dusts	Miner	Taskar and Coultas [2006]
5	COPD exacerbation	COPD	Construction dusts, hay	Farmer, construction	Blanc and Toren [2007]
6	Metastatic lung cancer	Lung cancer	Cutting oils, smoke, paint	Painter, metal worker	Veglia et al. [2007], Brown et al. [2002]
7	COPD exacerbation	COPD	Metal dusts and fumes	Foundry worker	Blanc and Toren [2007]
Possible work related causation—significant co-morbidity					
8	Sepsis	Chronic lymphocytic leukemia	Electromagnetic fields	Locomotive engineer	Alfredsson et al. [1996]
9	Sepsis	Multiple myeloma	Pesticides; infectious agents	Farmer	Khuder and Mutgi [1997]
10	Pneumonia	Interstitial pulmonary fibrosis	Construction dusts, mould, asbestos, welding fumes	Construction worker, welder	Taskar and Coultas [2006]
11	Volume overload secondary to chemotherapy	Lung cancer	Exhaust fumes, stainless steel welding	Welder	Sorensen et al. [2007]
12	Pneumonia	Lung cancer	Asbestos, polycyclic aromatic hydorcarbons	Brakeman	Henderson et al. [2004], Howe et al. [1983]
13	Bleeding due to elevated INR from drug interactions	Colon cancer	Sedentary work	Taxi driver	Zhang et al. [2006]
Asymptomatic condition					
14	Asbestos related pleural fibrosis	Asbestos related pleural fibrosis	Asbestos	Miner	Greillier and Astoul [2008]

15 cases of lung cancer identified in the study, four (26.7%) had possible occupation contribution. While 8% of the 50 other cancer cases had a possible occupational exposure which may have contributed to the development of the disease. In two cases of COPD, 6.5% of the COPD admissions, an occupational exposure may have contributed to the development of disease. Two cases of interstitial pulmonary fibrosis were thought to possibly have an occupational contributing factor. They accounted for 20% of the 10 cases of restrictive lung disease in the sample.

Workers were asked if they were occupationally exposed to 37 exposures which could potentially lead to occupational diseases. Table IV details those exposures reported by more than 5% of study respondents. The exposure to environmental tobacco smoke, dust, noise, outdoor work with sun light exposure and shift work were reported most commonly. A variety of chemical exposures as detailed in the table were also reported frequently.

The number of potential adverse exposures reported by the workers was added. On average, workers reported 5.5 exposures with a range of 0 to 19. Approximately 75% of the workers reported more than three exposures and about 10% reported over 10 potentially harmful exposures (Table V).

DISCUSSION

One case (0.3%), was identified where occupational factors ultimately led to admission to the medical wards. In this case occupational trauma started the chain of events that led to the admission. Twelve other cases were identified where occupational factors may have contributed to the admitting condition or to other symptomatic problems. Thus in total about 4.4% of the admissions were either related to or had a major co-morbidity which may have been due to occupational factors. An additional case of a man with asbestos related pleural fibrosis was identified, but this condition was asymptomatic. These finding are lower than the results of a study of similar design reported from Belgium where about 10% of admissions to an internal medicine unit were thought to be probably or possibly related to occupational exposures [Gennart et al., 1991]. However they are close to the estimated 6.4% of all mortality in men related to occupational factors reported for the Finnish population in a study that used the population attributable risk per cent model to assess occupational mortality [Nurminen and Karjalainen, 2001].

Cancers, COPD, and interstitial fibrosis were the diagnoses most frequently thought to be possibly related to occupational exposures. Occupational factors may have contributed to 12.3% of the cancers in this study, a figure which is between the 14% of cancers in men reported in Finland [Nurminen and Karjalainen, 2001] and 8% of selected cancers in men reported from the United Kingdom [Health and Safety Executive, 2007]. Blanc and Toren [2007] reported that occupational exposures account for about 15% of the cases of COPD which is higher than the 6.5% identified in this study. However, the lower percentage reported in this study may have been due to the fact that a relatively small number, 30 individuals, had COPD in the study population causing the rate to be unstable. Two of the 10 cases of restrictive lung disease had potential occupational contribution. Although not completely compatible, this result is close to the range of occupationally related population attributable risk per cent observed for idiopathic pulmonary fibrosis reported in the literature [Taskar and Coultas, 2006].

The interaction between work related and non-work related factors in the cause of disease is highlighted by the role of personal history of cigarette smoking in a number of

TABLE IV. Occupational Exposures Reported by Over 5% of Study Participants

Exposure	Number	% of participants
Environmental tobacco smoke	243	81.8%
Dusty work	176	59.3%
Noise	175	58.9%
Outdoor work	159	53.5%
Shift work	133	44.8%
Diesel exhaust	94	31.6%
Asbestos	84	28.3%
Engine exhaust	84	28.3%
Welding fumes	63	21.2%
Lead	42	14.1%
Combustion products	34	11.4%
Chlorinated solvents	34	11.4%
Pesticides	31	10.4%
Herbicides	31	10.4%
Hardwood dust	25	8.4%
Radiation	23	7.7%
Silica	22	7.4%
Nickel	21	7.1%
Coal/Tar	20	6.7%
Epoxy compounds	19	6.4%

TABLE V. Frequency of Occupational Exposures Reported by 297 Male Medical Inpatients

Number of exposures	Frequency	Percent
0	8	2.7
1	33	11.1
2–3	70	23.6
4–5	58	19.5
6–10	98	33.0
11–15	23	7.7
>15	7	2.4
Total	297	100.0

cases in this study. All of the cases of lung cancer and COPD which were thought to be possibly work related had significant personal smoking histories. This history led to many of these cases being considered as possibly work related instead of definitely work related.

The likelihood that the possible occupationally related cases identified in this study would have been accepted by Workers Compensation Boards would depend on the definition of occupational disease used in the jurisdiction in question. In Manitoba, Canada these cases likely would not have been accepted as work related as work would not have been seen as the dominate cause of the disease, a condition required by the Manitoba Board [Workers Compensation Board of Manitoba, 2008]. In these cases there were either non-occupational factors which would have been more likely causes of the disease or the association of the occupational exposure, in question, was not strong enough to say that the exposure was the dominant cause of the disease.

Potentially harmful occupational exposures were reported fairly commonly in this study. Only eight individuals (2.7%) reported no exposure. About 75% of participants reported three or more exposures and the median number of exposures reported was 5. These results are similar to those of Schwartz and coworkers [1991] who found that 75% of internal medicine outpatient clinic patients in Iowa City reported occupational exposure to at least one potentially toxic agent and 30% claimed exposure to at least four potentially toxic agents. These results can not be directly compared as the lists of exposures were not similar and the setting, out-patient versus in-patient, was different.

The general source for information on occupational disease in Canada is Worker's Compensation Board data, but this may underestimate the extent of occupational disease [Kraut, 1994]. Hospitalization data has been used to study the influence of work on health in Canada. Liss et al. [2000] showed that persons with occupational asthma suffer higher rates of hospitalizations for all causes combined, respiratory disease, and asthma than workers with musculoskeletal injuries. Other work from Ontario showed that hospital records were a reliable source for identifying cases of pneumoconiosis [Liss et al., 1997]. Hospital discharge data has also been used to study injuries in the farming and forestry industries in Canada [Pickett et al., 2001; Alamgir et al., 2006]. None of these studies were designed to estimate the extent that occupational exposures led to hospitalizations in a general population. As research on hospitalization due to occupational illnesses in Canada and other countries has generally been done either looking at a specific disease [Liss et al., 1997; Liss et al., 2000] or a specific occupational group [Pickett et al., 2001; Alamgir et al., 2006], this study should be replicated in other jurisdictions to gain a greater understanding of the extent of hospitalization due to occupational diseases in general.

Approximately 1/3 of this hospitalized population was not working because of illness or disability. No information on the working status of hospitalized patients on general internal medical wards in Canada could be identified to which this figure could be compared. However, given the high frequency of and morbidity due to chronic diseases in Canada [World Health Organization, 2008] and the attempts to limit hospitalizations to those who can not be managed on an out patient basis, this high proportion would be expected.

This study, as any study, has a number of limitations. First, the exposure data was self reported. Self reported exposure data may either under or over report exposures. Secondly, the protocol required that the occupational history be taken from the patient. This led to the exclusion of individuals who could not communicate due to their illness. Study participants were less likely to die or be transferred to the Intensive Care Unit than other patients who met the study criteria but were not picked to participate. This is because individuals who were sicker, were more likely to not be able to complete the study questionnaire and would be excluded from the study. If occupational illnesses tended to make people sicker than other illnesses this bias would lead to an under estimation of the extent of occupational disease or an overestimation if they make people less sick. Limiting the study to only English speakers is a potential limitation as non English speaking immigrants to Canada may be more likely to have hazardous jobs. However, as only 2 of 110 individuals, (Table I) who did not participate in the study did not do so because of a language barrier, this potential source of bias is unlikely to have significantly affected the findings. Another limitation is that individuals, who were admitted directly to the small respiratory unit in the hospital, were not included in the study. Given the high proportion of respiratory illness thought to be potentially work related in this study, this would be another source of under diagnosis of occupational disease. As this was a pilot study, the assessment of occupational relatedness was only done by one individual. Future work which incorporated a panel of occupational disease experts could have altered the number of work related associations reported.

Although psychosocial [Kivimaki et al., 2006], or other factors, may contribute to occupational cardiovascular disease, no cases of occupational cardiovascular disease were identified in this study population due to the difficulty in assigning causation to psychosocial risk factors in individual patients.

These results can only be generalized to hospitals which admit similar patient populations to the hospital studied here. As this study was done in a large inner city referral hospital, from a city with a mixed economy, which also serves a lower socioeconomic population in a developed Western country, the findings would only be most likely to approximate those found in similar institutions. A hospital whose catchment area included a large number of workers from industries that

had extensive adverse exposures could report a higher number of possible occupational disease admissions. However, given the hospital studied was a large facility servicing the core area of a city, the average educational level of the participants was lower than the population average of Manitoba, and the most common job reported was trades helper, it is likely that the study population had more adverse occupational exposures than the general population of Manitoba and as such would be more likely to have occupational diseases than the population of the province as a whole.

The possible work related cases identified in this study were identified because a more detailed occupational history was taken. Taking a more detailed occupational history at the time of admission would likely lead to more cases where workplace factors would be thought to cause or contribute to the medical admission.

CONCLUSIONS

This study showed that occupational exposures to male medical inpatients are common and that 4.4% of the admissions to the medical wards from outside the hospital were either related to or had a major co-morbidity which may have been due to occupational factors. Detailed occupational histories will likely lead to more suspected cases of work related medical admissions.

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APPENDIX

Summaries of cases where occupational exposures definitely or possibly led to the development of the condition causing admission or other co-morbidity

Case 1: 53-year-old with paraplegia due to a construction site accident at age 20. Admitted with bacteremia secondary to a line infection which was placed to manage chronic urinary tract infections due to the paraplegia. Sepsis as a long term consequence of the effects of occupational trauma.

Case 2: 64-year-old dentist with acute myelogenous leukemia. Reported X-ray exposures to faulty equipment from 1968 to 1973 and as part of experiment in 1958. Possible radiation induced leukemia.

Case 3: 65-year-old painter admitted with an ileus due to complications from the treatment of metastatic non-small cell lung cancer which was diagnosed in 2001. Patient was a 40 pack year smoker. Painted from 1961 to 1995 often with no respiratory protection. Possible lung cancer related to painting exposures.

Case 4: 72-year-old miner admitted with increasing shortness of breath due to interstitial fibrosis. The patient was on amioderone for heart problems but he had interstitial fibrosis on X-ray prior to initiation of this treatment. Multiple dust exposures prior to presentation. Possible interstitial fibrosis due to dust exposures.

Case 5: 59-year-old laborer admitted with a COPD exacerbation and congestive heart failure. He had a 20 pack year smoking history. Worked as a trapper, on a farm and did construction work for 30 years. Reported cough and shortness of breath with exposures to construction dust and hay. Possible COPD related to dust exposure.

Case 6: 68-year-old metal worker/painter admitted with metastatic lung cancer. Exposed to cutting oils, paint and second hand smoke. Fifty pack years smoking history. Possible cutting oil/ paint related lung cancer.

Case 7: 54-year-old foundry worker admitted with exacerbation of COPD. Worked in a foundry for 20 years. Patient had a 25-pack year smoking history. Possible COPD related to dust and fume exposure.

Case 8: 51-year-old locomotive engineer developed Chronic Lymphocytic Leukemia (CLL) after 28 years of work. Admitted with sepsis. Possible CLL related to exposure to electromagnetic fields.

Case 9: 48-year-old farmer diagnosed with multiple myeloma. Worked with herbicides approximately 1 week per year. Possible farming/pesticide related multiple myeloma.

Case 10: 56-year-old construction worker admitted with pneumonia. He had a previous diagnosis of interstitial pulmonary fibrosis. Multiple exposures to dusts, welding fumes, mould and asbestos. Possible interstitial fibrosis due to dust/fume exposures.

Case 11: 60-year-old mechanic presented with fluid overload following chemotherapy for lung cancer which had been diagnosed in 2006. Worked as an auto mechanic 1991–1999 and as a welder from 1999 to 2006. Often welded on stainless steel. Patient was a 40-pack year smoker. Possible lung cancer following mechanic and welding exposures.

Case 12: 73-year-old railway worker with pneumonia. History of lung cancer in 2005. The patient had smoked 60 pack years. Worked on the railways from 1952 to 1963. Had potential asbestos exposure as a brakeman and in the storeroom. Exposed to burning coal exhaust on trains. Computer tomography scan of the chest showed no evidence of interstitial or pleural fibrosis. Possible asbestos and or PAH induced lung cancer.

Case 13: 54-year-old taxi driver admitted with bleeding due to drug interactions. History of Crohn's disease and colon cancer (2002). Worked as a taxi driver (1977–1987) and in an office. Possible case of sedentary work predisposing to colon cancer.

Case 14: 59-year-old miner admitted with complications of ethanol abuse. Noted to have bilateral asbestos related pleural fibrosis on chest radiograph. Reported asbestos exposure when working in mines.