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Acute Occupational Respiratory Diseases in Hospital Discharge Data

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We investigated the feasibility of using hospital discharge diagnoses of ICD codes 506, 507, and 508, respiratory diseases from external sources, to identify occupational sentinel health events [SHE(O)]. Two hundred sixty-nine records were reviewed and 66 (25%) were incidents where the work-relatedness of the respiratory diseases was documented in the medical records. Twenty-six percent of the 269 records contained no exposure information. Sixty-four of the 66 occupational cases were from ICD codes 506.0–506.9, with the largest number classified as ICD codes 506.0 (bronchitis and pneumonitis due to fumes and vapors) and 506.3 (other acute and subacute respiratory conditions due to fumes and vapors). We conclude that surveillance of ICD codes in the 506 series, where 39% of the cases were secondary to occupational exposures, is a valuable component of a surveillance system for preventable occupational lung disease.

Key words: surveillance, sentinel health event, occupational respiratory disease, ICD classification

INTRODUCTION

Lung diseases are among the leading work-related diseases and injuries [Baker et al., 1988]. Acute respiratory conditions due to gases, fumes, and vapors are important components of the spectrum of occupational lung diseases [Merchant, 1986]. Surveillance is a key element in the prevention strategy for these diseases. Recently, attention has been focused on the use of hospital discharge data for occupational disease surveillance [National Research Council, 1987; Rosenman, 1988; Kipen et al., 1990].

The present study examines whether hospitalized patients with International Classification of Disease (ICD) codes in the 506, 507, and 508 series may represent sentinel health events which should be part of occupational disease surveillance systems. A sentinel health event (occupational) [SHE(O)] is defined as "a disease,

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TABLE I. Respiratory Conditions in the 506, 507, and 508 Series*

506	Respiratory conditions due to chemical fumes & vapors
506.0	Bronchitis and pneumonitis due to fumes & vapors
506.1	Acute pulmonary edema due to fumes & vapors
506.2	Upper respiratory inflammation due to fumes & vapors
506.3	Other acute and subacute respiratory conditions due to fumes & vapors
506.4	Chronic respiratory conditions due to fumes & vapors
506.9	Unspecified respiratory conditions due to fumes & vapors
507	Pneumonitis due to solids & liquids
507.1	Due to inhalation of oils & essences
507.8	Due to other solids & liquids
508	Respiratory conditions due to other & unspecified external agents
508.8	Respiratory conditions due to other specified external agents
508.9	Respiratory conditions due to unspecified external agent

*ICD-9 CM codes.

disability, or untimely death which is occupationally related and whose occurrence may: 1) provide the impetus for epidemiologic or industrial hygiene studies; or 2) serve as a warning signal that materials substitution, engineering control, personal protection, or medical care may be required" [Rutstein et al., 1983]. Awareness of such cases may enable identification of high-risk activities, industries, or employers, and thereby, may trigger public health efforts to prevent recurrences.

MATERIALS AND METHODS

Patients, hospitalized in New Jersey during 1985 and 1986 with discharge diagnoses coded in the 506, 507, and 508 (Table I) series, were identified using hospital discharge data reported to the New Jersey State Department of Health. We excluded 507.0 (inhalation of food or vomitus) and 508.0 and 508.1 (radiation pneumonitis and fibrosis), as they are not legally reportable in New Jersey. All 105 acute care non-federal hospitals in the state are required to abstract the medical record number, hospital code, primary diagnosis and up to seven secondary diagnoses, date of admission, date of discharge, date of birth, and sex of all hospital discharges. Information on the patient's occupation or employer is not available on this computer record.

A review of complete hospital records of 50 cases from two different hospitals indicated that when information about a causal exposure was not present in the face sheet, admission history and physical examination, or discharge summary, it was not contained elsewhere in the chart. A coding instrument was thus developed for extraction and analysis of information about exposure from these components of patient records. All exposures to exogenous agents were categorized as "occupational," "non-work," "location not specified," or "no exposure information."

Hospitals were requested to furnish the New Jersey State Department of Health with a copy of the face sheet, admission history and physical examination, and discharge summary for all 1985 and 1986 discharges with reportable diagnoses in the 506, 507, and 508 series. Hospital records were abstracted and coded. When more

TABLE II. Location of Exposure for Hospitalized Patients With Acute Respiratory Conditions Due to Exogenous Agents (1985–1986)*

Diagnosis	Records received	Records with no exposure information		Records with exposure information: Occupational exposure (includes emergency responders)		Non-workplace exposure		Location not specified	
		No.	Percent	No.	Percent	No.	Percent	No.	Percent
506.0	101	7	(7)	35	(35)	48	(48)	11	(11)
506.1	8	2	(25)	2	(25)	4	(50)	0	
506.2	3	0		1	(33)	2	(67)	0	
506.3	36	3	(9)	20	(56)	11	(31)	2	(6)
506.4	17	6	(35)	6	(35)	2	(12)	3	(18)
506.9	1	0		0		0		1	(100)
506.0–506.9	**166**	**18**	**(11)**	**64**	**(39)**	**67**	**(40)**	**17**	**(10)**
507.1	35	28	(80)	1	(3)	6	(17)	0	
507.8	28	9	(32)	0		19	(68)	0	
508.8	32	9	(28)	1	(3)	21	(66)	1	(3)
508.9	8	3	(38)	0		5	(63)	0	
507.1–508.9[a]	**103**	**49**	**(48)**	**2**	**(2)**	**51**	**(50)**	**1**	**(1)**
Total	269	67	(25%)	66	(25%)	118	(44%)	18	(7%)

*Nos. in rows indicate actual No. of records classified in each category of follow-up or exposure information. Nos. in parentheses are percent of retrieved records for the ICD category (row). Percentages may not total 100% due to rounding off. The rows in bold face denote subtotals.
[a]Excludes 508.0 and 508.1 (radiation pneumonitis and fibrosis).

than one of the reportable discharge diagnosis under study was listed on a record, the first such code listed was used.

RESULTS

Three hundred seventy-three discharges for the specified ICDs were identified for 1985–1986. Hospital records were requested from 89 identified hospitals. Of these, 68 hospitals (76%) provided copies of 269 patient records (72%).

No exposure was mentioned in 67 (25%) of the 269 patient records reviewed. Many of these may represent incorrect ICD codes, as 507.1 included 17 aspiration pneumonias associated with stroke, lung cancer, or other significant medical illness (should be 507.0). There were also 11 "lipoid pneumonias" included in the 507.1 category; however, only one of these noted an exogenous source (30 years as a shipyard painter). Endogenous lipoid pneumonia should be coded as 516.9. ICD 507.8 similarly had 9 cases of aspiration pneumonia associated with a significant medical problem and these are more properly coded as 507.0. Similar miscodings of non-exogenous medical conditions were also present in 508.8 and 508.9, although the diagnosis of "allergic bronchospasm" without a specified allergen was frequent in these codes, and some of these could be due to identifiable exposures.

An exposure to some exogenous agent was described for the remaining 202 patients (75%), of which 66 (33% of the 202) were occupational exposures (Table II). Among the 118 (60% of the 202) non-workplace exposures, which are not considered

TABLE III. Workplace Exposures Identified in Records as Causes of Respiratory Conditions Due to Fumes and Vapors: New Jersey, 1985–1986

	Mean age (range)	Sex (%)	Chlorine	Products of combustion	Known sensitizer/ asthmatogen[a]	Unspecified	Miscellaneous
506.0 (35 cases)	37.7 (20–59)	Male-28 (80) Female-7 (20)	6	12	2[b]	4	11[c]
506.1 (2 cases)	58.5 (46–71)	Male-2 (100)	—	—	—	—	2[d]
506.2 (1 case)	39	Female (100)	—	1	—	—	—
506.3 (20 cases)	37.9 (21–61)	Male-12 (60) Female-8 (40)	3	4	2[e]	5	6[f]
506.4[g] (6 cases)	48.6 (28–62)	Male-5 (83) Female-1 (17)	—	1	—	1	4[h]
507.1 (1 case)	50	Male-1 (100)	—	—	—	—	1[j]
508.8 (1 case)	41	Male-1 (100)	—	—	—	—	1[i]
Total—66			9	18	4	10	25

[a]Based on review of Merchant [1986].
[b]Agents included ethylenediamine and polyurethane.
[c]Agents included ethylene oxide, welding fumes, bromine (2), clorox, trichloroethylene, cosmetic aerosols, hydrofluoric acid (2), sulfuric acid and nitric acid, and nitrous oxide (sic).
[d]Agents included hot tar, and unspecified fog of gas.
[e]Agents included TDI and formalin.
[f]Agents included cleaning products (2), paints (2), acid, and glue.
[g]Three of the 6 cases were actually acute bronchitis but had been miscoded at the hospital.
[h]Agents included cleaning product, PVC fumes, benzene gas, welding fumes.
[i]NH_4Cl.
[j]Paint inhalation for 30 years.

further in this report, were 16 allergic/anaphylactic reactions, 14 reactions to fumes from household cleaning products, 31 ingestion/aspiration of toxic compounds, 2 suicide attempts, 5 victims of house fires, and 6 near-drownings. In 18 (7%) cases, an exposure was noted but the location was not specified.

The proportion of cases of work-related respiratory disease due to inhalation exposures varied greatly by ICD code (Table II). The largest number of occupational reports was derived from ICD 506. In the 506 series, a total of 166 patient records was reviewed. Of these, 64 cases (39%) represented occupational exposures; 61 of the 64 were in 506.0, 506.3, and 506.4. Out of the 506 series, only 506.3 had a majority (56%) of reported occupational exposures. In contrast, one of 63 in the 507 series and one of 40 in the 508 series had workplace exposures. Table III shows demographics of cases and exposure categories for cases with occupational exposure.

DISCUSSION

The cases examined in this study demonstrate that hospital discharge data offer the opportunity for surveillance of occupational causes of acute respiratory illness and injury. The explicit cooperation of individual physicians and hospital staff is not

needed for this surveillance since the information can be obtained from routine hospital discharge data. Documentation of the public health utility of such follow-up, however, must depend on the results of more timely case follow-up with complete exposure histories. This follow-up is now underway. Timely reporting of these cases by hospitals will be necessary so that public health agencies may quickly recognize and respond to sentinel events.

On the basis of the 269 hospital records reviewed for this study, it appears that at least one 3-digit (506) ICD code has a much better yield of work-related cases than do others. It is unlikely that the 28% of cases which could not be located by the hospitals would appreciably change this finding, as non-reported cases were not concentrated by geography or level of urbanization. In particular, the 506.0, 506.3, and 506.4 codes contained many occupational case reports that clearly warranted follow-up; however, the overall 506 rate of 39% work-related cases suggests that all four digit codes in 506 should be considered sentinel occupational events. Of note was the finding of 13 occupational asthma diagnoses in the 506.3 code. Due to the lack of a unique ICD rubric, occupational asthma cannot easily be identified in hospital discharge data. Because many of the agents recorded are not well-validated asthmatogens, follow-up may lead to documentation of new risks for occupational asthma.

Rutstein et al. included only 506.0 and 506.1 on the [SHE(O)] list [Rutstein et al., 1983]; all of ICD 506 and especially ICDs 506.3 and 506.4 are important additions. The overwhelming lack of exposure data and apparent medical context of many cases in 507 and 508 suggest these are less likely to be occupational; however, follow-up with physicians and patients would be necessary to verify this suggestion. The 11 lipoid pneumonias in 507.1 and some of the 12 allergic bronchospasms in 508.8 and 508.9 might be especially worthy of further investigation.

Inadequate descriptions of exposure incidents, as well as no mention of the patient's occupation, were common in the records we reviewed. Only 5% of patient records where an occupational exposure was described met two accepted standards for clinical toxicologic assessment: identification of the causative agent and estimation of dose (at least by description of the exposure circumstances). This supports the need for heightened awareness of principles of occupational medicine and toxicology in medical training [Institute of Medicine, 1988; National Research Council, 1987]. In contrast to our previous findings for ICD codes in the 495 series [Kipen et al., 1990], apparent coding errors were about half as common for the diagnostic codes in the 506, 507, and 508 series. Coding errors were far less prevalent in the 506 (11%) series than in the 507 and 508 series (48%).

We believe that surveillance of hospital discharge diagnoses in the 506 series offers a valuable avenue for identification of acute work-related respiratory disease. Based on the preliminary results of this paper, the New Jersey Department of Health has instituted rapid investigation of ICD 506 cases, including telephone interviews with patients and industrial hygiene follow-up as appropriate. The overall preventability of these cases will be ascertained upon completion of this in-depth follow-up. State health departments with timely access to hospital discharge data and existing occupational disease surveillance systems such as those funded by NIOSH for "Sentinel Event Notification Systems for Occupational Risks" (SENSOR), will find these data a useful addition to their surveillance efforts [Baker, 1989].

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