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A DOCUMENTATION OF OCCUPATIONAL DISEASES IN THE CHEMICAL INDUSTRY IN THE FEDERAL REPUBLIC OF GERMANY

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ABSTRACT

In addition to company-own documentation on industrial medicine, it is essential to have documentation covering occupational diseases in all branches of industry. The collected data should be mutually compatible to a large extent. The basic documentation set up by the Industrial Injuries Insurance Institute in the Federal Republic of Germany records yearly 37 000 cases. On the basis of the duration of exposure and the latent period observed in 475 cases of occupational cancer in the chemical industry important hints for a specific preventive medical care program can be gained.

In order to be able to detect occupational diseases it is imperative to keep record of a number of data during an employee's working life but also after he has ceased working. Some organizations in the chemical industry already record data on industrial medicine, but generally their systems are not compatible. Since in modern enterprises of the chemical industry occupational diseases are comparatively infrequent, a wide joint system would be advantageous for this reason alone. At the congress "Medichem 1977" Kummer and Rijkels spoke in favour of an expansion of computer-assisted documentation systems in the industry.

In view of the large number of employees in medium-sized and small companies and their fluctuation, it is necessary to develop a company external system which would include other branches of industry as well. However, this should be done on condition that respective documentation systems are at least compatible.

The external documentation system, covering all branches, should be located at the responsible Industrial Injuries Insurance Institute which is responsible for the analysis of industrial accidents and occupational diseases. The Institute accepts an occupational disease only after an examination has been carried out by an expert in occupational medicine. As a rule, its experts have available relatively reliable data for documentation purposes. It is obvious that

these data could provide vital knowledge for the preventive medical care program.

Let me therefore outline roughly the system of documentation of occupational diseases at the Industrial Injuries Institute for the Chemical Industry in the Federal Republic of Germany.

Even 37 000 cases of occupational diseases out of a total of 20 million working people are registered annually. Of particular interest are the 7 000 cases which result in compensations, since these cases are based on reliable data. In the chemical industry including the rubber with their 880 000 employees, about 1 800 cases and nearly 200 compensations were recorded in 1977. These 200 cases represent 11% of all compensations resulting from accidents in the chemical industry, 42% of them were noise-induced diseases and only 21% were what are known as chemical occupational diseases.

The documentation of occupational diseases is a basic documentation which can be easily extended by means of additional documentations as we did, for example, in the cases of diseases caused by vinyl chloride, so that it is possible to retrieve each individual case.

The code used was purposely kept simple; the encoding is done on a single documentation sheet (Fig. 1) on the back of which part of the code is shown for explanation. The comprehensive Code Registers for such items as diagnoses and working area location as well as encoding examples are described in separate instructions. This system enables people working in the administration of insurance companies and dealing with these matters to employ the same encoding method. The examining physicians could not be entrusted with the encoding. All the available data are stored in a large central computer for the benefit of all insurance agencies.

The records of the occupational diseases thus stored are continuously adjusted so that the course of the disease can be followed e.g. where there is a deterioration due to the appearance of some malignant neogenesis. The following information is recorded: 1. personal data, 2. name of occupational disease and diagnosis, 3. the patient's anamnesis, 4. occupational history, including the object or substance which caused the disease, 5. preventive and rehabilitative measures, 6. severity of the disease and the cause of death.

Personal data

Under this heading is recorded – besides name, sex, date of birth, region, nationality and company – what is known as the insurance number which provides a link to the data and information systems of the statutory sick funds, the pension insurance institutes, and also the companies.

Name of occupational disease and diagnosis

According to a regulation, certain diseases are classified as occupational diseases. At the present time the list specifies 55 diseases. The occupational disease in each case is encoded. A separate code had to be developed for the

Berufskrankheiten-Dokumentation (BK-DOK)

FIG. 1 – Occupational diseases – records.

documentation of diagnoses. The international ICD code was found unsuitable for occupational deseases because it lacked intensity of evidence. The location of the injury, e.g. pleura, liver, is encoded by means of two digits (Fig. 2) and the medical description - like fibrosis, malignant neogenesis, various types of contact

Lokalisation (Schädigungsort)

Schlüssel-zahl	Bezeichnung/Text	Schlüssel-zahl	Bezeichnung/Text
	Allgemeines	30	Nasennebenhöhlen
01	Gesamtorganismus	31	Mund, Mundschleimhaut, Lippen
02	Psyche	32	Zähne, Zahnhalteapparat
03	Haut und Anhangsgebilde	33	Speicheldrüsen
04	Knochen	34	Rachenring
05	Wirbelsäule	35	Äusseres Ohr, Ohrmuschel
06	Gelenke	36	Mittelohr
07	Muskeln	37	Innenohr
08	Sehnen, Sehnenscheiden, Sehnenansätze	38	...
09	Schleimbeutel	39	...
10	Lymphknoten, Lymphbahnen		
11	Blut, blutbildende Organe		**Hals**
12	Kreislauforgane, Blutgefässe	40	Hals
13	Nervensystem-Peripher sensibel	41	Kehlkopf
14	Nervensystem-Peripher motorisch	42	Schilddrüse
15	...	43	Speiseröhre (Oesophagus)
16	...	44	...
17	...		
18	...		
19	...		**Brustkorb**
		45	Brustkorb-Region (Thorax), oberer Rumpfbereich
	Kopf	46	Mamma, Mamille
20	Kopf- und Schädelknochen	47	Obere Lufwege (Trachea)
21	Hirnhaut, Hirnsinus	48	Bronchien
22	Gehirn	49	Hilus
23	Rückenmark		
24	Hirnnerven	50	Lunge
25	Gesicht, Gesichtsknochen	51	Pleura
26	Auge (gesamt)	52	...
27	Lid, Bindehaut, Tränenapparat, Sklera, Hornhaut	53	...
		54	Herz (Endocard, Myocard)
28	Iris, Linse, Retina, Uvea, Glaskörper	55	Herzbeutel (Perikard)
29	Nase, Nasenscheidewand	56	Herzkranzgefässe (Koronararterien)

FIG. 2 – Extract from register of codes "Localisation (location of injury)".

eczema – by three digits (Fig. 3). The approximately 220 terms available were taken over from the list of recognized occupational diseases and are thus very much practice-related. It is also possible to record different diagnoses for one case.

Medizinisches Bild

Schlüssel-zahl	Bezeichnung/Text	Schlüssel-zahl	Bezeichnung/Text
	Allgemeines	161	Krebs, Karzinom
		162	Sarkom
100	Verlust	163	Mesotheliom
101	Schädigung	164	Hämangiendothelsarkom
102	Verengung (Striktur, Stenose)	165	Gutartige Neubildung, gutartiger Tumor
103	Schwäche (Asthenie)		
104	Ausfallerscheinung	166	Papillom
105	Funktionsstörung (Insuffizienz oder Überfunktion)	167	Zyste
		168	Pleuraplaque
106	Durchblutungsstörung (auch Bleikolorit)	198	Sonstige, vorübergehende Allgemeinbeschwerden
107	Blutung	199	Sonstige allgemeine Erkrankung
110	Entzündung		
111	Geschwür (Ulcus)		
112	Granulom (auch Zahngranulom)		
113	Thrombose, Embolie		**Haut**
		200	Kontakt-Ekzem (Dermatitis)
120	Kollaps, Schock, Koma	201	Kontakt-Ekzem, degenerativ
121	Kolik, Krampf (Spasmus)	202	Kontakt-Ekzem, allergisch
		203	Eiterausschlag (Pyodermie, Paronychie)
130	Nekrose (Gewebstod), Gangraen	204	Lichtsensibilisierung (Photo)
131	Verätzung		
132	Verbrennung	210	Akne (z. B. Perna, Bromakne)
		211	Krätze (nicht Milbenkrätze s. 746)
140	Schwund, Schrumpfung (Atrophie)	212	Follikulitis
141	Schwellung, Oedem	213	Haarausfall
142	Sklerose (Verhärtung)		
143	Fibrose	220	Pechhaut
144	Narbe	221	Hyperkeratose (übermässige Verhornung)
150	Allergie (nicht Asthma s. 400)	222	Warzen
151	Blasenbildung	223	Hautsarkoid
152	Verfärbung	224	Melanose
		225	Argyrose
160	Bösartige Neubildung, bösartiger Tumor	299	Sonstige Hauterkrankung

FIG. 3 – Extract from register of codes "Medical description".

The patient's history of illness

This gives indication of diseases (e.g. of the heart circulation system) which have no connection with the occupational disease. It also supplies information on the patient's height and weight as well as smoking habits.

Occupational history with regard to the object/substance which caused the disease

Occupational anamnesis regarding the object/substance which caused the disease is of particular importance and is therefore made as complete as possible, i.e. recorded are also periods of employment during which exposures with adverse affects on the person's health cannot be assumed. Periods of employment in specific activities are encoded. Activities have a special code divided into nine main groups which also contain information on activities in the chemical industry. A register of the labour administration with about 340 terms is used for the designation of activities. Further, details are recorded concerning the intensity of exposure to dangerous substances, similar diseases of fellow employees, the duration of exposure and the object/substance which caused the disease (Fig. 4).

Krankheitsauslösender Gegenstand
(Gliederung nach Schlüsselzahlen)

Schlüssel-zahl	Bezeichnung/Text	
142	**Kohlenwasserstoffe, aromatisch**	
1 420	Benzol	Benzol und seine Homologe: BK-Nr. 1303
1 421	Toluol	
1 422	Xylol	
1 423	Styrol (Vinylbenzol)	
1 424	Naphthalin	
1 425	Anthrazen	
1 426	...	
1 427	...	
1 428	...	
1 429	Sonstige oder nicht näher bezeichnete Stoffe dieser Gruppe (z. B. Biphenyl, Diphenyl, Tetralin)	
143	**Kohlenwasserstoffe, aliphatisch chloriert**	
1 430	Dichlormethan (Methylenchlorid)	
1 431	Trichlormethan (Chloroform)	
1 432	Tetrachlormethan (Tetrachlorkohlenstoff)	
1 433	Vinylchlorid	
1 434	Trichloräthylen	
1 435	Tetrachloräthylen (Perchloräthylen)	
1 436	aliph. chlor. Alkyloxide	BK-Nr. 1310
1 437	aliph. chlor. Alkylsulfide	BK-Nr. 1311
1 438	Kohlenwasserstoffe, cyclisch chloriert	
1 439	Sonstige oder nicht näher bezeichnete Stoffe dieser Gruppe	

FIG. 4 – Extract from register of codes "Disease – causing substance".

Preventive and rehabilitative measures

Under the heading "preventive and rehabilitative measures" particulars of findings obtained from special preventive examinations are recorded, as far as they are related to the occupational disease. Duration of ambulatory and stationary cures, aids at work and changes in the place of work are also recorded.

Severity of the disease and cause of death

The severity of the disease is measured according to the person's diminshed ability to earn a living expressed in per cent. The cause of death is important for epidemiologic investigations. It is recorded by means of the 3 digit ICD code (Fig. 5). Also recorded are such details as the year of death, whether the death was caused by the occupational disease, and whether the cause of death was confirmed by autopsy.

Todesursachen

Schlüssel-zahl	Bezeichnung/Text
160 – 163	**Bösartige Neubildungen der Atmungsorgane**
160	Bösartige Neubildung der Nase, der Nasennebenhöhlen, des Mittelohres und der dazugehörigen Nebenhöhlen
170 – 174	**Bösartige Neubildungen der Knochen, des Bindegewebes, der Haut und der Brustdrüse**
170	Bösartige Neubildung der Knochen
171	Bösartige Neubildung des Bindegewebes und sonstiger Weichteile
172	Bösartiges Melanom der Haut
173	Sonstige bösartige Neubildungen der Haut
174	Bösartige Neubildung der Brustdrüse
180 – 189	**Bösartige Neubildungen der Harn- und Geschlechtsorgane**
180	Bösartige Neubildung des Gebärmutterhalses
181	Chorionepitheliom
182	Sonstige bösartige Neubildungen der Gebärmutter
183	Bösartige Neubildung des Eierstocks, der Eileiter und des Ligamentum latum
184	Bösartige Neubildung sonstiger und n. n. bez. weiblicher Geschlechtsorgane
185	Bösartige Neubildung der Prostata
186	Bösartige Neubildung des Hodens
187	Bösartige Neubildung sonstiger und n. n. bez. männlicher Geschlechtsorgane
188	Bösartige Neubildung der Harnblase
189	Bösartige Neubildung sonstiger und n. n. bez. Harnorgane

FIG. 5 – Extract from register of codes "Cause of death – ICD-code".

There is surely no need to emphasize the fact that this volume of data can serve to answer a multitude of questions. Some 50 standard programmes are printed annually. Particular types of questions, e.g. on occupational cancer, can also be raised. The latent periods observed up to now can thus provide the basis for working out special preventive medical care programs.

We have, therefore, analyzed 475 cases of recognized occupational cancer where compensation has had to be paid (Table 1). Even 70% of the cases came from member firms of the Industrial Injuries Insurance Institute of the Chemical Industry (BG Chemie) and they accounted for more than 90% of the cancer cases

caused by chrome, arsenic, aromatic amines and halogenated hydrocarbons. However, the high percentage of the chemical industry's share may partly be influenced by the fact that the Industrial Injuries Insurance Institute of the Chemical Industry has classified and recorded occupational diseases in greater detail and over a longer period than other industrial injuries insurance institutes.

TABLE 1
Cases of occupational cancer.

Occupational disease	Number of cases		
	Total	BG Chemie	%
Chromium	49	47	95.9
Arsenic	16	15	93.8
Beryllium	1	1	—
Aromatic amines	119	117	98.3
Chlorinated hydrocarbons	16	15	93.8
Benzene	31	23	74.2
Nitro derivatives of benzene	1	1	—
Rays	10	4	40.0
Infection	2	—	—
Silicosis	1	—	—
Asbestosis and lung cancer	112	48	42.9
Mesotheliom	14	6	42.9
Skin cancer	88	49	55.7
§ 551/2 RVO	13	9	69.2
Cancer after injury	2	—	—
All	475	335	70.5

TABLE 2
Duration of exposure and latent-period of occupational cancer.

Cancer caused by	n	Average age at		Exposure (years)		Latency (years)	
		diagnosis	death	average	min. max.	average	min. max.
1	2	3	4	5	6	7	8
Aromatic amines	119	59	61	14	0.5–51	28	7–54
Chlorinated hydrocarbons	16	47	48	13	5–21	17	11–30
Asbestos	112	62	63	17	0.5–46	30	8–56
Chromium	49	56	57	16.1	2–43	24	5–58
Arsenic	16	61	63	10	0.8–40	26	14–44
Benzene	31	50	51	13	0.5–44	18	2–45
Tar etc. (skin)	88	55	60	24	3–45	27	4–53

If one looks at the mean duration of exposure and the latent period of 7 types of occupational cancer – which contribute up to 91% of the total – one will observe noticeable differences (Table 2). The latent period is considered as the time interval between the first exposure and the time of the first diagnosis. On the average short latent periods are found in cases caused by halogenated hydrocarbons (17 years) and benzene (18 years).

In comparison, the latent period in the case of bladder cancer caused by aromatic amines is 28 years and in the case of lung cancer caused by asbestos 30 years. Noticeable is also the wide gap between the shortest and the longest latent period. The shortest latent period is to be found in the case of benzene (2 years), cancer of the skin (4 years) and chrome (5 years).

We were confirmed in our belief that in the case of individual occupational cancer in particular cases an exposure of one to two years can suffice, as for example in cancer of the bladder. There have been no indications, however, that in the case of a short duration of exposure one may expect a long latent period. This applies also to mesothelioma following asbestos exposure. The decisive factors in occupational cancer will, therefore, have to be seen in the intensity of exposure and in the disposition of the person affected.

A further finding which is relevant in human terms has come to light: apart from cancer diseases of the skin, the average time of death exceeds only slightly the time at which the first diagnosis was made. This should provide a stimulus for improving early detection and therapy.

The few examples shown here are meant to illustrate the fact that even basic documentation can supply information which will help to expend and improve the system of preventive occupational medical care programs. To summarize, one may say that it has been proven necessary to have not only company-own but also external documentation covering the whole industry. However, these documentation systems should be made compatible. They should, if possible, be based on the same terminology in order to make results comparable. Moreover, it would be of great advantage if agreement could be reached on an international level as well. Perhaps there are experts who could screen the available material and make practicable suggestions.