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Childhood leukaemia in Switzerland: Comparison of different sources of data

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Childhood leukaemia has attracted much attention in recent years: clusters have been observed and in certain cases hypotheses about the origin of these clusters could be formulated[1–3]. Knowledge about the pattern of the geographical distribution is necessary in order to identify clusters, and monitoring disease rates over long time periods can help to identify time trends.

The incidence of childhood leukaemia in Switzerland has not been studied in depth so far; substantial efforts, however, have been made to evaluate treatment procedures and to follow patients over long periods for this purpose. The Swiss Paediatric Oncology Group (SPOG) established a registry of childhood leukaemia in 1976 in order to evaluate treatment effects. Since 1980, efforts have been made to achieve complete registration of all leukaemia cases occurring in Switzerland. The question was raised whether this register was complete and could be used to evaluate incidence rates and trends in Switzerland.

The following paper compares different sources of data on leukaemia with the SPOG register, and assesses the completeness of the SPOG register. The reliability of this register is tested and an attempt is made to estimate incidence rates in the whole of Switzerland.

Methods

The study was conducted in 1990. Three sources of data were used and will be briefly described before the procedures to compare them are detailed.

The registry of the Swiss Paediatric Oncology Group (SPOG) and the Swiss Study Group for Clinical Research on Cancer (SAKK)

In the mid-1970s the Swiss Study Group for Clinical Research on Cancer (SAKK) and the Swiss Paediatric Oncology Group (SPOG) initiated multicentre clinical research trials. Through carefully documented, standardized observations of clearly defined tumour stages under uniform treatments this multi-centre documentation could ensure the inclusion of sufficient numbers of patients for treatment effects to be assessed. At the beginning, the SPOG data recorded only patients treated with standardized treatment protocols (nine protocols have thus been evaluated). However, since the beginning of the 1980s SPOG has tried to register all leukaemia patients in order to improve the completeness of its databank. 58 patients found in the registry were not taking part in a clinical trial. Most of them were recorded between 1985 and 1989. Patients were included in the study up to the end of 1989. Age was limited to the completed 14th year of life.

Cancer registries

During the last 20 years, statistical registration and epidemiological analysis of the incidence of cancer in Switzerland have greatly improved. In the German speaking part of Switzerland the first registration was introduced in 1961 at the Institute for Pathology in St. Gallen. In 1990 there were six cantonal cancer registries: St. Gallen and Appenzell (SG); Zürich (ZH); Basel (BS/BL); Vaud (VD); Geneva (GE) and Neuchâtel (NE), recording cancer cases in the populations of these cantons. The six registries cover about 3 million inhabitants, about 45% of the total Swiss population.

Death certificates

Analysis of death certificates can be used to estimate the incidence of cancers with high lethality. At the federal level the Swiss mortality statistics have existed since January 1876, and in 1901 confidential and anonymous death certificates were introduced. Registration of the cause of death can be considered reliable for the last 20 to 30 years only.

Procedures

The present study started from the patients registered in the SPOG databank. The patients' data was only available on data sheets and was transferred to a computer data bank by the first author (G. M.). Table 1 shows the data recorded from the SPOG data sheet.

Tab. 1. SPOG data sheets.

1. Patient number
2. Sex
3. Date of birth
4. Residence at onset of illness (at least 1 year before illness)
5. Place of treatment
6. Diagnosis
ICD-8* code, ICD-0* code
7. Date of diagnosis
8. Relapse (date and specification)
9. Concomitant disease
10. Family history of cancer
11. Death and data of death

* ICD = International Classification of Diseases

Tab. 2. SPOG data (and hospital patients).

SPOG study patients		628
checked against hospital records	325	
completed with hospital records	182	
hospital records not found	9	
data not verified	112	
Patients newly found in hospitalization		97
		725
Exclusion of patients:		
residence outside Switzerland	62	
older than 14 years	21	
incomplete data	21	
Remaining for the analysis		621

Some of the data sheets were incomplete and had to be completed using case notes in the paediatric hospitals. The paediatric clinics of Aarau, Basel, Bern, Luzern, Lausanne and St. Gallen could be visited for this purpose. Lists were not available for Zürich and Geneva, nor could these hospitals be visisted. When the case notes were compared, the hospitalization lists were checked for additional cases of childhood leukaemia, and these cases were also registered. The data were recorded anonymously, the names of the patients being known only to the first author.

As a next step the SPOG data files were compared with the cantonal cancer registers. For this purpose, a list of patients identified in a canton with an existing cancer register was sent to the person responsible for the register. Two questions were asked:

- Could every patient be found in the cantonal register?
- Did the cantonal register contain patients who were not on the list?

Cantonal registry data could be used from 1976 to the end of 1988.

From the Federal Statistical Office a copy of the records of all childhood deaths between 1976 and 1989 was obtained. During this period 145 leukaemia patients were recorded in the SPOG registry as having died. Matching with mortality data from the Federal of Statistics was done using the following data: date of birth, sex, diagnosis, date of death and place of residence. Identity was accepted if at least date of birth, date of death, sex, diagnosis and/or place of residence were identical. When the diagnoses were not identical, an explanation for the difference had to be found. Identity was accepted if leukaemia was noted as concomitant cause of death or in case of replacement of ICD-9 code[4] 205 by 207. (i.e. myelogenic leukaemia was replaced by „other" leukaemia).

Results

The SPOG data file

The SPOG data base contains 628 patients with leukaemia recorded between 1976 and 1989. Of these 325 (52%) could be checked against clinical files and a further 182 (29%) completed. For nine cases clinical records could not be found, and 112 from Geneva and Zürich could not be checked. From these 121 patients 21 patients had to be excluded owing to incompleteness of data. When lists of hospitalizations in the paediatriac hospitals were compared with SPOG data files, 97 additional leukaemia patients were identified.

Patients residing outside Switzerland were excluded from the files (62). Furthermore, the SPOG data contained 21 patients older than 14 years who were also excluded from further analysis. The number of patients remaining in the analysis was thus reduced to 621 (Table 2).

Identification of SPOG patients in cantonal cancer registries

From the 621 leukemia patients identified in SPOG data files and in the hospitals, 252 (41%) were residents in one of the six cantons where cantonal cancer registry data are available. Since the cancer registries compared data only until 1988, 239 cases could be sent to them for comparison. Table 3 shows the identification of cases over the years in the SPOG files, without the additional cases found in hospital records. Table 4 includes the 38 cases additionally found in hospital records.

It is interesting to note that over the years the SPOG file improved registration, and that by the end of the period 91% of the cases registered in cancer registries could be identified in the SPOG file. The cancer registers contained over 90% of the cases identified in the SPOG file, and this proportion remained stable over time. When additional hospital cases were taken into account, a considerably higher

Tab. 3. Comparison of SPOG data files (N = 201) with cantonal cancer registry data (N = 253) 1976–88.

Found in	1976–80	1981–84	1985–88	1976–88
SPOG files and cancer registry	48	53	83	184
SPOG file only	4	5	8	17
Cancer registry only	42	19	8	69
Detection rate				
SPOG cases in cancer registry	92%	91%	91%	92%
Cancer registry cases in SPOG files	53%	74%	91%	73%

Tab. 4. Comparison of SPOG data files completed with hospital records (N = 239) and cancer registry data (N = 253).

Found in	1976–80	1981–84	1985–88	1976–88
SPOG files and cancer registry	77	56	85	218
SPOG file only	6	6	9	21
Cancer registry only	13	16	6	35
Detection rate				
SPOG cases in cancer registry	93%	90%	90%	91%
Cancer registry cases in SPOG files	86%	78%	93%	86%

Tab. 5. Comparison of SPOG mortality (N = 145) with official mortality statistics (N = 270) (Codes 204–208).

Found in	1976–80	1981–84	1985–88	1989	1976–88
SPOG and mortality statistics	43	38	47	12	140
SPOG file only	1	3	1	0	5
Mortality statistics only	85	28	14	3	130
Detection rate					
SPOG in mortality statistics	98%	93%	98%	100%	97%
Mortality statistics in SPOG file	34%	58%	77%	80%	52%

Tab. 6. Comparison of SPOG mortality completed with hospital records (N = 177) with official mortality statistics (N = 270) (Codes 204–208).

Found in	1976–80	1981–84	1985–88	1989	1976–88
SPOG and mortality statistics	54	51	53	13	171
SPOG file only	2	3	1	0	6
Mortality statistics only	74	15	8	2	99
Detection rate					
SPOG in mortality statistics	96%	94%	98%	100%	97%
Mortality statistics in SPOG file	42%	77%	87%	87%	62%

proportion of the SPOG data could be identified in the cancer registry.

Comparison of SPOG data with mortality statistics

During the period 1976 to 1989, 145 leukaemia patients were recorded in the SPOG register as having died. Tables 5 and 6 show the result of the comparison between the SPOG mortality data and the cases identified as having died of leukemia in death files of the Federal Office for Statistics. In 1989, all cases recorded as having died in the SPOG file could be identified in the mortality statistics. However, three cases could be identified in the mortality statistics only.

Characteristics of SPOG Patients

Table 7 summarizes some characteristics of the 621 patients in the SPOG data file. Acute lymphatic

Tab. 7. Diagnosis of SPOG patients (ICD 204–208), sex distribution and treatment place 1976–89.

Diagnosis:			
204 00	acute lymphatic leukaemia	533	85,8%
205 00	acute myeloic leukaemia	61	9,8%
205 01	chronic myeloic leukaemia	16	2,6%
206 00	acute monocytic leukaemia	4	0,6%
208 00	acute leukaemia cell type unknown	7	1,1%
		621	100%
Sex:	male	342	55,1%
	female	278	44,8%
	unknown	1	0,2%
		621	100%
Place of treatment:			
Basel		54	8,7%
Zürich		98	15,8%
Bern		170	27,4%
St. Gallen		61	9,8%
Luzern		51	8,2%
Aarau		51	8,2%
Lausanne (CHUV)		36	5,8%
Genf		44	7,1%
Others		56	9,0%
		621	100%

leukaemia is the most frequent diagnosis and accounts for 86% of the patients. Males predominate among the cases. Bern was recorded most frequently as the place of treatment. Since the registry was started in Bern it might well be that registration was more complete there at the beginning of the period studied. Comparison with the cancer registry, however, showed fairly complete registration in Zürich. (No registry in Bern).

With these figures an attempt can be made to calculate the incidence rate over the time of observation using all children between 0–14 living in Switzerland in the year being considered as denominator. Figure 1 illustrates three different calculations of incidence:

- Incidence calculated from SPOG cases only
- Incidence calculated from cases identified in both SPOG file and cancer registries
- Incidence calculated from all cases identified in either SPOG registry or in cancer registries

It is unclear at this stage whether the apparently higher incidence in 1985 is due to an improvement in recording or whether this is a true increase of incidence. Since 1985 (when the discrepancy between the registries and other sources of data decreases) the incidence rates seem to be decreasing. As yet, it is unclear whether this is a trend which will continue or just a normal fluctuation. Further

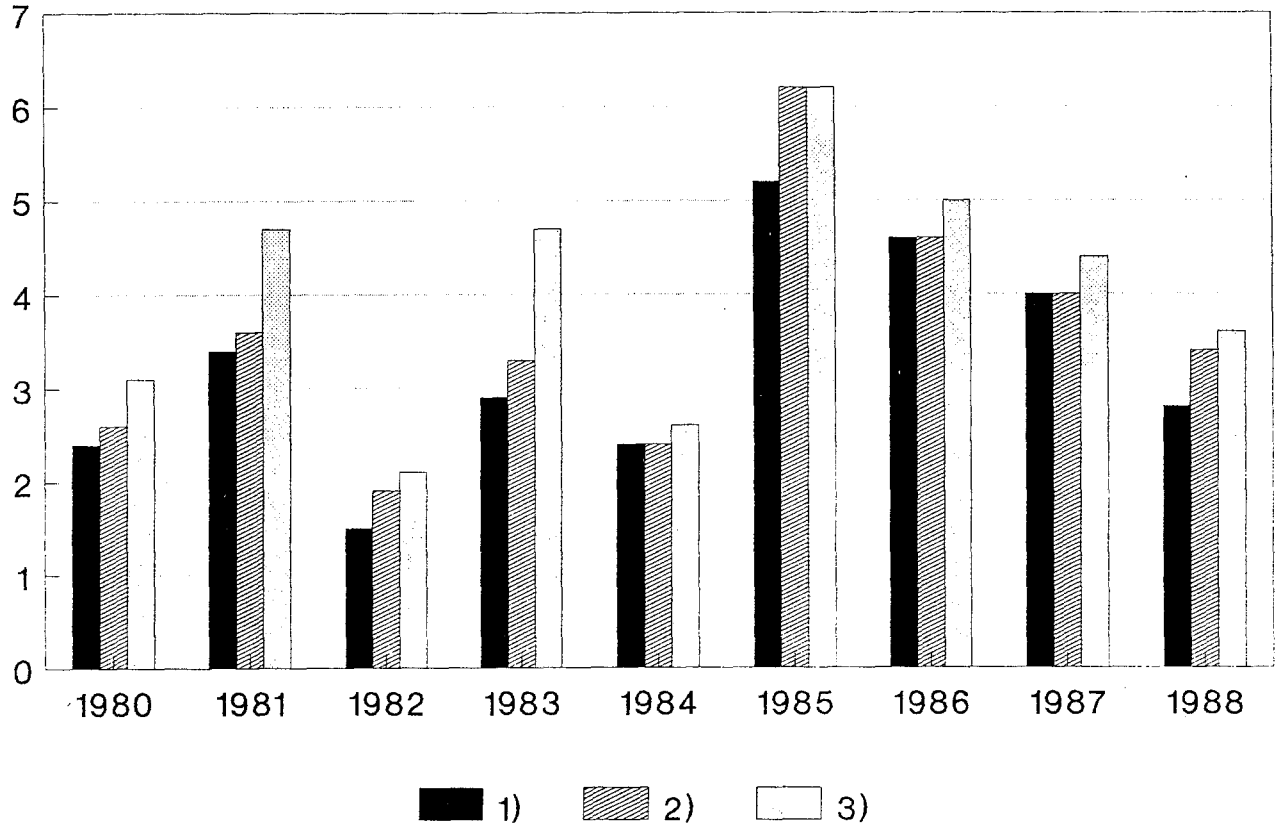

Fig. 1. Incidence of childhood leukaemia. 1) Incidence calculated from cases found in SPOG and cancer registries; 2) Incidence calculated form SPOG cases only; 3) Incidence calculated from all cases (SPOG and cancer registries).

analysis of cases is need and will be easier with the quality of data now available.

Discussion

The present study attempts to judge the quality of childhood leukaemia registration in Switzerland on the basis of three different sources of data: the SPOG registry (an effort created to evaluate clinical trials completed with non-trial cases since 1981), the cancer registries which exist in 9 cantons, and the official mortality statistics.

For the cancer registers different factors influencing completeness have been described in the past: the age of the register, the information gathering process, the place where the diagnosis was first confirmed, the collaboration of practising physicians, and the patient's age and sex [5,6]. The registration rate also differs among cantonal registries. Discrepancies between registers found in this study might be due to the fact that diagnosis was made before the register existed.

According to Wietlisbach and Levi [7] the population coverage of the cantonal registries varies at present between 85 and 99%. Extrapolation of cancer registry data to the total Swiss population is limited by the fact that urban populations are overrepresented. However, this study shows reasonably good agreement of SPOG data with cancer registers which suggests that both data banks are reliable. For the SPOG data file, this means that it can be used as an epidemiological data base for the whole of Switzerland.

Minder [8] has critically reviewed the quality of mortality statistics. He found that the coding of malignant tumours and lung diseases was reliable although malignant tumours might be slightly overrecorded.

The SPOG registry is the only data source that potentially covers the whole of Switzerland. The comparison with the cancer registry revealed that the quality of that data bank is improving. However, each registry contained approximately 10% of cases which could not be found in the other data source, so it can be reasonably assumed that an incidence calculation from either cancer registry data or from the SPOG data file would always remain on the low side.

It is important to know that a registry like the SPOG data file can actually be used for epidemiological analysis for childhood leukaemia provided the quality is regularly checked and comparisons with other data sources are repeated. Epidemiological studies of childhood leukaemia are important because it is one of the most frequent malignant tumours in childhood, and also because of new hypotheses emerging about its origins [9]. It is therefore to be hoped that SPOG will maintain its efforts to keep accurate and complete records so that studies can be made based on its cases.

Summary

Since 1976 the Swiss Paediatric Oncology Groups (SPOG) has registered leukaemia cases occurring in Switzerland. The registration was set up for clinical research; however, since 1985 efforts have been made to complete the registers with cases not taking part in a clinical trial. The data of the SPOG register between 1976 and 1989 are compared to data from cancer registers and the mortality statistics of the Federal Office of Statistics. Between 1985 and 1988 the SPOG register included 91% of the cases recorded by the six cantonal registries. Compared to mortality data, registration was 100% in 1989. The SPOG data file can therefore be assumed to be complete enough to be used for epidemiological studies on incidence of leukaemias and on time trends of leukaemias in Switzerland.

Résumé

Les leucémies de l'enfant en Suisse: Comparaison des sources de données

Depuis 1980, la SPOG (Swiss paediatric oncology group) enregistre des cas de leucémie qui apparaissent en Suisse. Ce registre a été installé pour la recherche clinique. En plus, depuis 1985, la SPOG entreprend un grand effort pour compléter le registre par les cas de leucémie ne prenant pas part aux études cliniques. Les données de la SPOG des années 1976 à 1989 sont comparées aux données des registres du cancer et de la statistique de mortalité de l'Office fédéral de la statistique. Entre 1985 à 1988, la SPOG comptait 91% des cas enregistrés par les six registres cantonaux du cancer. Comparé à la statistique de mortalité, l'enregistrant était de 100% en 1989. C'est pourquoi les données de la SPOG peuvent être utilisées pour entreprendre des études épidemiologiques sur l'incidence et l'évolution des leucémies en Suisse.

Zusammenfassung

Kindliche Leukämie in der Schweiz: Vergleich der Datenquellen

Seit 1976 registriert die Schweizerische Pädiatrische Onkologie Gruppe in der Schweiz vorkommende Leukämien. Das Register wurde für klinische Forschung aufgebaut, seit 1985 aber laufen Bemühungen, auch Fälle ins Register aufzunehmen, die nicht an einer klinischen Studie teilnehmen. Die vorliegende Arbeit vergleicht Daten des

SPOG Registers zwischen 1976 und 1989 mit Daten der Krebsregister und mit Daten der Mortalitätsstatistik des Bundesamtes für Statistik. Verglichen mit den sechs kantonalen Krebsregistern erreichte die Vollständigkeit der Daten in den SPOG Registern 91% zwischen 1985 und 1988 Verglichen mit den Mortalitätsdaten erreichte die Registrierung 100% im Jahre 1989. Die SPOG Datenbank kann deshalb als vollständig genug angesehen werden, um epidemiologische Studien über die Inzidenz von Leukämien in der Schweiz und den Verlauf dieser Inzidenzen durchzuführen.

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