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Patients, diagnoses and processes in general practice in the Nordic countries

An attempt to make data from computerised medical records available for comparable statistics

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***Objective* — To try out a collection of a standard set of data from computerised medical records.**
***Design* — Retrospective extraction of ordinary patient record information put into the computer by general practitioners.**
***Setting* — Encounters in office hours in strategically selected practices or health centres in Denmark, Finland, Iceland, Norway and Sweden.**
***Subjects* — 59 general practitioners and a total study population of 97475 persons.**
***Main outcome measures* — Proportions, crude and specific rates of encounters, diagnoses and processes.**
***Results* — In a 4-week period there was a threefold difference in the office encounter rates between the participating sites in the Nordic countries. Gender and age patterns were similar despite these differences. An access to several different denominators revealed diverse patterns of referring to the specialist, prescribing, ordering blood tests, X-rays and physiotherapy. Data from computerised medical records agree well with earlier studies in the Nordic countries using other methods.**
***Conclusions* — This survey demonstrates that valid and reliable data for routine statistics are available from computerised medical records in general practice. The major obstacle extracting more epidemiological data from computerised medical records is caused by information in the databases not being uniquely linked to episodes of care.**

***Key words: general practice, computerised medical records, statistics* and numerical data.**

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Statistics from primary health care in the Nordic countries have been sparse and difficult to compare (1). The Nordic Medico Statistical Committee (NOMESCO) therefore initiated a project to prepare the basis for descriptive Nordic health statistics using data mainly from computerised medical records in general practice.

The project group soon discovered that there were two major organisational circumstances that made data comparison difficult. Patients have, to varying degrees, direct access (first contact) to specialist health services in Finland, Iceland and Sweden. In Denmark and Norway they usually need a referral. Antenatal care, infant check-ups, vaccinations, health screening and family planning are offered outside general practice. That is the case in particular in Sweden and in Norway, although general practitioners often participate.

In our approach we therefore decided to put the questions as follows: How do these organisational differences affect the number of encounters and the contents of general practice, and how can they best be illustrated when comparisons are made? Next, what difficulties and limitations are revealed when data from computerised medical records are collected in practice, and what is needed to make information accessible from general practice computer systems?

MATERIALS AND METHODS

General practitioners in Denmark and Iceland have patient lists. In Finland, Norway and Sweden the denominator had to be defined by health centres or geography, which is possible only in some areas. The practices were selected strategically in order to avoid any extremes of health service delivery or population composition.

Table I lists the study material and summarises important organisational factors that had been identified and which we assumed would be important when interpreting the results.

In Denmark, 10 general practitioners were originally recruited, but four doctors in one health centre had to be left out because of a lack of compliance in regard to registration of diagnoses. In Sweden, 2.5 doctors serving the chosen areas did not participate. We estimated a loss of about 20% of patient contacts in the Swedish data. In Finland, Iceland and Norway,

all the general practitioners in the selected areas participated as agreed.

We limited data collection to normal office hours, including both indirect encounters and office encounters (2). The doctors were not asked to register any additional information for the purpose of the project. Registration was carried out for 4 weeks in early 1997.

For diagnostic purposes, the general practitioners in Denmark and Norway used the ICPC (International Classification of Primary Care) (3), while in Sweden and Iceland they used the ICD9 (International Classification of Diseases) (4). In Finland, one medical centre had developed its own code list of diagnoses, whereas the others used the ICD9. To overcome this problem, we aggregated the diagnoses into larger groups. This categorising of diagnoses had been tested in an earlier study (5). When processing the data, we only dealt with one diagnosis per encounter (principal diagnosis).

The tables presented were designed prior to collection of the data. Each country prepared its own data to be included in the tables. Most tables describe proportions or encounter rates, with the total population or contacting patients as denominator. In one table, the results have been standardised with respect to gender and age to reveal any possible effects of the population composition. We report office encounters as incidences with 95% confidence intervals in the population-based tables. This provides an estimate of the reliability of the measuring, but the method of choice does not give rise to an examination as to whether or not the differences we found are statistically significant. Interpretation of the results was done jointly by the national project leaders.

RESULTS

In all, 59 doctors participated. The total study population included 97475 persons (Table I). Of those, 12774 patients made 15754 office encounters over the 4-week registration period.

The proportion that consulted a general practitioner in the course of 4 weeks, the number of office encounters, and the encounter rates are given in Table II. The number of office encounters was highest for Denmark, regardless of whether the total population or number of patients was used as denominator. The number of office encounters in Sweden was clearly the lowest, about 1/3 of what took place in Denmark. In Finland, Iceland and Norway, the proportion of the population who saw a general

Table I. Participating practices and doctors in the NOMESCO primary health care study, including factors known ahead and believed to have major influences on office encounter rates and general practice activities.

	Denmark [1]	Finland [2]	Iceland [3]	Norway [4]	Sweden [5]
General practitioners					
Number of posts	6	13	7	19	14
Population served	9315	25 394	19 361	17 718	25 687
Wages: Fixed salary only				10	14
Fee for service+others	6	13	7	9	
Patient charges: adults children	None None	50 FIM None	700 IKR 300 IKR	78 NOK None	120 SEK None
Practice organisation					
Group- or solo-practice	4 solo, 1 group	2 health centres	1 health centre	3 health centres	3 groups in one health centre
Doctors have patient lists	Yes	No	Yes	No	No
Services included in general practice (office hours)					
Emergency ward/-room	Yes	Yes	Yes	Yes	Yes
Well-baby care	Yes	Yes	Yes	No	No
Antenatal care	Yes	Yes	Yes	Partially	No
Routine cervical smears	Yes	No	Optional	Yes	No
Family planning	Yes	Yes	No	Yes	No
Occupational health	No	Yes	No	No	No
'Gatekeeper' to specialised services	Yes	Partially	Partially	Yes	Partially
Doctors sick-leave certificate needed from day	(4)	1	Variable	4	8

[1] Six private practitioners on the island of Funen.
[2] Two health centres with defined population — Tapiola, Hangö and Ekenäs Health Centres.
[3] One municipality — Solvangur Health Centre.
[4] Three municipalities — Surnadal, Ørskog and Ørsta.
[5] One municipality — Arvika.

Table II. The number of persons and proportion of the population with office encounters (face-to-face in office hours) and number of encounters in general practice during the course of 4 weeks. The total number of office encounters per 10 000 persons is adjusted for gender and age using the WHO European standard population (95% confidence interval).

	Study population	Persons with encounters		Total no. of encounters	No. of encounters			
					Per 100 with encounter	Per 10 000 persons		
		No.	(%)			Unadjusted	Adjusted	95% CI
Denmark	9315	1,983	(21)	2696	136	2,894	2,845	2,742–2,952
Female	4661	1,156	(25)	1591	138	3,413		
Male	4654	827	(18)	1105	134	2,374		
Finland	25 394	3,601	(14)	4789	133	1,886	1,941	1,856–2,030
Female	12 961	1,945	(15)	2671	137	2,061		
Male	12 433	1,656	(13)	2118	129	1,704		
Iceland	19 361	2,559	(13)	3187	125	1,646	2,301	2,208–2,397
Female	9673	1,507	(16)	1864	124	1,927		
Male	9688	1,052	(11)	1323	126	1,366		
Norway	17 718	2,637	(15)	2970	113	1,676	1,643	1,565–1,725
Female	8760	1,561	(18)	1729	111	1,974		
Male	8958	1,076	(12)	1241	115	1,385		
Sweden	25 687	1,994	(8)	2112	106	82	782	729–839
Female	13 019	1,157	(9)	1217	105	935		
Male	12 668	873	(7)	895	107	707		

practitioner (13–15%) was approximately identical, but the Finnish and Icelandic patients consulted a doctor more often during the study period than did the Norwegians.

Standardisation by gender and age had the greatest impact on the encounter rate in Iceland, and revealed that the selected population there was relatively young. In Norway and Sweden, the effect was the opposite, but not to the same extent. The 95% confidence intervals showed no overlapping.

Office encounters by gender and age

General practitioners in the Nordic countries have more female (58–60%) than male patients (Table II). Only the Finnish data had a significantly lower proportion of women, i.e. 54%. Although a larger proportion of women consulted a doctor, the frequency of their visits during 4 weeks was no higher than that of men.

Age and office encounter rates can be studied in Fig. I. The overall picture is different levels of encounter rates.

The office encounter rates during the first years of living (0–9) were identical in Denmark, Finland and Iceland and much higher than in Norway and Sweden. This difference was due to a higher frequency and higher proportion of children seeing a general practitioner in those three countries. From age group 10–19 to 70–79 years, there was an overall rise in the number of encounters, except for Finland. In Denmark and Norway, the encounter rates were relatively high in the age groups 20–29 and 30–39 owing to more women visiting the doctor. There was a significant fall in encounter rates for the very old (+ 80) in Denmark and Iceland, primarily caused by a lower proportion consulting a doctor at this age. Nevertheless, in 4 weeks as much as 1/4 to 1/3 of the population in the oldest age groups visited their general practitioner.

Diagnoses and other reasons for encounter

The diagnoses are grouped in Table III. The number of office encounters per 10000 persons describe the absolute number. The proportion distribution is a relative comparison, as if the doctors had the same total number of patients.

Respiratory tract infections were the most common diagnoses in all the countries, both absolutely and proportionally. The number was particularly high in Finland. In Iceland, the number was also high, but the proportion was about the same as in Norway and Sweden. The encounter rate for injuries was also high in Finland, but low in Iceland. Icelandic doctors had a high rate of office encounters for digestive functional problems compared with doctors in the other sites.

Proportionally, Swedish general practitioners had a high proportion of office encounters concerning patients suffering from hypertension and chronic heart diseases. The encounter rate for ischaemic heart disease and arrhythmias was highest in Norway. Danish doctors had many patients with skin infections.

Table III. The number and proportions of office encounters and the number of office encounters per 10 000 persons during four weeks related to the main diagnosis given in general practice in the Nordic countries.

Diagnosis	No. of encounters	(%)	Denmark per 10 000 persons	95% CI	No. of encounters	(%)	Finland per 10 000 persons	95% CI	No. of encounters	(%)	Iceland per 10 000 persons	95% CI	No. of encounters	(%)	Norway per 10 000 persons	95% CI	No. of encounters	(%)	Sweden per 10 000 persons	95% CI
Respiratory tract infections incl. otitis	203	(9)	218	190–249	1348	(28)	531	487–579	699	(19)	361	325–401	436	(15)	246	217–279	367	(18)	143	121–169
Neck shoulder & other enthesopathies	78	(4)	84	67–104	91	(2)	36	26–50	105	(3)	54	41–71	218	(8)	123	103–147	100	(5)	39	28–54
Low back problems	63	(3)	68	53–86	124	(3)	49	37–65	120	(3)	62	48–80	140	(5)	79	63–99	74	(4)	29	20–42
Psychiatric problems	111	(5)	119	99–143	94	(2)	37	26–52	188	(5)	97	79–119	138	(5)	78	62–98	121	(6)	47	35–63
Atopic and hypersensivity problems	97	(4)	104	86–127	43	(1)	17	10–28	159	(4)	82	66–102	92	(3)	52	39–69	95	(5)	37	26–52
Hypertension	141	(7)	151	129–178	198	(4)	78	62–98	136	(4)	70	55–89	90	(3)	51	38–68	172	(8)	67	52–86
Ischemic heart disease and arrhythmias	42	(2)	45	33–61	86	(2)	34	24–28	56	(2)	29	20–42	158	(6)	89	72–110	118	(6)	46	34–62
Diabetes	44	(2)	47	35–63	48	(1)	19	12–30	12	(0)	6	2–14	50	(2)	28	19–41	67	(3)	26	17–39
Cancer	17	(1)	18	11–29	1	(0)	0.4	0–6	15	(0)	8	4–16	18	(1)	10	5–19	3	(0)	0	0–5
Female genital problems	70	(3)	75	60–95	104	(2)	41	30–56	66	(2)	34	24–48	78	(3)	44	32–60	49	(2)	19	12–30
Digestive system functional problems	69	(3)	74	59–94	173	(4)	68	53–87	350	(9)	181	156–210	89	(3)	50	37–66	31	(2)	12	7–22
Skin infections	100	(5)	107	88–130	130	(3)	51	38–68	41	(1)	21	13–33	58	(2)	33	23–47	28	(1)	11	6–20
Injuries and accidents	95	(4)	102	84–124	475	(10)	187	162–216	43	(1)	22	14–34	133	(5)	75	59–95	118	(6)	46	34–62
All other diagnoses	886	(41)	951	892–1014	1 381	(29)	544	500–592	1380	(37)	713	662–768	916	(32)	517	474–564	699	(34)	272	241–307
Sum	2016	(92)	2164	2074–2258	4298	(91)	1692	1613–1775	3369	(91)	1740	1660–1824	2613	(92)	1475	1401–1553	2040	(98)	794	740–852
Antenatal care and family planning	74	(3)	79	63–99	58	(1)	23	15–35	89	(2)	46	34–62	170	(6)	96	78–118	0	(0)	0	0–5
Vaccination well baby care check-ups smears etc.	93	(4)	100	82–122	391	(8)	154	131–181	252	(7)	130	109–155	51	(2)	29	20–42	36	(2)	14	8–24
Total	2183	(100)	2344	2250–2441	4746	(100)	1869	1786–1956	3710	(100)	1916	1832–2004	2844	(100)	1605	1528–1686	2076	(100)	808	754–866
Diagnoses not given	513				11				32				126				40			

In all the countries, 8–10% of the office encounters were for non-disease reasons, except for Sweden where this was a rare reason for encounter. Norway had a high encounter rate for antenatal care and family planning. Denmark, Finland and Iceland had most encounters in the group comprising vaccination, infant check-ups, routine smears and other health check-ups.

Management

Table IV gives some common processes in general practice, the proportion of patients who received these, and what this meant in population-based rates.

The proportion of patients referred to specialists by the general practitioner was the same in all countries, but when applied on the study population Danish people received more secondary health care than the others. On the other hand, Danish general practitioners more seldom ordered X-rays or physiotherapy, and wrote prescriptions or took blood tests in a lesser proportion of the office encounters than did doctors in the other countries. Swedish doctors wrote prescriptions or took blood tests in a high portion of the consulting patients, but at the population level the rate was anyway the lowest. The rate of the total population having X-rays was highest in Finland.

In Table IV we show whether or not a drug was prescribed in connection with an office encounter, and in Table V we have counted the total number of items prescribed (repeat prescriptions included) in connection with both indirect and direct office encounters. We have used four different denominators, thus illustrating the different patterns of prescribing in our countries. The high number of items prescribed per 10000 in Denmark was due to a high number of items prescribed to each patient given a prescription and the high encounter rate per 10000. The low number of items prescribed per 10 000 in Iceland was mainly caused by a lower proportion of patients getting prescriptions. Norwegian doctors made out prescriptions to both a high proportion of their patients and in connection with a high proportion of encounters.

DISCUSSION

The present survey has demonstrated that valid and reliable data can be extracted from computerised medical records. At the same time we have revealed great differences in health care utilisation and management in general practice even within the Nordic countries. Organisational matters can explain most of the variance.

A limitation of this study was that the selection of doctors and populations was done strategically in

Table IV. The proportion of office encounters resulting in a referral to specialist, X-ray or physiotherapy, a blood test or a prescription, and the number per 10 000 in the study populations exposed to these processes during the course of 4 weeks.

	Referral to specialist			X-ray			Prescription			Blood test			Physiotherapy		
	Per 100 office encounters	Persons per 10 000		Per 100 office encounters	Persons per 10 000		Per 100 office encounters	Persons per 10 000		Per 100 office encounters	Persons per 10 000		Per 100 office encounters	Persons per 10 000	
		No.	(95% CI)		No.	(95% CI)		No.	(95% CI)		No.	(95% CI)		No.	(95% CI)
Denmark	8	161	(138–188)	3	43	(31–58)	28	721	(670–777)	10	252	(223–286)	1	25	(16.37)
Finland	–	–		6	107	(88–130)	39	727	(676–782)	–	–		–	–	
Iceland	–	–		–	–		45	739	(687–795)	–	–		–	–	
Norway	9	148	(126–174)	6	87	(70–108)	35	592	(546–642)	26	421	(382–464)	3	50	(37–66)
Sweden	9	79	(63–99)	7	60	(46–78)	52	432	(393–475)	42	346	(311–385)	4	30	(21–43)

different ways in the respective countries, either by doctors' lists or geographically. Consequently, we cannot claim to have procured national data. But when we compare our findings with those of earlier major studies in the Nordic countries, they correspond very well (6–10).

Some of the encounters lacked diagnoses (Table III). When asked about this, the participating doctors answered that they had probably merely forgotten, and that this was distributed arbitrarily to the various diagnoses. We experienced that aggregating diagnoses into larger groups could be done easily, and was sound even when the participants used three different classifications of diagnoses.

As in many other studies from general practice, we have focused on office encounters, but comparing the number of prescriptions in Table IV and Table V, it is revealed that a large proportion of the prescriptions were issued through indirect encounters (15–55%). This was also the case for referrals and blood tests, though to a lesser extent (3–20%). Consequently, activities connected with indirect encounters must also be registered in order to provide a total picture of what is done in general practice. We also have to add that neither night duty nor home visits were included in our study and many patient contacts in general practice are dealt with by nurses only and not registered as office encounters. In Norway and Sweden this is the case for more than a third of the encounters.

We are unable to quantify differences in encounter rates caused by diverse gatekeeper functions to specialised health services in the Nordic countries, but the total low rate of encounters in Sweden we believe was due to people having a relatively easy access to specialist services. Still, this did not cause any obvious shift in the profile of diagnoses seen in general practice compared to the other countries. Denmark and Iceland, the only Nordic countries with patient lists, had the highest encounter rates. Danes do not have to pay for office encounters (11).

The effect of various organising of non-curative activities (Table I) is evident from both Fig. 1 and Table III. Well-baby care is an integrated part of general practice in Denmark, Finland and Iceland, but not in Norway and Sweden. Encounters related to antenatal care, routine cervical smears and family planning are common in general practice in Denmark and Norway, to a lesser extent in Finland and Iceland, but in Sweden are carried out mainly by midwives.

In the Finnish site, the slope of the age-specific curve in Fig. 1 differed from the others (age group 10–19 to 30–39). One explanation could be the high rate of encounters for infections, which are epidemic,

Table V. The proportion of the population with contact (direct and indirect in office hours) given prescription(s) and the number of items prescribed per 100 encounters, per 100 persons receiving prescriptions and per 10 000 persons during the course of 4 weeks in general practice (repeat prescriptions included). [1]

	Study population	Persons with contact office hours			No. of encounters	No. of items prescribed			
		No.	Given prescription			Total	Per 100 contacts	Per 100 given pre-scriptions	Per 10 000 in-habitants
			No.	(%)					
Denmark	9315	3400	1756	(53)	6684	3652	55	208	3921
Iceland	19361	4339	2188	(50)	4913	2706	55	124	1398
Norway	17718	3417	2269	(66)	4194	3679	88	162	2076
Sweden	25687	4000	1536	(38)	7428	3230	43	210	1257

[1] No data available from Finland.

and for injuries. Both affect young people. A relatively high number of injuries also appear in other statistics from Finland (12). Finns, moreover, need a medical certificate from a doctor from the first day of absence from work, and the health check required when entering military service is delegated to general practitioners in Finland.

CONCLUSION

We believe that computerised medical records will, in the near future, be an important source of information. To us, it represented a great deal of work, but all the tables presented can be prepared automatically by means of reports from medical record systems. Several authors have already demonstrated this (8,13).

We experienced two major obstacles compiling statistics. First, to do epidemiologic and process studies it is essential that the information about processes and outcome in the databases (referrals, medication, laboratory tests, etc.) are uniquely linked to episodes of care. This was only partly the case in the present record systems and the reason why our tables were

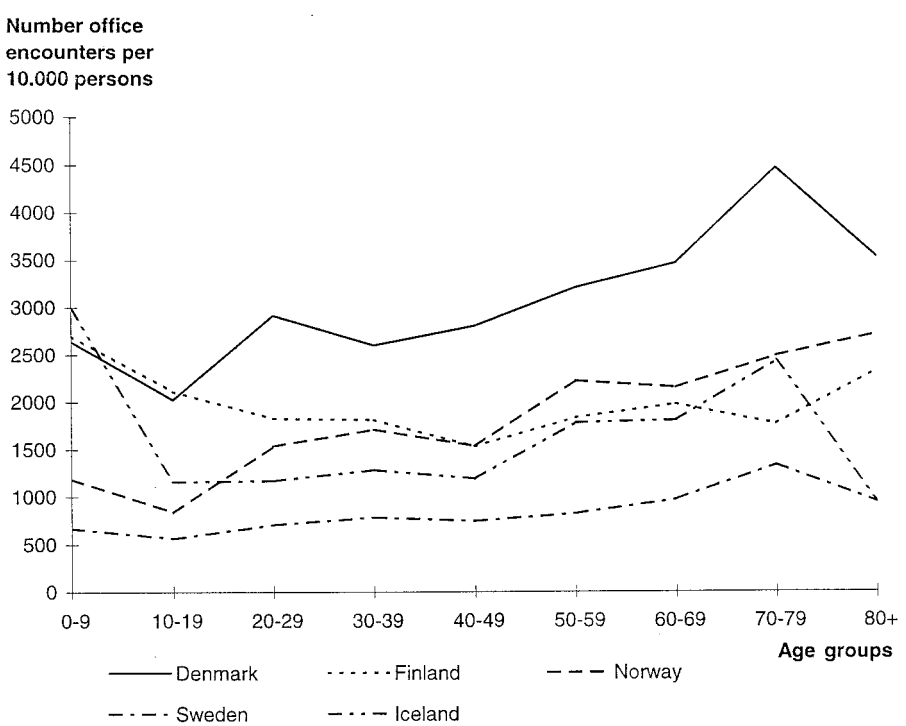

Fig. 1. The number of office encounters per 10000 persons in general practice in different age groups during the course of 4 weeks in the Nordic countries.

not complete for all the countries. Secondly, in none of the computerised medical records were the same standards or classifications being used in any field.

We also learned that it is vital when interpreting the results to have local knowledge. Asking the participating doctors about some of the differences revealed meaningful and logical explanations that could easily have been overlooked by an outside researcher.

In a proposal to NOMESCO we have put forward further details about collecting data in general practice (14).

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