Estimating incidence and prevalence of episodes of care in general practice

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Objectives – To develop methods for prospective registration and analysis of episodes of care (one or more contacts about the same health problem). To compare estimates of point prevalence and incidence of hypertension among a group of elderly patients by means of an elaborate coding of episodes and a new method based on routine coding of contact diagnoses.

Design – Prospective longitudinal cohort study.

Setting – General practice in Denmark.

Subjects – 31 GPs and 1722 patients 70+ years of age.

Main outcome measures – During the course one year, data were registered in the doctors’ electronic medical record systems. Registration included ICPC diagnoses and codes for diagnostic and therapeutic procedures. Individual contacts were linked into episodes of care by the recording physician. Prevalence and incidence were calculated from the GPs’ registration of episodes of care and from contact registration by means of a new method, “the waiting time distribution”.

Results – Estimates of incidence (2.1 per 100 patient years) and point prevalence (21.2 per 100 patients) of episodes of hypertension care could be calculated when the GPs actively linked contacts into episodes. Based on simple contact registration it was possible to calculate similar estimates.

Conclusion – A full registration of episodes of care is time-consuming and complicated. Incidence and point prevalence of chronic conditions, however, may be estimated from simple coding of contact diagnoses.

Key words: diagnosis, general practice, incidence, longitudinal, prevalence.

Patients may consult their general practitioner (GP) several times about the same health problem (an episode of care), especially if the GP works in a system with patient lists and if the patient has a chronic condition. This longitudinal aspect is essential for understanding the work of general practice and for interpreting data collected for quality development studies. Not all aspects of diagnosis and treatment have to be covered in every consultation, but may have been dealt with previously or be taken up later. Our knowledge about episodes of care in general practice (and the health care system as such), however, is limited because of insufficient data. Most of our knowledge about how health problems are handled in general practice is based on cross-sectional studies, and even a simple epidemiological estimate such as the point prevalence of episodes will be biased if based on contact data (length bias) (1).

Data collection for episode-based studies is logistically difficult because of the need for long-term prospective registration of coded data, and because registrations from different consultations pertaining to the same episode must be aggregated either by the GP (2) or by the investigators (3–8). Episode registration is further complicated by the fact that more than one health problem may have been discussed in a consultation (Fig. 1) and therefore actions taken must be associated with the right problem. Analysis poses new problems when information has been recorded in a database. Previous studies have not suggested methods for estimation of the point prevalence of episodes of care (answering the question: how many patients in the practice population are being treated for the disease at this point in time?). For non-chronic disorders the main problem is that it is difficult to determine when an episode of care has terminated, but the problem can be solved if long-term meticulous coding of episodes of care is performed by the GPs.

Because this procedure is time-consuming (and expensive), it is tempting to establish an alternative method based on routine registration of contact diagnoses. Obviously such a new approach requires

The concept of “episode of care” is important in research and planning, but we lack methods for epidemiologic analysis of episodes.

• Estimates of point prevalence and incidence may be based on the GP’s elaborate registration of episodes.

• Similar estimates may be obtained from routine registrations of contact diagnoses by means of a recent graphic method.
validation, i.e. comparison with estimates based on data coded into episodes of care by the GPs.

The objectives of the present study were: 1) to develop methods for prospective registration and analysis of episodes of care; and 2) to compare estimates of point prevalence and incidence of hypertension among a group of elderly patients by means of an elaborate coding of episodes and a new method based on routine coding of contact diagnoses.

MATERIAL AND METHOD

General practitioners and patients

Thirty-one general practitioners (GPs) working in 18 clinics registered daytime contacts \((n = 24,415)\) which they had with a random sample of their 70+ year-old patients \((n = 1,722)\) in the period 24 December 1996 to 24 December 1997. All GPs \((n = 133)\) living in three geographical areas were invited to participate in the study. Forty GPs \((24 \text{ clinics})\) took part in the registration, but because of technical problems 9 GPs started later than 24 December 1996, the last one on 17 February 1997. For the present study we needed a full 12-month registration period and therefore had to exclude data from late starters. Invited doctors had a minimum of 3 years’ experience of using one of 5 electronic patient record systems (Aesculap, Medex, Midoc, PC-Praksis or PLC). For each participating GP, 60 patients were randomly sampled from the 70+ year-olds on the patient list. The randomisation took place half a year before the project was started \((108 \text{ patients died or changed practice before project start})\), and one practice only had 30 patients over 70 years. Only 1,722 patients were therefore included in the cohort.

Definitions

In the project, an encounter was defined as any communication between the doctor (or his personnel) and the patient (or a proxy for the patient). A contact was defined as a communication about symptoms and signs which the doctor related to one diagnosis; the patient could therefore have several contacts in one encounter. One or more contacts over time about the same health problem were defined as an episode of care.

Registrations

Recordings were made by means of the electronic patient record system, which had been supplemented with registration software. Any contact \(\text{(repeat prescription/telephone consultation/home visit/surgery consultation)}\) from one of the included patients was registered by the software and at the end of surgery hours the doctor would be asked to finalise the registrations. The following data were recorded for each contact: reason for encounter and the GP’s diagnosis as classified by means of the International Classification of Primary Care (ICPC). The registration software automatically generated information about the contact date, codes of billing, laboratory investigations, prescriptions and the contact method \(\text{(telephone consultation, surgery consultation or home visit)}\). The GP actively coded contacts into episodes of care. At the first contact in the registration period the GP would have to decide whether the contact was part of an ongoing episode of care or a new problem. The GP would furthermore allocate investigations and prescriptions to the different episodes of care for the patient. Registration data were sent from the participating GPs to the research database every 2 weeks and validated \(\text{(matching with National Health Insurance Register and exclusion of unlikely codes, e.g. pregnancy among 70+ year-old patients)}\).

Analysis

Estimates of prevalence and incidence of episodes of care were estimated using two different methods. These were compared based on: 1) the GP’s coding of episodes of care, and 2) the waiting time distribution as described by Hallas et al. \((9)\).

From the GP’s coding into episodes, estimates of point prevalence and incidence of episodes were based on standard epidemiological formulas \((1)\). When registering episodes of care it is not possible to predict when an episode ends. It is therefore not possible to calculate the point prevalence at the end of a registration, but as the GPs had actively considered the status of the episode \(\text{(ongoing/new)}\) at the start of the project, the point prevalence could be calculated at the starting date of the registration period (Fig. 1).
Hallas et al. in a study of drug use suggested the waiting time distribution as a graphical tool for estimation of point prevalence at the start of the observation period and the incidence rate in the observation period (9). The approach may briefly be summarised as follows: For each subject only the first contact for hypertension within the observation period is used. The event times of these are then graphed in a histogram, and for long-term conditions the shape shown in Fig. 2 will be expected. Hallas et al. hence suggest choosing a cut-point after which the distribution appears to be constant. The level of this distribution then determines the incidence, and the initial excess of observations can be used for estimating prevalence. The shape of the curve arises since first events are contributed by two groups of subjects.

First consider those prevalent at the start of the window. Their first contact within the observation period forms part of an ongoing treatment sequence, and so most of these events will appear in the beginning of the time window. If for example all patients with hypertension visit their GP at least every 3rd month, all of these patients will have their first event recorded in the first 3 months of the observation period. In contrast, the first observed event of those who are non-prevalent will be expected to be uniformly distributed over the observation period. Readers interested in a more sophisticated approach (which yields similar results) are referred to (10,11).

RESULTS

Fig. 3 shows episodes of care for 398 patients with hypertension in the population. At the start of registration, 367 patients were registered with ongoing episodes, and the cohort comprised 1722 patients. The remaining 31 patients were incident in the one-year study period.

Calculated on the basis of the GPs’ episode registration the estimate of point prevalence of hypertension at the start of the study was thus 21.2 per 100 old patients (CI 95% 19.51–22.90), while incidence was 2.1 per 100 patients per year (CI 95% 1.35–2.82). Fig. 4 shows changes in the point prevalence as a function of the duration of the registration period. By extending the observation period from 9 to 12 months the increase in estimated prevalence was only 0.5%.

Fig. 5 shows the waiting time curve for first contact about hypertension. The graphic reading showed a stable level from the 7th month, corresponding to an incidence of approximately 3 patients per 14 days (average of last 5 months) in the cohort of 1722 patients.
Fig. 5. Patients diagnosed with hypertension distributed according to the period in time (intervals of 14 days) when the diagnosis was registered for the first time. The curve contains 398 patients diagnosed with hypertension in a population of 1722 patients from the 18 clinics (31 GPs) who registered one year. Incidence rate was estimated: 3 patients per 14 days in a population of 1722 corresponds to 78 patients per year, which equals 4 per 100 patients. Point prevalence was estimated: 398 (all patients with hypertension)−78 (incident patients per year) = 320 patients in a population of 1722 equals 20 per 100 patients 70+ years of age.

patients. This equals an incidence rate of 4 per 100 old patients per year and the corresponding point prevalence was 20 per 100 old patients.

DISCUSSION
To our knowledge, the present study is the first to present methods for estimation of point prevalence of episodes of care in general practice. The point prevalence can be calculated for all types of episodes (short-term or long-term) if the GP actively codes contacts into episodes and the first registration in an episode is labelled as new or ongoing. For long-term episodes of care (such as hypertension) relatively unbiased estimates of the point prevalence (and incidence) may also be obtained from simple registration of contact diagnoses by means of the waiting time distribution.

The waiting time distribution, however, is subject to several potential errors: 1) The method was developed for dynamic cohorts and not a fixed cohort study. The drop-out in our study cohort, however, was less than 10%, so the extent of this error was limited. 2) The graphic method may present problems in reading the steady state level. 3) Patients with a very long time between contacts may be observed as incident instead of prevalent. A longer observation period may correct that problem. Some of those factors may explain the small difference in incidence between the two methods.

Estimates of the point prevalence at the start of the registration (based on elaborate coding of episodes) are also dependent on everybody with the disorder contacting within the project period. The change in prevalence of only 0.5% from 9 to 12 months indicates that the curve is close to maximum and that almost all patients with hypertension had contacted within one year.

In the literature there are only a few systematic ‘episodes of care studies’. The reason could be that it is resource-consuming, with regard to both organisation and logistics, to collect valid data. Among major episode of care studies the Transition Project (TP) from Holland, where the data collection was done manually, should be mentioned (5,8). In England, the Somerset Morbidity Project (SMP) (7) and the Fourth National Morbidity Study (3) used the doctors’ computerised medical record systems to collect data. In all these studies the GPs have indicated whether contacts were new, old or ongoing, and the researchers later linked contacts with the same diagnosis into episodes of care. The prevalence estimates were calculated as period prevalence in one year, and incidence calculated from new episodes during the project period. Such studies show the number of patients treated for hypertension in a period of time (period prevalence), but do not provide information about the number of patients in active treatment at a point in time (point prevalence).

Our study shows that it is possible for GPs to make a complete coding of episodes of care, but that it is time-consuming. Every doctor spent on average half an hour per day coding contacts for only 60 patients. Experience from a Danish county shows that a routine diagnosis coding of all daily contacts (no registration into episodes) can be done in less than 5 min per day, and routine coding has been shown feasible even with the more complicated ICD-10 codes (12).

Point prevalence and incidence are essential parameters for following the disease pattern development in general practice over years, and this knowledge is paramount for research, education and administration purposes. The waiting time distribution provides the possibility of estimating these parameters from a routine coding of contacts, but the waiting time distribution needs further development to a parametric method and to a method that can also be used for non-chronic disease (10,11).

REFERENCES
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