Asthma Programme in Finland: Did the use of secondary care resources become more rational?

L.E. Tuomisto [a,*], M. Erhola [b], T. Luukkaala [c,d], H. Puolijoki [a],
M.M. Nieminen [e,f], M. Kaila [g]

[a] Seinäjoki Central Hospital, Huhtalantie 53, FI 60220 Seinäjoki, Finland
[b] National Institute for Health and Welfare, Helsinki, Finland
[c] Science Centre, Pirkanmaa Hospital District, Tampere, Finland
[d] Tampere School of Public Health, University of Tampere, Tampere, Finland
[e] University of Tampere, Tampere, Finland
[f] Koskiklinikka Medical Centre, Tampere, Finland
[g] Department of Pediatrics, Tampere University Hospital, Tampere, Finland

Summary

Objectives: The aims were to evaluate the profile of newly diagnosed adult asthma cases and the approach adopted to the secondary care management at the launch of the Finnish asthma programme in 1994 and seven years later, in 2001.

Methods: A retrospective medical record audit was made of non-acutely referred patients with asthma in 1994 ($n = 165$) and in 2001 ($n = 133$). Clinical profile data, numbers of out-patient visits and periods of in-patient care before and after asthma diagnosis were gathered from referral letters and secondary care records.

Results: The newly diagnosed asthma patients in 2001 were older, more obese and had more co-morbidities. The main asthma symptoms, such as dyspnoea, wheezing and cough, occurred equally in both years but were more often periodic than daily in 2001. Wheezing during auscultation was significantly less common in 2001. The diagnostic process was associated to a history of asthma in first-degree relatives (OR 5.34, 95% CI 1.12—24.49) in 1994 and a visit to a nurse prior to that to a physician (OR 3.13, 95% CI 1.17—8.37) in 2001. Secondary care visits per new case of asthma (7.3 in 1994 vs. 5.4 in 2001) and days in hospital (3.6 in 1994 vs. 0.95 in 2001) decreased significantly.

* Corresponding author. Tel.: +358408457163; fax: +35864154989.
  E-mail address: leena.tuomisto@epshp.fi (L.E. Tuomisto).

Conclusions: The profile of asthma diagnosed in secondary care indicates milder disease with more co-morbidities in 2001 than in 1994. Trends towards assigning a more active role on the part of primary care physicians and more rational use of secondary care resources in the management of asthma were found.

Introduction

Good co-operation at the interface between the primary and secondary care sectors is important for a health care system with limited resources.[1] Changes in the organization and delivery of care can improve its quality and certain outcomes of chronic disease.[2] One model of chronic care predicts that increasing clinical expertise and decision support, improvements in patient self-management, increased effectiveness of practice teams and the existence of more accessible and useful clinical information can produce a system reform in which informed, activated patients interact with prepared, proactive practice teams.[3] The effective management of asthma — as of all chronic diseases — begins with making an accurate and timely diagnosis, after which continuous anti-inflammatory treatment, patient education in self-management and regular follow-up visits are the cornerstones of good management of chronic asthma.

In Finland as in other Nordic countries asthma symptoms caused by cold weather are common and many other environmental factors play a key role in the prevention and management of asthma.[4] Increased variability of asthma symptoms by environmental factors gives an additional diagnostic challenge for the health care professionals. The national asthma programme was launched in 1994 in Finland among the first nations, at a time when the number of asthmatics was increasing.[5] Since then the management of adult asthma has changed at all levels of care, with some regional variations (Table 1). Before 1994 asthma was considered a disease to be diagnosed by a specialist in pulmonary medicine with facilities for all lung function measurements. In Finland a 72% reimbursement is given on anti-asthma medication only if the recipient has physician-diagnosed chronic asthma which fulfils the prevailing criteria based on lung function measurements (peak expiratory flow (PEF) and/or spirometry and/or provocation test).[9] The asthma programme, together with later published evidence-based guidelines, encouraged primary care physicians to use simple, easily available diagnostic methods, including a careful history of symptoms, PEF measurements, spirometry with a bronchodilation test and in some cases observed steroid reversibility tests to reach the criteria for anti-asthma medication.[6,10] The main responsibility for adult asthma management was shifted to primary care, but referral to a pulmonary specialist was recommended in cases of unclear diagnosis or poor response to initial or long-term asthma treatment. During and after the programme, a new division of labour between primary and secondary care was defined. Asthma co-ordinators (one physician and at least one nurse) were nominated at each health care centre,[11] and asthma nurses took an active role in primary care and later also in secondary care in the management of asthma, both before and after diagnosis.

In a previous study we audited non-acute asthma-related referral letters sent to the Department of Respiratory Diseases at Seinäjoki Central Hospital in 1994 and 2001.[7] Verification of a new asthma case was the reason for referral in 54% of the asthma-related letters in 1994 and 48% in 2001, but had the profile of these patients with asthma changed? Had there been any changes in the approach to the asthma management? Have the numbers of visits and hospital admissions for secondary care changed? To address these questions we reviewed the medical records of the new asthma cases in both years with the aims of defining the clinical profile and time to diagnosis of referred cases of asthma and assessing whether the use of secondary care resources had changed between 1994 and 2001.

Materials and methods

Setting

This study forms part of a systematic evaluation of the Finnish asthma programme, employing a retrospective medical record audit methodology. The work was conducted at the Department of Respiratory Diseases, Seinäjoki Central Hospital, which has a catchment area with a population of nearly 200 000 (4% of the total Finnish population), comprising 27 municipalities with 18 primary health care (PHC) centres. A regional asthma programme, based on the national one, had been published in 1997. The study design is illustrated in Fig. 1, and the origin of the non-acute referral letters is described in detail in our previous study.[7]

Handling of referral letters and use of a preliminary visit to a nurse at the Department of Respiratory Diseases

It was agreed among the pulmonary specialists at the Department of Respiratory Diseases in 1996 that on receipt of a referral letter they would carefully plan all the necessary procedures before the patient's first visit to the department. Information in the referral letter (together with copies of previous lung function test results) has been found crucial for making the appropriate plans for secondary care visits, especially previous asthma medication usage. For most of the patients with suspicion of asthma, a visit to a respiratory nurse was arranged at least two weeks before the first physician visit to complete the referral information. At the visit the respiratory nurse discussed patient's recent symptoms and medication usage, checked inhalation technique and guided a fresh 2-week

Table 1 Management of adult asthma before 1994 and after 2001 and the division of labour between physicians and nurses in primary and specialist care in the region served by Seinäjoki Central Hospital (modified from the original table in Ref. 6).

	Before 1994	After 2001
Primary care General practitioner	• No asthma guidelines • No local treatment chains • All asthma suspicions referred to a specialist without previous lung function tests • Poor-quality referral letters without any results of lung function measurements[7]	• Easy access to evidence-based guidelines and local treatment chains • Diagnosis of asthma by a GP • Short specialist consultations as needed • Better-quality asthma referral letters, including peak flow follow-ups and good quality spirometries with a bronchodilation test[7,8]
	• Infrequent follow-up visits as needed • Asthma prescriptions renewed without a check-up	• Annual follow-up visits
	• Only a reliever as needed while waiting for a diagnosis	• Anti-inflammatory treatment started without delay after diagnosis
	• All moderate and severe asthma exacerbations referred to hospital	• Milder asthma exacerbations treated by self-management guidance, only patients with severe, repeated exacerbations referred to hospital
Nurse	• Spirometry measurements seldom performed • No systematically organized guidance of peak flow measurements, inhaler usage or asthma education	• Daily spirometry measurements • Routine guidance in peak flow measurement and the use of inhalers • Patient-centred asthma education with self-management guidance • Annual follow-up visits to a nurse
Specialist care Specialist	• Diagnosis of asthma • Some of the diagnostic tests performed during non-emergency hospital admission	• Only a portion of new diagnoses • All diagnoses at out-patient visits • Planning of the first specialist visit beforehand based on referral letters
	• Frequent follow-up visits for asthma patients • Majority of acute asthma care	• Follow-up of severe cases only • Only asthma patients with the most severe or repeated exacerbations
Nurse	• Nurse present at visits to a doctor • Patient guidance in peak flow measurement and use of inhalers in conjunction with the specialist visit	• Visits to a nurse before the first visit to a specialist and after asthma diagnosis, with the possibility for specialist consultation • Patient-centred, systematic asthma education

PEF follow-up measurement. In case of severe symptoms immediate specialist consultation was available.

Selection of cases

The nurse performing this survey gathered all the final diagnoses received by the patients referred to the department in each year into a summary chart (Fig. 1). New asthma had been diagnosed during secondary care visits in 165 cases (27% of all referrals) in 1994 and in 133 cases (29% of all referrals) in 2001. Copies of the asthma patient records from the first secondary care visit and of the spirometry report sheets were collected.

Medical record audit

The auditing process included the following steps: definition of the items of clinical data to be collected and included (Tables 2 and 3), preparation of a manual for the collection of clinical data, training of a nurse to use it, extraction of the clinical data from the copies of the referral letters and patient records, counting of all
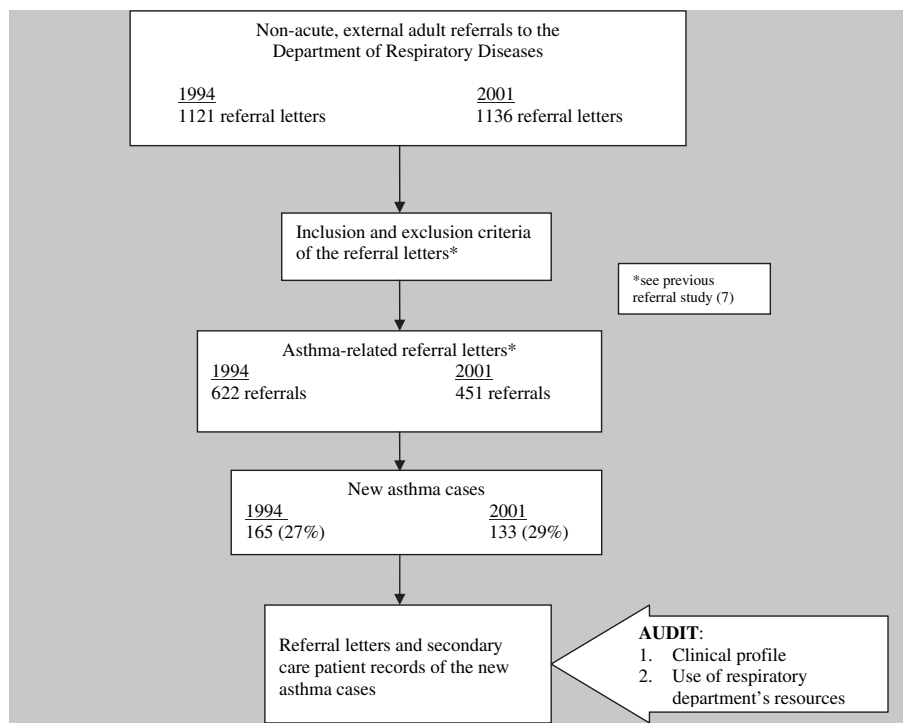
Figure 1 Study design and origin of the referral letters.

secondary care out-patient visits, admissions and in-patient days before and after the diagnosis of asthma, and finally, recoded of a 6% sample of cases and assessment of the intra-rater repeatability for each item in the clinical data using the κ statistic. The median of all the κ values was 0.94 (mean value 0.75, range 0.36–1.0).

Clinical profile

The clinical profile consisted of specified details of the patient's background, history, asthma medication prior to the first visit, symptoms, findings and results of lung function tests (Tables 2 and 3). Co-morbidity was coded as present in the case of hypertension, coronary disease or diabetes. Data were extracted both from the index referral letter and the record of the first specialist visit. In the event of a conflict between these, the most recent information was used. If there were no data either in the referral letter or the record of the first visit the case was coded as having the data missing.

Timing of the asthma diagnosis and number of visits

Main reason for referral was to diagnose or exclude asthma. The timing of the asthma diagnosis was easy, the diagnostic visit was clearly defined in the patient records. The numbers of all specialist visits, hospital admissions and days in the respiratory ward were calculated before and after the diagnostic visit or stay. In order to obtain a better estimate of the use of respiratory department resources, every non-acute hospital stay in the respiratory ward was counted as two out-patient visits. The patient records were

screened for any visits up to six years after the index referral. The post-diagnosis visits of nine asthma patients in 2001 were excluded because their follow-up was complicated by other chronic diseases.

Statistical analysis

Total numbers and percentages for the various items of clinical information, including the patient's background, history, asthma medication prior to the first visit, symptoms, findings and results of lung function tests, were calculated and compared between the two years, 1994 and 2001, with and without missing values. Pearson's Chi-Square or if expected counts were too low, Fisher's Exact tests were used for these comparisons. The results of the lung function tests at the first visit were expressed in terms of medians with ranges, due to the skew distributions, and tested with the Mann Whitney test for differences between the years 1994 and 2001. Logistic regression was used to assess determinants of the diagnosis at the first secondary care visit among the following factors: age, asthma in first-degree relatives, atopic status, subjective and objective wheezing, blood eosinophils, use of recent asthma medication (bronchodilator or preventive), symptom frequency, availability of primary care lung function results at referral and a pre-diagnostic visit to a nurse. The numbers of secondary care visits and hospital admissions were studied by Kaplan–Meier analysis, and intra-rater repeatability was assessed in terms of Kappa coefficients.[12] All the analyses were performed with SPSS 16.0 for Windows (SPSS Inc., Chicago, USA). Statistical significance was set at $p < 0.05$.

Table 2 Background data on newly diagnosed asthma patients, their history and asthma medication prior to the first visit in 1994 and 2001, frequencies (*n*) with percentages (%). Differences between 1994 and 2001 were tested with (p_1) and without (p_2) missing cases.

	1994 N = 165	2001 N = 133	p_1	p_2
Background				
Female, *n* (%)	96 (58)	81 (61)		0.635
Age, mean (Sd)	42.2 (17.3)	46.5 (16.2)		0.031
BMI,[a] mean (Sd)	26.4 (4.7)	28.4 (5.7)		0.002
Missing, *n* (%)	28 (17)	6 (5)		
BMI over 30	26 (19)	42 (33)		0.011
History				
Family history of asthma,[b] *n* (%)			0.758	0.457
First-degree relatives	69 (42)	61 (46)		
Missing	25 (15)	20 (15)		
Smoking, *n* (%)			0.553	0.353
Never smoked	79 (48)	65 (49)		
Current smoker	30 (18)	31 (23)		
Missing	7 (4)	6 (5)		
Co-morbidity,[c] *n* (%)			0.010	0.013
Yes	24 (15)	37 (28)		
Missing	32 (19)	16 (12)		
Chronic rhinitis, *n* (%)			0.971	0.969
Yes	95 (58)	76 (57)		
Missing	22 (13)	19 (14)		
Atopy,[d] *n* (%)				0.425
Not tested	16 (10)	14 (11)		
Skin-prick test positive	64 (39)	43 (32)		
Dermatographism	3 (2)	6 (5)		
Asthma medication prior to the first visit				
Bronchodilator, *n* (%)	114 (69)	102 (77)	0.018	0.712
Missing	15 (9)	2 (2)		
Corticosteroid,[e] *n* (%)	7 (4)	40 (35)	<0.001	<0.001
Missing	15 (9)	2 (2)		

[a] Body mass index.
[b] At least one of the first-degree relatives (parent, sibling or child) had asthma.
[c] Co-morbidity includes hypertension, coronary disease or diabetes.
[d] Atopy defined as at least one positive skin-prick test for common allergens.
[e] Includes also three cases using combination asthma medication (long-acting β_2 agonist and steroid).

Results

Clinical profile

The clinical profile of the new asthma cases at the first visit to secondary care is presented in Tables 2 and 3. Two thirds of the cases were women in both years. The asthma patients in 2001 were significantly older, more obese and had more co-morbidities than in 1994. The proportion of obese asthmatics (BMI > 30) increased significantly from 19% in 1994 to 33% in 2001 (*p* = 0.011). Two thirds reported chronic rhinitis in both years, and practically one fourth were current smokers. Thirty-nine percent of the asthmatics were atopic in 1994 and 32% in 2001. The main symptoms were dyspnoea, cough and wheezing, with no significant differences between the years. Expiratory wheezing observed by auscultation at the primary or secondary care physician's visit was significantly less common in 2001. Symptoms occurred periodically more often than daily or weekly in 2001. The smokers and ex-smokers had significantly more sputum production than those who had never smoked (88%, 71% and 62% respectively) in 1994 (*p* = 0.037), but the difference only came near to significance (85%, 77%, 62%; *p* = 0.080) in 2001. The smokers had not wheezed either subjectively or objectively more often than the non-smokers, however (*p* = 0.828 in 1994, and *p* = 0.117 in 2001).

Bronchodilator drugs were commonly prescribed in both years, but the use of anti-inflammatory drugs before the specialist consultation was significantly more frequent in 2001, one third of the cases (*n* = 40) having received inhaled corticosteroids less than four weeks prior to the first secondary care visit. If anti-inflammatory medication had been prescribed before the first visit objective expiratory wheezing was documented either at the primary health care visit or at the first visit to specialist more often (*p* = 0.045 in

Table 3 Symptoms, findings and spirometry values in newly diagnosed cases of asthma in 1994 and 2001, frequencies (*n*) with percentages (%). Differences between 1994 and 2001 were tested with (p_1) and without (p_2) missing cases.

	1994	2001	p_1	p_2
	N = 165	N = 133		
Symptoms and findings				
Dyspnoea, *n* (%)			0.633	0.477
Yes	155 (94)	123 (93)		
Missing	1 (1)	0 (0)		
Cough, *n* (%)			0.024	0.079
Yes	118 (72)	94 (71)		
Missing	27 (16)	11 (8)		
Sputum production, *n* (%)			0.078	0.800
Yes	81 (49)	75 (56)		
Missing	54 (33)	28 (21)		
Subjective wheezing, *n* (%)			0.428	0.205
Yes	107 (65)	95 (71)		
Missing	23 (14)	17 (13)		
Expiratory wheezing by auscultation in primary or secondary care, *n* (%)			<0.001	0.001
Yes	76 (46)	34 (26)		
Missing	3 (2)	11 (8)		
Night-time symptoms, *n* (%)			0.085	0.650
Yes	69 (42)	46 (35)		
Missing	66 (40)	70 (53)		
Frequency of symptoms, *n* (%)			0.001	0.001
Daily	51 (31)	26 (20)		
Weekly	3 (2)	0 (0)		
Periodic	53 (32)	70 (53)		
Missing	58 (35)	37 (28)		
Spirometry values at the first visit				
Pre-FEV$_1$ %,[a] Md (Range)	81 (30−112)	81 (20−108)		0.398
Missing	1	7		
Pre-FEV %,[b] Md (Range)	74 (29−98)	76 (26−94)		0.411
Missing	1	8		
Post-FEV %,[c] Md (Range)	77 (37−99)	78 (29−93)		0.143
Missing	62	23		

[a] Pre-FEV$_1$% = forced expiratory volume in 1 s, % of predicted.
[b] Pre-FEV% = ratio of forced expiratory volume in 1 s (FEV$_1$) to forced vital capacity (FVC) measured before the bronchodilator test.
[c] Post-FEV% = as above, but measured after the bronchodilator test.

1994 and $p = 0.005$ in 2001), but the lung function parameters did not differ significantly between the groups who had or had not received anti-inflammatory medication recently (data not shown). The median pre-FEV$_1$% and pre-FEV% values did not differ significantly between the two years, nor did the post-FEV% values differ, but 37% of these values were missing in 1994 and 17% in 2001. The blood eosinophil count was elevated in 24% of the asthmatics (missing in 10%) in 1994 and 23% (missing in 6%) in 2001.

Secondary care visits

Comparison of the number of out-patient visits before confirmation of the asthma diagnosis was not straightforward, as 26% of the diagnoses were established during a non-acute hospital stay in 1994 and 8% in 2001 (Table 4). We compensated this by counting one hospital stay in the respiratory ward as equivalent to two out-patient visits. When the diagnosis had been reached at the first out-patient visit without admission to hospital, this took place significantly earlier in 2001 and involved 45% of the diagnoses as compared with only 24% in 1994. By logistic regression analysis only a history of asthma in first-degree relatives (OR 5.34, 95% CI 1.12−24.49) in 1994 and a visit to a nurse prior to the specialist visit (OR 3.13, 95% CI 1.17−8.37) in 2001 significantly associated to the early asthma diagnosis. Nurse visit as a first visit to specialist care was not available in 1994. In 2001 specialist decided to call 60% of the asthmatics (*n* = 80) to visit a nurse first. When this visit in 2001 was taken into account, the significant difference in the number of pre-diagnostic visits disappeared. The probabilities attached to the number of visits before asthma diagnosis in the two years are shown in Fig. 2. There were significantly fewer visits after the diagnosis in 2001 than in 1994 ($p < 0.001$) (Table 4), so that where 55% of the asthma patients visited a specialist three times or less after the diagnosis in 1994 the figure was 75% in 2001. If both visits to a nurse and hospital stays (one hospital stay equivalent to two out-patient visits) are counted, the use

Table 4 Use of respiratory department resources for asthma diagnosis.

	1994	2001	p
	New asthma	New asthma	
	n = 165	n = 133[c]	
Asthma diagnoses made at an out-patient visit, n (%), including	121 (73)	122 (92)	< 0.001
those made at the first specialist visit, n (%)	29 (24)	55 (45)	
those made during a non-acute hospital stay, n (%)	43 (26)	11 (8)	
Out-patient visits to a doctor			
before asthma diagnosis, Md (Range)	2 (0—8)	2 (0—7)	0.741
after asthma diagnosis, Md (interquartile range)	3 (2—5)	2 (1—4)	<0.001
all, Md (interquartile range)	6 (4—7)	4 (3—6)	<0.001
Out-patient visits to a doctor, including non-acute hospital	1208	599	
stays,[a] total number of visits per year per new asthma case	7.3	4.8	
All out-patient visits,[b] including non-acute hospital stays,[a]	1208	661	
total number of visits per year per new asthma case	7.3	5.4	
Days of non-acute hospital stay			
total number of days before asthma diagnosis	536	101	
days before asthma diagnosis, Md (Range)	0 (0—25)	0 (0—19)	<0.001
total number of days in hospital	594	127	
total days, Md (Range)	0 (0—25)	0 (0—19)	<0.001

[a] One hospital stay in the respiratory ward was counted as two out-patient visits.
[b] Including visits to a nurse prior to the first specialist visit in 2001.
[c] Visits after diagnosis and total number of visits include only 124 new asthma cases.

of respiratory department resources in connection with the diagnosis of asthma can be estimated at 7.3 visits per new asthma diagnosis in secondary care in 1994 and 5.4 visits in 2001 (Table 4). The overall number of visits to secondary care did not differ in the case of the smokers (data not shown). Thirty-nine percent of the asthmatics (n = 64) were admitted to hospital electively in 1994 and 14% (n = 19) in 2001, and the number of days in hospital per new asthma diagnosis was also significantly higher in 1994 (3.6 vs. 0.95, respectively).

Discussion

The clinical profile of the patients referred to the Department of Respiratory Diseases with newly diagnosed asthma was nearly the same in 1994 as in 2001, although milder asthma was implicated in 2001. The diagnosis was made at the first secondary care visit significantly more often in 2001 than in 1994, however. We identified one factor explaining the difference in the diagnostic process in each year, a history of asthma in first-degree relatives in 1994 and a visit to a nurse before the first specialist consultation in 2001. Hospital out-patient visits, admissions to hospital and number of hospital days both before and after the confirmation of asthma diagnosis decreased in 2001.

The leading symptoms of newly diagnosed asthma were the well-known ones: dyspnoea, wheezing and cough in both years, although objective expiratory wheezing was documented by a physician in almost half of the cases in 1994, but in less than every third case in 2001. Symptoms were present daily significantly less often in 2001. Thus we could speculate that the asthma diagnoses were made by the primary care physician in 2001 if the patient had the typical chronic asthma symptoms and findings, including objective wheezing, but otherwise the probability of referral to a specialist increased.

Even though there was no difference in lung function parameters between the years, we may presume that referral in 2001 was mild, early asthma with diagnostic difficulties. If an anti-inflammatory drug had been prescribed by the primary care physician, wheezing was found to be heard more often in 2001. This reflects the more active and timely therapeutic role of the primary care physician in 2001, even though later referring the patient to a specialist. Moreover, these asthma patients in 2001 represented 75% of all those who had received inhaled corticosteroid prescribed by a primary care physician prior to referral to a specialist.[7] In some cases, however, previous anti-inflammatory asthma medication might have prolonged the diagnostic process in secondary care, especially if no results of previous primary care lung function tests were available.

Finnish questionnaire study in 2000 reported that 63% (n = 2952) of its patients with asthma (mean age 54.4, SD 17.6 years) had at least one out of ten selected co-morbidities.[13] In the present study co-morbidities such as hypertension, coronary disease or diabetes were more common in 2001, partly associated with significantly increased obesity among asthmatics. Obesity has become one of the major health problems in Finland, as worldwide, with especially high incidence in the region concerned here, where there is also a high prevalence of type 2 diabetes.[14,15] A connection between obesity and asthma has been well documented, as recently reviewed.[16] Obesity may lead to overdiagnosis of asthma, which can be best avoided by using objective testing using spirometry and, if necessary, bronchial challenge testing to confirm asthma in patients with respiratory symptoms.[17]

Workload in the secondary care asthma management decreased between the study years. The total numbers of visits to hospital and days in hospital were significantly lower in 2001 than in 1994. The diagnostic process was
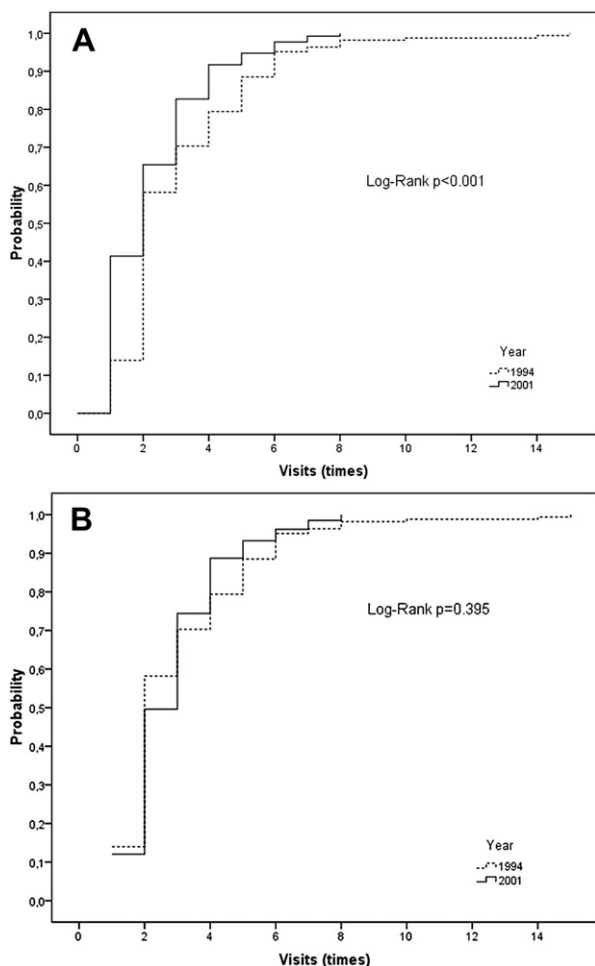
Figure 2 Probability of given numbers of visits before asthma diagnosis. Out-patient visits to a doctor, including hospital stays,* before asthma diagnosis (A) and the same *added with* one visit to a nurse prior to the first visit to a doctor (B).

promoted by means of a preliminary visit to a nurse and less specialist visits were required. In the final report of the Finnish asthma programme the overall costs per patient per year were decreased 36% between years 1993 and 2004.[6] One part of this cost savings was the reduction of hospitalization days (including acute and non-acute care) from 271/100 000 patients in 1993 to 120/100 000 patients in 2003. Two main objectives of the asthma programme were to increase common awareness of asthma and the early detection of asthma which seems to have decreased the overall hospitalization of asthma. Asthma programme was not the only promoting factor in this process, however. The overall trend in the Finnish health care for last two decades has been towards out-patient care in the management of all chronic diseases. Good availability of preventive asthma medications with simple devices has also been one major reason for the decreased workload of all health care sectors.

A review of patient records entails some limitations because of the retrospective nature of the study design. Patient records reflect the everyday management of the disease, however, and its real-life documentation.

Although the main symptoms were well documented in the present data, some important clinical information was missing in more than a third of the cases, e.g. night-time symptoms or the frequency of symptoms. The strength of the study lies in the fact that every asthma diagnosis was based on strict criteria and extensive use of diagnostic tests, reviewed by a specialist. The asthma profile we describe is not the whole picture of new asthma cases. Especially, in 1994 many new cases were diagnosed after acute hospital admission. Furthermore, we don't know what proportion of the newly diagnosed asthma cases was referred and how they differed from the non-referred ones. The reduction in non-acute admissions of asthma patients to hospital also reflects in part the overall trend towards out-patient management in health care. All the posts of physician in the health care centres of the region were occupied in 1994, whereas in 2001 only 80% were occupied, and there was also a shortage of physicians in secondary care in 2001 in particular, which made the waiting times longer. The reduced resources in terms of physicians on both sides of the interface forced the health care providers to consider a new division of labour between physicians and between physicians and nurses in both primary and secondary care, which also had an effect on referral policy.

Asthma is a common disease which involves even more common symptoms, and the trend towards milder, intermittent manifestations is likely to pose more diagnostic challenges for all health care professionals.[18] According to national asthma programme primary care professionals have the main responsibility for early asthma diagnosis, as well as for patient education and regular asthma follow-ups. In the future, however, primary care focusing programmes for chronic diseases will work only if primary care works. The recent worsening in the shortage of primary care physicians, as seen in 2001, has made it essential to consider even more rational use of nursing resources to take care of patients with asthma and certain other chronic diseases. In 2007 the Finnish Ministry of Social Affairs and Health explored the possibility of reorganizing health care in order to bring specialized medical consultation into primary health care, which together with advanced facilities for maintaining electronic patient records opened up new opportunities to enhance cost-effective communication and short consultations at the interface (www.stm.fi).

There are several factors affecting the primary care physician's referral decision in addition to diagnostic uncertainty,[19] including problems with the patient's self-management ability, allergy screening, work-related symptoms, difficulties in interpreting the lung function test results and a request on the part of the patient. Further training and consultation, especially in connection with the interpretation of lung function results, will enhance the accuracy of asthma diagnoses in a primary care setting in the future without referral of the patient. The diagnosis of chronic but mild asthma will remain a challenge, however, as will the treatment of severe asthma. An appropriately framed and mutually agreed policy of referral to a specialist and back-referral to a primary care physician will be a crucial part of the more rational use of health care resources in the management of asthma.

Conflict of interest statement

Acknowledgements

Supplementary data

Supplementary data associated with this article can be found in the online version, at doi:10.1016/j.rmed.2010.01.018.

References

1. Kvamme OJ, Olesen F, Samuelsson M. Improving the interface between primary and secondary care: a statement from the European Working Party on Quality in Family Practice (EQuiP). *Qual Health Care* 2001;**10**:33–9.
2. Wagner EH, Groves T. Care for chronic diseases. *BMJ* 2002;**325**:913–4.
3. Bodenheimer T, Wagner EH, Grumbach K. Improving primary care for patients with chronic illness. *JAMA* 2002;**288**:1775–9.
4. Dahl R, Bjermer L. Nordic consensus report on asthma management. *Respir Med* 2000;**94**:299–327.
5. Asthma Programme in Finland 1994–2004. *Clin Exp Allergy* 1996;**26**(Suppl. 1):1–24.
6. Haahtela T, Tuomisto LE, Pietinalho A, et al. A ten-year asthma programme in Finland: major change for the better. *Thorax* 2006;**61**:663–70.
7. Tuomisto LE, Kaila M, Erhola M. Asthma programme in Finland: comparison of adult asthma referral letters in 1994 and 2001. *Respir Med* 2007;**101**:595–600.
8. Tuomisto LE, Järvinen V, Laitinen J, Erhola M, Kaila M, Brander PE. Asthma programme in Finland: the quality of primary care spirometry is good. *Prim Care Respir J* 2008;**17**:226–31.
9. *Finnish statistics on medicines 2007*. Helsinki: National Agency for Medicines and Social Insurance Institution; 2008 [in Finnish].
10. Haahtela T, Kaila M, Ahonen E, et al. Current care guideline for asthma. *Duodecim* 2000;**116**:2568–84 [in Finnish, updated 2006].
11. Erhola M, Makinen R, Koskela K, et al. The asthma programme of Finland: an evaluation survey in primary health care. *Int J Tuberc Lung Dis* 2003;**7**:592–8 [Abstract].
12. Landis JR, Koch GG. The measurement of observer agreement for categorical data. *Biometrics* 1977;**33**:159–74.
13. Ikaheimo P, Hartikainen S, Tuuponen T, Kiuttu J, Klaukka T. Comorbidity and medication load in adult asthmatics. *Scand J Public Health* 2005;**23**:88–94.
14. Tuomilehto J, Lindström J, Eriksson JG, et al. Finnish Diabetes Prevention Study Group. Prevention of type 2 diabetes mellitus by changes in lifestyle among subjects with impaired glucose tolerance. *N Engl J Med* 2001;**344**:1343–50.
15. Niemi M. *Winell K: diabetes in Finland (in Finnish) Stakes reports 8/2005 Helsinki*;, ISBN 951-33-1648-3; 2005. p. 22.
16. Sin DD, Sutherland E. Obesity and the lung: 4. Obesity and asthma. *Thorax* 2008;**63**:1018–23.
17. Aaron SD, Vandemheen KL, Boulet LP, et al. Overdiagnosis of asthma in obese and nonobese adults. *CMAJ* 2008;**179**:1121–31.
18. Nathell L, Larsson K, Jensen I. Determinants of undiagnosed asthma. *Allergy* 2002;**57**:687–93.
19. O'Donnell CA. Variation in GP referral rates: what can we learn from the literature? *Fam Pract* 2000;**17**:462–71.