Influence of ethnic group on asthma treatment in children in 1990-1: national cross sectional study

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Abstract

***Objective*—To examine the extent to which the prescription of drugs for asthma adhered to recommended guidelines in 1990-1 and to assess the influence of ethnic group on prescription.**

***Design*—Cross sectional.**

***Setting*—Primary schools in England and Scotland in 1990-1.**

***Subjects*—Children aged mainly 5-11 years. The representative samples included 10 628 children. The inner city sample included 7049 children, 4866 (69%) from ethnic minority groups. For the prevalence estimation 14 490 children were included in the analysis (82% of the eligible children). For the treatment analysis a subgroup of 5494 children with respiratory symptoms was selected.**

***Main outcome measures*—Prevalence of respiratory symptoms and drugs commonly prescribed for asthma, method of administration, inappropriate treatment, and odds ratios to assess the effect of ethnic group on rate of prescription and method of administration.**

***Results*—Children with respiratory symptoms in the inner city sample were less likely to be diagnosed as having asthma. Of children with reported asthma attacks, those in inner city areas had a higher risk of not having been prescribed any drug for asthma (odds ratio 1.87 (95% confidence interval 1.26 to 2.77). Overall, 773 (75%) of these children had received a β_2 agonist, 259 (25%) had received steroids, 148 (14%) had received sodium cromoglycate, and 194 (19%) had received no drug treatment in the previous year. When prescribed, β_2 agonists were inhaled in 534 (69%) of cases, and this percentage was even lower in ethnic minority groups. Children of Afro-Caribbean and Indian subcontinent origin who had asthma were less likely to receive β_2 agonists, and those from the Indian subcontinent were less likely to receive anti-inflammatory drugs. Antibiotics were less prescribed and antitussives more prescribed in children from ethnic minority groups than in white children.**

***Conclusion*—In 1990-1 the risk of underdiagnosis and undertreatment of asthma was higher in children from ethnic minority groups. The implementation of indicators and targets to monitor inequalities in the treatment of asthma in ethnic groups could improve equity and effectiveness in the NHS.**

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Introduction

In 1983 Speight *et al* reported that underdiagnosis of asthma in children led to undertreatment.[1] Other investigators in several countries have also reported continuing underdiagnosis and undertreatment,[2-4] which increase school absenteeism[1 2] and possibly the number of emergency room visits and hospital admissions.[5-9]

To improve the management of childhood asthma, guidelines for its diagnosis and treatment were published in 1989[3] and later updated.[10 11] The guidelines recommended five steps for treatment. The first step is the least severe disease and only β_2 agonists are recommended. In the second step anti-inflammatory drugs (sodium cromoglycate) are introduced in addition to β_2 agonists. If the second step does not work, the third step is to add inhaled steroids. Finally, steps four and five may require regular oral steroids to treat the most severe disease.

Studies in other countries have found a need to improve adherence to guidelines[4 12 13] and also major racial inequalities in the management of asthma.[14 15] In the United Kingdom a recent study reviewed prescribing information on asthma treatment in a sample of British general practices,[16] but it did not give information on the degree of underdiagnosis and undertreatment in the community, and, so far as we know, no study has assessed the variation between ethnic groups.

The national study of health and growth collected data on respiratory symptoms and treatment in 1990 and 1991. This study of primary school children investigated the prevalence of treatment for respiratory illness, the extent to which treatment for asthma adhered to recommended guidelines, and the influence of ethnic group on asthma treatment.

Methods

SUBJECTS

The national study was an annual survey of children aged 5 to 11 years. Information was obtained from three samples. One was an English and one a Scottish sample, which were both based on stratified random sampling of employment exchange areas with proportionally more children from poorer social groups.[17] As the distribution of social class in these samples was similar to that in the general population[18] we refer to them as representative in this paper. The third was an inner city sample, which was selected according to characteristics of deprivation and proportion of ethnic groups.[19] We analysed data together for the 1990 English sample, the 1990-1 Scottish representative sample, and the 1991 English inner city sample.

OUTCOME AND EXPLANATORY VARIABLES

All information on respiratory illnesses of the children and their parents, on drugs prescribed to the children, and on family background was obtained from a self administered questionnaire. In the English inner city areas the questionnaire was available in dual languages: English-Urdu, English-Gujarati, or English-Punjabi, as appropriate.

Parents reported whether the child had had attacks of asthma or bronchitis during the past 12 months, whether he or she usually coughed first thing in the morning or coughed at any other time, whether his or her chest ever sounded wheezy or whistling, and, if so, whether these symptoms were present on most days or nights.

Table 1—*Numbers of children and prevalence of reported symptoms by group*

	Representative sample		Inner city sample				
	England	Scotland	White	Afro-Caribbean	Indian subcontinent	Other	Total
No in sample	6463	4165	2183	1124	2696	1046	17 677
No with complete data on respiratory symptoms	5616	3814	1688	678	1985	709	14 490
No (%) with any respiratory symptom	1671 (29.7)	1066 (27.9)	708 (41.9)	343 (50.6)	576 (29.0)	244 (34.4)	4608 (31.8)
No (%) with persistent wheeze with or without asthma attacks	384 (6.8)	208 (5.4)	156 (9.2)	62 (9.1)	122 (6.1)	53 (7.5)	985 (6.8)
No (%) with asthma attacks	301 (5.3)	153 (4.0)	77 (4.6)	34 (5.0)	76 (3.8)	32 (4.5)	673 (4.6)

Parents also reported any drugs taken by the child for chest trouble in the past 12 months. The parents were asked to give the name or type of drug, how it was taken, the number of times it was taken, and the month it was last taken, as in a previous study.[20] Up to four drugs could be reported. We grouped the drugs into seven categories: β_2 agonists, other bronchodilators, steroids, other anti-inflammatory drugs such as sodium cromoglycate and nedocromil sodium, antihistamines, antibiotics, and antitussives. The method of administration was also analysed and grouped into four categories: inhalation, syrup, tablet, and unknown.

Variables on family background were as follows: one or two parent family; paternal social class classified in five groups (classes I and II, IIIN, IIIM, IV and V, and unknown); and the ethnic group of the child, classified by the language spoken at home and the fieldworker's subjective assessment of the child's ethnic group, as used since 1983.[19] In the inner city sample ethnic group was classified as white, Afro-Caribbean, children of families originating from the Indian subcontinent, and other (a heterogeneous group of children), to which were added two groups, England (1990 representative sample) and Scotland (1990-1 representative sample).

STATISTICAL ANALYSIS

The analysis of treatment was based on the subsample of children who had symptoms reported by their parents; this subsample was divided into four groups. Group I comprised children with any reported respiratory symptoms or conditions except occasional or persistent wheeze or asthma attacks; group II, children with occasional wheeze but not persistent wheeze or asthma; group III, children with persistent wheeze but no asthma attacks; and group IV, children with reported asthma attacks.

For each of the four groups the prevalence of prescribed drugs was estimated and the relation between any of the seven categories of prescribed drugs and ethnic group was also assessed by fitting multiple logistic regression models. Independent variables in the analysis were ethnic group, social class, one parent family, parents' reported atopic illness, child's sex and age, bronchitis reported for the child, and, for group IV, the child's number of asthma attacks in the previous 12 months as a proxy of severity.

The proportion of children taking β_2 agonists and steroids by different methods of administration was estimated for each group of children. A multiple logistic regression model was fitted to assess the probability of taking inhaled β_2 agonists rather than syrup or tablets among the four groups of children.

The final models were obtained using backward elimination carried out until all the remaining independent variables were significant at the 5% level.

Results

There were 10 628 eligible children from the representative sample (6463 living in England, 4165 living in Scotland) and 7049 from the inner city sample.

The response rate for the questionnaire was 92.3% for the representative sample and 85.3% for the inner city sample. Information on child respiratory illness had low percentages of missing values, between 3% and 10% according to respiratory symptom, in the representatives sample, and between 20% and 23% in the inner city sample. The Afro-Caribbean group had the worst response rate among the ethnic groups (varying from 31% to 33% by respiratory symptom). A total of 14 490 (82%) children had complete data and were included in the analysis.

The prevalence of respiratory symptoms varied between groups (table 1). Respiratory symptoms as a whole and persistent wheeze were more common in children from the inner city belonging to white, Afro-Caribbean, and other groups than they were for the representative sample and groups from the Indian subcontinent ($P<0.01$). The variation in reported asthma was smaller, suggesting that children with persistent wheeze were less likely to report asthma if they were from the inner city, particularly if they were white or Afro-Caribbean.

A total of 5494 children with at least one reported respiratory symptom were selected for further analysis. β_2 Agonists were prescribed for 75.1% of children with asthma attacks, and a much lower proportion had

Table 2—*Numbers (percentages) of children receiving prescribed drugs by group of respiratory symptoms or conditions*

	Bronchodilators		Anti-inflammatory drugs				
Group	β_2 Agonists	Other	Steroids	Other*	Anti-histamines	Antibiotics	Anti-tussives
I: Any symptom except occasional or persistent wheeze or asthma attacks (n=3138)	74 (2.3)	6 (0.1)	9 (0.2)	10 (0.3)	18 (0.5)	381 (12.1)	167 (5.3)
II: Occasional wheeze but no persistent wheeze or asthma attacks (n=924)	180 (19.5)	15 (1.6)	33 (3.6)	28 (3.0)	21 (2.3)	188 (20.3)	5 (0.5)
III: Persistent wheeze but no asthma attacks (n=404)	80 (19.8)	7 (1.7)	17 (4.2)	5 (1.2)	8 (2.0)	98 (24.3)	47 (11.6)
IV: Asthma attacks (n=1028)	773 (75.2)	75 (7.3)	259 (25.2)	148 (14.4)	46 (4.5)	149 (14.5)	40 (3.9)

*For example, sodium cromoglycate and nedocromil sodium.

Table 3—*Numbers (percentages) of children receiving prescribed drugs for asthma by group of respiratory symptoms or conditions*

Drugs prescribed for asthma	Group I (n =3138)		Group II (n=924)		Group III (n=404)		Group IV (n=1028)	
β_2 Agonists and anti-inflammatory drugs*:								
Total in group		9 (0.3)		37 (4.0)		20 (5.0)		310 (30.2)
Also taking antibiotics or antitussives	3 (33)		6 (16)		8 (40)		27 (9)	
β_2 Agonists:								
Total in group		66 (2.1)		139 (15.0)		60 (14.9)		463 (45.0)
Also taking antibiotics and antitussives	19 (29)		42 (30)		22 (37)		102 (22)	
Anti-inflammatory drugs*:								
Total in group		10 (0.3)		20 (2.1)		2 (0.4)		61 (5.9)
Also taking antibiotics and antitussives	0		3 (15)		1 (50)		10 (16)	
Neither β_2 agonists nor anti-inflammatory drugs:								
Total in group		3053 (97.3)		726 (78.6)		322 (79.7)		194 (18.9)
Also taking antibiotics and antitussives	482 (16)		205 (28)		104 (32)		38 (20)	

Group I = any symptom except occasional or persistent wheeze or asthma attacks; group II = occasional wheeze but no persistent wheeze or asthma attacks; group III = persistent wheeze but no asthma attacks; and group IV = asthma attacks.
*Any combination of steroids, sodium cromoglycate, and nedocromil sodium.

steroids (25.1%) or other anti-inflammatory drugs (14.4%). Children who had occasional or persistent wheeze only were less likely to receive drugs indicated for asthma and more likely to receive antibiotics and antitussives if they did not report asthma (table 2).

Neither β_2 agonists nor anti-inflammatory drugs were prescribed for 78.5% of children with occasional wheeze and for 79.7% with persistent wheeze compared with 18.9% of children with reported asthma attacks (table 3). Among children with diagnosed asthma the risk of not receiving any drug for asthma was significantly higher in children in the inner city sample compared with the representative sample (odds ratio 1.87 (95% confidence interval 1.26 to 2.77)). This was due to those included in the other ethnic group (odds ratio 2.40 (1.18 to 4.87)) and those from the Indian subcontinent (odds ratio 3.73 (2.33 to 5.98)).

Antihistamines, antibiotics, or antitussives were prescribed without asthma treatment in 205 (28%) of children with occasional wheeze only, 104 (32%) with persistent wheeze only, and 38 (19%) with asthma attacks. Among the children who received drugs for asthma, 199 (72%) of those who had wheeze but were not diagnosed as having asthma and 463 (56%) of those with a diagnosis of asthma received β_2 agonists alone.

There were significant differences in the method of administration of β_2 agonists in relation to the group of symptoms (P<0.001). Only 69% of children with asthma attacks were prescribed inhaled β_2 agonists and the proportion was lower for wheezy children without asthma attacks. Except for Afro-Caribbean children, all children living in an inner city area were less likely than children in the representative sample to take inhaled β_2 agonists (table 4).

In those with symptoms other than wheeze or asthma, ethnic origin was associated only with the use of antibiotics and antitussives. Compared with the representative sample, children of families from the Indian subcontinent were significantly less likely to use antibiotics, but all children in the inner city sample were more likely to use antitussives (odds ratio 3.10 (2.05 to 4.69)).

In those with reported asthma attacks, ethnic origin was associated with the prescription of most drugs indicated for the treatment of asthma and with the prescription of antibiotics and antitussives (P<0.001). Use of β_2 agonists was independently associated with ethnic origin, number of asthma attacks, social class, bronchitis, and sex. Use of anti-inflammatory drugs was associated with ethnic origin, the number of asthma attacks, and sex. Use of antibiotics was associated only with ethnic origin. Children from the Indian subcontinent and those from other groups were less likely to be prescribed β_2 agonists, anti-inflammatory drugs, and antibiotics compared with children in the representative sample (table 5). Afro-Caribbean children were less likely to be prescribed β_2 agonists. Afro-Caribbean children and those from the Indian subcontinent were more likely to be prescribed antitussives.

Table 4—*Probability of taking inhaled β_2 agonists by group of respiratory symptoms, ethnic group, and age*

	No (%) of patients	Unadjusted odds ratio	Adjusted odds ratio (95% confidence interval)	P value
Group				<0.001
IV: Asthma attacks (n=773)	534 (69.1)	1	1	
III: Persistent wheeze (n=80)	36 (45.0)	0.36	0.43 (0.26 to 0.72)	
II: Occasional wheeze (n=180)	93 (51.6)	0.47	0.50 (0.35 to 0.71)	
Ethnic origin				<0.001
English (n=459)	320 (69.7)	1	1	
Scottish (n=267)	190 (71.1)	1.07	1.05 (0.74 to 1.49)	
Inner city:				
White (n=130)	74 (56.9)	0.57	0.59 (0.41 to 0.96)	
Afro-Caribbean (n=44)	26 (59.1)	0.62	0.63 (0.30 to 1.19)	
Indian subcontinent (n=101)	37 (36.6)	0.25	0.25 (0.15 to 0.40)	
Other (n=32)	16 (50.0)	0.43	0.40 (0.19 to 0.94)	
Age (years)				<0.001
≤5 (n=41)	14 (34.1)	1	1	
-7 (n=336)	164 (48.8)	1.84	1.50 (0.73 to 3.05)	
-9 (n=290)	197 (67.9)	4.09	3.36 (1.63 to 3.91)	
>9 (n=366)	288 (78.6)	7.12	5.73 (2.78 to 11.8)	

Discussion

Only around 20% of children with wheeze, whether occasional or persistent, but 80% of children with recognised asthma attacks received drugs indicated for asthma. Of those with recognised asthma attacks, Afro-Caribbeans were less likely to receive β_2 agonists and children from families originating in the Indian subcontinent were less likely to receive β_2 agonists and anti-inflammatory drugs than children in the representative sample. Afro-Caribbeans and those from the Indian subcontinent received more antitussives and fewer antibiotics than white children in the inner city areas or representative sample.

Our study is based on large samples with high response rates for all groups, with the exception of Afro-Caribbeans and to a less extent the heterogeneous other groups. Although there have been studies relating to social class and asthma,[21] this is, to our knowledge, the first British study assessing the effect of ethnic group on treatment.

Differences in reported use of drugs between ethnic groups could be due to differences in reporting between the ethnic groups. Regardless of language spoken at home, children from families originating from Africa, the Caribbean, or the Indian subcontinent received fewer β_2 agonists and anti-inflammatory treatments than did white children. They received more antitussives, however, and prescription patterns between ethnic groups varied only in those with asthma attacks and not in those with wheeze without asthma attacks. It seems improbable that parents' memory of treatment is related to their ethnic group according to type of treatment or that ethnic group determines memory of asthma attacks but not wheeze alone.

ASTHMA DIAGNOSIS AND TREATMENT

Children with persistent symptoms are more likely to be asthmatic and to have atopic disease,[22] so children from the inner city areas, particularly the Afro-Caribbean and white children, probably have comparatively underdiagnosed asthma compared with children in the representative sample. The possibility that asthma remains comparatively underdiagnosed in the inner cities is important as it may lead to lower treatment rates, as shown in this study and in several others.[2 4]

We confirm the positive effect of asthma diagnosis on treatment seen in other studies.[1 2 4] Children with wheeze were less likely to be prescribed bronchodilators and anti-inflammatory drugs and more likely to be prescribed antibiotics and antitussives. Children with wheeze were less likely to receive inhaled β_2 agonists than those with asthma attacks, which suggests that the diagnosis also influences the method of administration. It is of interest that treatment is similar for those with occasional or persistent wheeze, suggesting that severity is less important than the diagnostic label in determining the treatment pattern.

According to the guidelines,[10 11] β_2 agonists should be taken at any step of severity and inhaled. However, our study shows that nearly 80% of children with persistent wheeze and 19% with asthma attacks did not receive β_2 agonists, bronchodilators, or anti-inflammatory drugs. Most of those taking β_2 agonists were not taking any anti-inflammatory agent. Although it is not possible to assess the correct need for these drugs, the lack of any difference between those with persistent and those with occasional wheeze and the high percentage receiving antibiotics or antitussives all suggest uncertainty in the diagnosis and inappropriate treatment of asthma.

The fact that children with persistent wheeze were less likely to be prescribed sodium cromoglycate and steroids than those reported as having asthma and that the use of these drugs was similar to that of children with occasional wheeze may indicate undertreatment. The relative use of sodium cromoglycate and steroids and of inhaled and oral steroids in Warner's study was very similar to the relative use of these drugs in our study.[16]

Key messages

- Underdiagnosis and undertreatment are common problems in the management of asthma
- In 1990-1 children with reported asthma attacks were more likely to be prescribed drugs for asthma and to use the appropriate method of administration
- In 1990-1 children with reported asthma attacks who were from ethnic minority groups were less likely to be prescribed drugs for asthma and to use the appropriate method of administration
- The implementation of indicators and targets to monitor inequalities in the treatment of asthma in ethnic minority groups would help purchasers and providers to improve equity and effectiveness in the NHS

ETHNIC ORIGIN AND ASTHMA TREATMENT

Ethnic origin was not associated with the prescription of drugs in children with persistent wheeze, but it was associated with most drugs in children with asthma attacks after adjusting for confounding variables. This suggests that there are no variations in treatment between ethnic groups when there is not a diagnosis of asthma. However, since a higher proportion of children with persistent wheeze in ethnic minority groups do not have a diagnosis of asthma, a higher number of children in these groups are likely to be undertreated. The association between prescription of β_2 agonists and the number of asthma attacks, one parent family, social class, bronchitis, and sex, but the lack of association between these variables and the method of administration, indicate that severity and social environment influence the level of prescription but not the method of administration.

A study in the United States has found that black asthmatic children received medical care more frequently but that they obtained drugs less frequently than other groups.[23] Other studies from the United States have shown that variations in rates of admission to hospital and in mortality between ethnic groups are more related to poverty than race.[24 25] Although children from ethnic minority groups are more likely to belong to lower social groups than other children in the United Kingdom, treatment for asthma is unlikely to be determined by accessibility to services. Consultations with general practitioners are higher in black and other ethnic groups,[26] but parents' and doctors' behaviour may have an effect on asthma care.[27]

Our study has shown that underdiagnosis and undertreatment of asthma was a serious problem in the United Kingdom, especially in ethnic minority groups, in 1991. Causes of variation in treatment among ethnic groups should be studied and possible interventions

Table 5—*Associations between ethnic group and type of drug prescribed in children with reported asthma attacks (group IV)*

	β_2 Agonists*	Anti-inflammatory drugs†	Antibiotics	Antitussives
English (n=433)	1	1	1	1
Scottish (n=254)	0.85 (0.57 to 1.28)	0.92 (0.67 to 1.28)	1.08 (0.70 to 1.60)	0.67 (0.21 to 2.18)
Inner city:				
White (n=121)	0.82 (0.49 to 1.38)	0.90 (0.59 to 1.37)	1.07 (0.62 to 1.84)	2.60 (0.96 to 6.90)
Afro-Caribbean (n=55)	0.43 (0.22 to 0.81)	0.74 (0.41 to 1.35)	0.48 (0.18 to 1.27)	8.28 (3.20 to 21.4)
Indian subcontinent (n=121)	0.35 (0.22 to 0.57)	0.26 (0.15 to 0.45)	0.20 (0.07 to 0.51)	3.40 (1.35 to 8.57)
Other (n=44)	0.41 (0.21 to 0.82)	0.44 (0.21 to 0.92)	0.22 (0.05 to 0.96)	0.98 (0.12 to 7.80)

*One parent family, social class, number of asthma attacks, bronchitis, and sex were also significantly associated with prescription of β_2 agonists and included in model.
†Number of asthma attacks and sex were also significantly associated with prescription of anti-inflammatory drugs and included in model.

evaluated. Qualitative studies in ethnic minority groups could help to identify reasons for the deficiencies in treatment of asthma in these groups. Ethnic monitoring[28] and targets for specific populations to monitor adherence to clinical guidelines have been suggested.[16 29] The implementation of indicators and targets to monitor inequalities in the treatment for asthma in ethnic minorities could help to improve equity and effectiveness in the NHS.

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WORDS TO THE WISE

An extended family

Genes, genitals, and *gender* all clearly have something to do with the process of reproduction. They are, in fact, members of a large family of words presumed to originate from a single Indo-European root sounding something like *gon-* or *gen-*. In Greek this became *gonos*, a seed, and *genea*, a race. From the former we have *gonad,* and from the latter *genealogy, homogeneous,* and the *-gen* ending used to signify "giving rise to." Meanwhile, in northern Europe, the Germanic languages mutated the Indo-European "g" into a "k"; a process first described by Jakob Grimm, the famous philologist and author. In English the result is *kin, kindred,* and the alarming collective noun for kittens: a *kindle.*

Three Latin words are responsible for originating most of the *gen-* family, however: *genus,* a race or group; *gens,* a family; *gignere,* to beget. The notion of tribes or groups gives us *generic, general,* and *gentiles.* Ideas of begetting appear in *malignant* ("born of evil"), *progeny, indigenous,* and (in a pleasing self referential way) *cognate,* used to describe words that share a common origin. A related word, *germen* (to sprout), followed similar evolutionary pathways: *germ* and *germinate* involve notions of begetting, *germane* has connotations of relatedness, and the *Germans* were a tribal grouping that the Romans had cause to fear.

The perceived nobility and trustworthiness of your relatives generates more *gen-* words: *ingenuous, genteel, gentle, genial, generous,* and *genuine.* The kindness of relatives (and unkindness of strangers) is a fertile source of words elsewhere, too: *kindness* itself derives from *kin,* and the cognate groups *extraneous, stranger,* and *strange,* and *kith, couthy,* and *uncouth* speak for themselves.

The Latin word *genius* originally applied to a tutelary spirit that guarded each Roman from birth onwards. Nowadays it is applied to a different congenital advantage, which may manifest as *ingenuity,* and allows *engineers* to design *engines.* On its first appearance in English in the thirteenth century, the word "engine" had a very specific meaning: a siege engine. Which brings us to a story that unites generals and engineers, ingenuity and engines, pathogens and genocide.

The walled town of Kaffa (now Feodosiya, in the Crimea) was once a tiny Genoese trading outpost in the midst of the splendidly named Khanate of the Golden Horde. In 1346 it was besieged by a Mongol army, which was later forced to withdraw by an outbreak of the bubonic plague which it had brought with it from the Central Asian steppes. In a final peevish gesture, the departing Mongols loaded their siege catapults with corpses, which they then hurled over the city walls. This was presumably achieved before the infected fleas had abandoned the cooling cadavers, because the citizens of Kaffa subsequently became victims of the Black Death. The disease was then transmitted along Genoese trade routes into Europe, where it had been unknown for centuries. It is estimated that about a third of the continent's population died during the ensuing epidemic.—GRANT HUTCHISON *is a consultant anaesthetist in Dundee*

We welcome filler articles of up to 600 words on topics such as *A memorable patient, A paper that changed my practice, My most unfortunate mistake,* or any other piece conveying instruction, pathos, or humour. If possible the article should be supplied on a disk.