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A multinational study of treatment failures in asthma management

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SUMMARY

SETTING: Emergency rooms.

OBJECTIVE: To assess quality of care and its determinants for asthma patients before emergency room treatment.

DESIGN: Consecutive patients with acute severe asthma attending emergency rooms were questioned about the severity of their disease and treatment in the previous 4 weeks. Prescriptions of inhaled corticosteroids were recorded. Other outcomes included self-reported adherence to treatment and loss of work.

RESULTS: Thirteen centres in 11 countries recruited 1156 patients. Only 36% of patients with persistent asthma had been prescribed an adequate dose of inhaled corticosteroids. This percentage improved in those receiving regular care from the same doctor (OR 2.86, 95%CI 1.38–5.96), and was at least as good for the 10% of patients receiving 'private' health care (OR 3.08, 95%CI 1.69–5.62). Forty-four per cent of patients had health insurance covering some asthma medications. These patients were more likely to be receiving adequate inhaled corticosteroids (OR 1.74, 95%CI 1.17–2.58), and reported better adherence than those without insurance (OR 3.00, 95%CI 1.64–5.50). Of those on adequate inhaled corticosteroids, 18% had lost work in each of the 4 previous weeks compared with 59% among those more than one treatment step below the recommended dose.

CONCLUSIONS: Access to adequate treatment is critical for better management of asthma.

KEY WORDS: asthma; emergency room; delivery of care; cost of illness; inhaled corticosteroids

CHRONIC DISEASE is an increasing problem, particularly in low-income countries. This has serious implications for the financing and management of health services. Chronic illnesses require continuity of care and long-term financial commitment. Traditional health services were initially developed to cope with acute severe illnesses, and the transition to services capable of coping with chronic illnesses has been slow.[1]

Guidelines for the management of asthma were developed in the 1980s, and are now widely disseminated.[2] The delivery of services has, however, been much more problematic, and there is a need for simple, low-cost instruments to identify deficiencies in care and rectify them. Two specific areas have been identified as potential barriers to better care: reliance on emergency rooms[3,4] and the widespread reliance on private health care, particularly in low- to middle-income countries.[5] Lack of insurance coverage, particularly for medicines, is also a source of concern in several countries.

This paper is based on an audit programme instituted by the International Union against Tuberculosis and Lung Disease (The Union), Paris, France, using sentinel event monitoring in emergency rooms as a way of identifying these deficiencies.

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Table 1 Enrolment of subjects by centre and characteristics

Centre	*n**	Age range, years	Male %	Classified by GINA criteria *n* (%)	With intermittent disease *n* (%)†	With persistent disease *n* (%)†
Santiago, Chile	133	15–88	32	124 (93)	43 (35)	81 (65)
Algiers, Algeria	32	18–75	63	32 (100)	2 (6)	30 (94)
Sousse, Tunisia	39	17–71	49	39 (100)	13 (33)	26 (67)
Kuwait City, Kuwait	134	12–69	57	134 (100)	42 (31)	92 (69)
Ramallah, Palestine	56	3–85	55	56 (100)	3 (5)	53 (95)
Lattakia, Syria	105	14–84	41	105 (100)	19 (18)	86 (82)
Aleppo, Syria	100	13–73	49	100 (100)	9 (9)	91 (91)
Sarajevo, Bosnia-Herzogovina	98	22–83	54	98 (100)	14 (14)	84 (86)
Lewisham, UK	56	16–87	27	55 (98)	11 (20)	44 (80)
Vancouver, Canada	100	17–77	50	100 (100)	20 (20)	80 (80)
Annaba (GP), Algeria	100	15–90	25	100 (100)	39 (39)	61 (61)
Annaba (Interns), Algeria	78	13–78	45	74 (95)	12 (16)	62 (84)
Khartoum, Sudan	139	14–70	52	139 (100)	36 (26)	103 (74)
Total	1170	3–90	46	1156 (99)	263 (23)	893 (77)

* Number reported.
† Percentage of those classified.

STUDY POPULATION AND METHODS

Centres with emergency rooms that saw asthma patients, mainly in middle-income countries, were invited to participate. Each centre collected information on up to 100 consecutive cases of diagnosed asthma presenting at the emergency rooms. Information included severity in the previous 4 weeks, as defined by the Global Initiative for Asthma (GINA) criteria.[2] Severe persistent asthma was defined as waking up almost every night with asthma or taking high-dose inhaled corticosteroids (>800 μg/day of inhaled beclomethasone or equivalent), moderate persistent asthma as waking up at least once a week or having trouble breathing almost every day or taking 500–800 μg/day of inhaled beclomethasone or equivalent, and mild persistent as waking with breathlessness at least twice a month or trouble with breathing at least once a week or taking low-dose inhaled corticosteroids (<500 μg/day of inhaled beclomethasone or equivalent) and intermittent disease as less than mild disease. Further information included current treatment, specifically the use of inhaled corticosteroids; self-assessment of the patient's own adherence to treatment; the patient's source of regular care for their asthma, if any; whether they had any insurance coverage; whether health insurance covered all or part of the patient's asthma treatment; and the patient's loss of usual activity because of asthma.

Adequacy of treatment by GINA recommendations and the patient's self-assessed adherence to asthma care guidelines was then related to whether the patient had regular care, what the source of this care was, whether the patient had insurance cover and whether this insurance covered all or part of their medication.

Within-centre analysis used χ^2 statistics for binary outcomes and Student's *t*-test for continuous variables. Overall conclusions were based on random effects meta-analysis of the data from different centres, which also provided assessments of the heterogeneity between centres. All analyses were undertaken using Stata Statistical Software Release 8.0, 2003 (Stata Corporation, College Station, TX, USA).

As this was an audit, the project did not go through an ethical review board, as is usual in most countries.

RESULTS

Thirteen centres in 11 countries contributed usable data from 1156 patients. Fourteen patients whose severity could not be assessed were excluded (Table 1). All centres entered data on adults aged 15–90 years. Some also included children. There were approximately equal numbers of men and women. Most centres recruited over 50 patients, and seven recruited 100 patients or more. In Khartoum, these came from three

Table 2 Characteristics of patients with persistent asthma

	Patients *n*	With persistent asthma %
GINA grade in the previous 4 weeks		
Mild	252	28
Moderate	374	42
Severe	267	30
Characteristics of health care		
Regular care	342	38
Health insurance	391	44
Prescribed steroids	520	58
Adherent to treatment	516	58
Adequacy of steroid treatment		
Adequate steroid dose	319	36
One step below*	209	23
Two steps below*	208	23
Three steps below*	155	17

* Treatment steps below GINA guidelines.
GINA = Global Initiative for Asthma.[2]

Table 3 Relation between GINA severity and health care provision for patients with persistent asthma

Severity of disease	Regular health care *n* (%)	Health insurance *n* (%)	Prescribed steroids *n* (%)	Adherence to treatment *n* (%)
Mild ($n = 252$)	111 (44)	116 (46)	156 (62)	145 (58)
Moderate ($n = 377$)	162 (43)	199 (53)	221 (59)	212 (57)
Severe ($n = 265$)	139 (52)	120 (45)	143 (54)	159 (60)
Total ($N = 893$)	412 (46)	435 (49)	520 (58)	516 (58)
Association with severity				
χ^2_2	5.6 $P > 0.05$	5.0 $P > 0.05$	3.9 $P > 0.10$	0.44 $P > 0.10$

GINA = Global Initiative for Asthma;[2] $\chi^2_2 = \chi^2$ with two degrees of freedom.

separate clinics. Seventy-seven per cent (range 61–95%) of the patients had persistent asthma.

Among patients with persistent asthma, 30% (range 0–66%) had severe persistent asthma (Table 2) and 28% (range 7–44%) had mild disease. Of those with persistent disease, 342 (38%) reported that they were receiving regular care for their asthma, 391 (44%) reported that they had some health insurance, 520 (58%) were being prescribed inhaled corticosteroids and 516 (58%) reported that they were taking their medications as prescribed; the rate was 66% (342/520) for those on inhaled corticosteroids. In 64% of patients with persistent asthma, the dose of inhaled corticosteroids prescribed was less than that recommended in the GINA guidelines.

Associations between these characteristics of health care and the severity of disease were weak (Table 3). Patients with persistent disease receiving care for their asthma from the same person and on a regular basis were more likely to be receiving an adequate steroid dose (odds ratio [OR] 2.86, 95% confidence interval [CI] 1.38–5.96), although this relationship varied greatly between centres ($P < 0.001$). The association between regular care and adequate steroid dose was not found for those who claimed to be receiving care from an emergency room (OR 1.13, 95%CI 0.38–3.36) or from a public health care facility (OR 1.39, 95%CI 0.69–2.81).

Patients under the care of private physicians were more likely to be receiving adequate steroids than all other patients (Figure 1). The association was significant, with no significant differences between the centres (OR 3.08, 95%CI 1.69–5.62, $P = 0.73$). The effect was still significant after adjusting for the presence of insurance coverage (OR 2.77, 95%CI 1.48–5.17), but was no longer significant when the comparison was confined to patients receiving some other form of regular care (OR 1.46, 95%CI 0.74–2.91) or after adjusting for specialist care (OR 1.37, 95%CI 0.62–3.03). The OR for receiving adequate treatment with steroids, if receiving treatment from a specialist, was 2.02 (95%CI 1.09–3.76, P for heterogeneity = 0.65), smaller than the odds for receiving treatment from a private physician. However, adjusting the effects of specialist care for private care gave an OR of 2.23 (95%CI 1.04–4.80, P heterogeneity = 0.34).

In some centres, health insurance was not salient, either because there was universal coverage (United

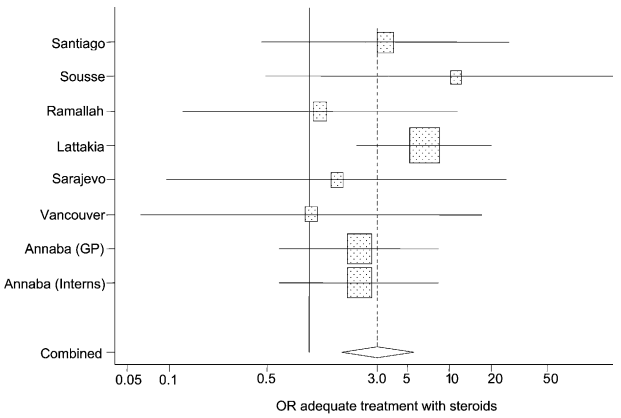

Figure 1 Forest plot showing ORs (95%CI) of patients receiving adequate steroid doses according to whether they were receiving regular care from a private physician. OR = odds ratio; CI = confidence interval; GP = general physician.

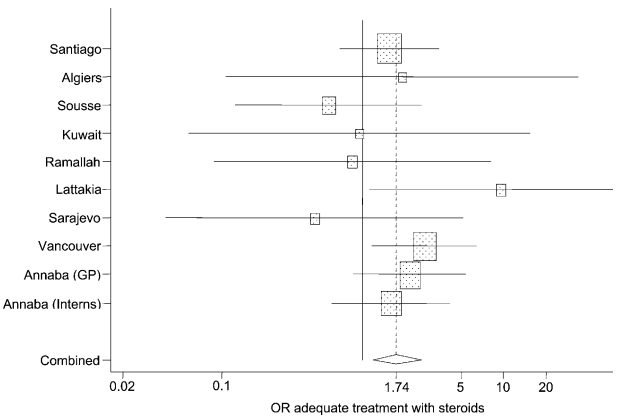

Figure 2 Forest plot showing ORs (95%CI) of patients receiving adequate steroids according to whether they held health care insurance at least partly covering asthma treatment costs. OR = odds ratio; CI = confidence interval; GP = general physician.

Table 4 Loss of work or usual activity in the previous month by adequacy of steroid dose

Loss of work/activity	Adequate dose *n* (%)	One treatment step too low *n* (%)	Two treatment steps too low *n* (%)	Three treatment steps too low *n* (%)	Total *n* (%)
None	100 (32)	43 (21)	51 (25)	41 (26)	235 (27)
Less than once per week	157 (50)	104 (50)	40 (19)	23 (15)	324 (37)
At least once per week	58 (18)	59 (29)	115 (56)	91 (59)	323 (37)
Total	315	206	206	155	882

Kingdom) or because there was no or very little health insurance (Kuwait and Syria). In the other centres, those with health insurance covering at least part of the costs of asthma treatment were more likely to be on an adequate dose of inhaled corticosteroids (OR 1.74, 95%CI 1.17–2.58) (Figure 2), and there was no significant variation between centres in this association ($P = 0.49$). Patients with health care insurance were also more likely to report being compliant with their prescribed treatment (74% vs. 45%, OR 3.00, 95%CI 1.64–5.50).

Although this study did not attempt to quantify in detail the economic consequences of poorly controlled asthma in these patients, these are clearly substantial (Table 4). Thirty-seven per cent of all patients with persistent disease had lost at least one day per week of work or usual activities in the previous month, and only 27% reported that they had not lost any work in this period because of their disease. Of those receiving 'adequate' doses of inhaled corticosteroids, only 18% had lost work every week. In contrast, 57% of those who were more than one step below the recommended dose had lost at least one day per week of work. Loss of work or usual activities was equivalent for men and women, but increased with age and with GINA severity. After adjusting for all these variables, those not prescribed inadequate inhaled corticosteroids were three times as likely to have lost at least 2 days of usual activities in the previous month (OR 2.96, 95%CI 1.09–8.03).

DISCUSSION

This study shows that among those attending emergency rooms with acute severe asthma, those receiving regular health care, particularly those seeing private physicians, and those with health insurance are more likely to be prescribed adequate steroids according to GINA guidelines. They are also more likely to comply with treatment. Those receiving 'regular' health care from emergency rooms appear less likely to be adequately treated.

This report is based on an audit of treatment failures and compares treatment failures being adequately treated according to current guidelines with those whose treatment would be regarded as inadequate. It was not the objective of this study to assess the correctness of the guidelines themselves.

This study has limitations. Although there was a common protocol for all centres, the selection of patients varied. The protocol specified consecutive patients, but this was not achieved in all centres and one centre included only patients who were admitted to hospital from the emergency room. As the analysis is undertaken 'within' centre, this is unlikely to have changed the conclusions. The patients seen were not intended to be representative of patients in the study centres, and self-selection is likely to have been more important than variations in implementation of the protocol.

The GINA guidelines at the time specified use of inhaled steroids. However, in Aleppo, Khartoum, Kuwait, Lattakia, Ramallah and Sousse, more subjects were taking oral than inhaled steroids. When we assumed that all those who had received any oral steroid had been 'adequately' treated, the percentage of adequately treated patients increased from 36% to 52%, but the associations between 'adequate' care and regular care, private care and health insurance coverage, although slightly lower, were all still significant. The proportion of those on 'adequate steroids' who had lost work in each of the previous 4 weeks also rose from 18% to 25%, suggesting lower efficacy. The substitution of oral for inhaled steroids is likely to reflect financial constraints and is likely to be accompanied by a high incidence of unwanted effects. Since this study was conceived the emphasis has moved from the original GINA classification of severity towards more emphasis on 'control' and a simpler classification.

Although we relied on the emergency room staff to make the diagnosis of asthma, some of these patients may have had chronic obstructive lung disease. Even with extensive testing it is sometimes difficult to distinguish clearly between the two conditions, and mixed disease is also likely. However, in this study, what is relevant is that the doctors and patients believed that they had asthma and that this diagnosis was not being adequately treated. When we restricted the study to those aged <50 years only, 34% compared with 36% of patients with persistent disease were on inhaled corticosteroids and, although the power within centres was low, the findings were broadly unchanged. Furthermore, the conclusion that a lack of 'adequate' asthma treatment is dependent on factors likely to limit access to treatment, such as continuing care or health insurance, is not dependent on diagnosis.

Although some of the issues investigated in this study, such as health insurance, were not relevant to all centres, where the issues were relevant the results were remarkably consistent, considering the very wide variety of health systems that are represented.

Much of the literature on economically less developed countries has followed Roemer[5] when discussing private health care as a problem. In more affluent countries, 'for-profit' health care has also sometimes been regarded as being of poorer quality.[6] Private physicians have been seen as more difficult to monitor and less likely to receive continuing professional training. They are also seen as less available outside large conurbations and less available to those who cannot easily afford out-of-pocket payments. It is therefore possible that the better treatment from private practitioners in this programme is the result of residual confounding. In New Zealand, public health services were shown to care for patients with less favourable circumstances.[7] It is also possible that physicians adapt their prescribing to the means of their patients and, if those who attend private physicians have greater resources, this could lead to their being more likely to receive a prescription for inhaled corticosteroids. This cannot, however, be assumed. Adjusting for health insurance coverage did not substantially alter the strength of the association between receiving private health care and the greater likelihood of patients being prescribed inhaled corticosteroids. Differences between physicians in the private and public sectors may have been exaggerated. In most places, those physicians who provide private care also work in the public sector.

In UK, it has been shown that specialist physicians are more likely than general physicians to follow guidelines.[8] This was also true of the present study. There is evidence of confounding between private care and specialist care, and it is probably not possible to disentangle the individual effects, as access to each are closely linked. Although the advantage of private care may be due in part to access to specialist care, it is clear that private care is not harmful for the individual patient. The inadequacy of care for those attending emergency rooms for long-term asthma care has been noted in several studies.[3] Although patients attending emergency rooms with asthma may be biased towards those with less access to continuing care and worse self-management skills, it is also likely that this environment is less appropriate for delivering regular long-term care.

The better prescribing pattern for patients who have some form of health insurance is not surprising. In the United States, there is good evidence that out-of-pocket payments reduce demand[9–11] and that this price sensitivity is more marked among the poor in both industrial[12] and less economically developed countries.[13] Nevertheless, the size of the effect in this study is striking. Although introducing higher charges for health care in poorer countries has not greatly reduced consumption,[13,14] these charges have been small in absolute terms compared with the costs of inhaled corticosteroids in some low-income countries. Yoder's study of the effects of fee changes in Swaziland reported fees equivalent to $US 0.45 for preventive services and $US 0.90 for acute services.[13] By contrast, the monthly cost of asthma medication for moderate persistent asthma in one study ranged from $4.33 in Algeria to $20.33 in Burkino Faso.[15] Furthermore, whereas the introduction of charges had little effect on the demand for acute care in Swaziland, there were more marked effects on the uptake of prophylactic services,[13] which may be the more relevant comparison when discussing chronic care.

The costs of asthma increase steeply with severity, and this is particularly true for the indirect costs.[16] The increase in indirect costs associated with undertreatment was substantial in this study also. It seems likely that if inhaled corticosteroids could be provided at the true economic cost and the costs of ineffective treatment could be saved, there could be a net financial saving for individual patients due to better treatment. This is without taking into account the wider economic consequences of better treatment.

The patients included in this study are not representative of all patients with asthma, but provide information on the important subgroup of treatment failures. In a disease with a very wide spectrum of severity, this represents the most costly group in terms of both financial and economic burden.

This study suggests that a key task in improving health care in all countries is providing improved access to inhaled corticosteroids. Solutions are likely to include better access to continuing care and improved mechanisms to spread costs, combined with efforts to ensure that drugs are available at their true economic cost. The requirement to improve physician training in both the public and private sectors remains. It seems unlikely, however, that this alone will be enough to remedy the problems that we have identified.

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RÉSUMÉ

CADRE : Salles d'urgences.
OBJECTIF : Evaluer chez des asthmatiques se présentant dans les salles d'urgence la qualité des soins reçus antérieurement et ses déterminants.
CONCEPTION DE L'ETUDE : Les malades s'étant présentés consécutivement dans les salles de d'urgence pour crise d'asthme sévère ont été interrogés sur la sévérité de leur maladie et sur le traitement reçu au cours des 4 semaines précédentes. Les prescriptions de corticostéroïdes inhalés ont été enregistrées. D'autres informations telles que l'adhérence au traitement et la perte de travail ont été incluses dans le questionnaire.
RÉSULTATS : Treize centres dans 11 pays ont recruté 1156 patients. Seulement 36% de patients présentant un asthme persistant avait eu une prescription adéquate de corticostéroïdes inhalés selon la sévérité de leur maladie. Cette proportion était meilleure chez les malades recevant leurs soins régulièrement par le même médecin (OR 2,86 ; IC95% 1,38–5,96), et étaient au moins aussi bons pour les 10% de patients traités dans un établissement de santé «privé» (OR 3,08 ; IC95% 1,69–5,62). Quarante pour cent des patients inclus dans l'étude avaient une assurance médicale maladie qui couvrait quelques médicaments d'asthme. Ces patients recevaient plus souvent la dose adéquate de corticostéroïdes inhalés (OR 1,74 ; IC95% 1,17–2,58), et reportaient une meilleure adhérence au traitement que ceux sans assurance (OR 3,00 ; IC95% 1,64–5,50). Au cours des 4 semaines précédant leur visite aux services d'urgence, 18% des malades qui recevaient un traitement à dose adéquate avaient perdu des journées de travail comparé à 59% de ceux qui recevaient un traitement d'un palier inférieur à la dose recommandée.
CONCLUSIONS : L'accessibilité des malades à un traitement adéquat est critique pour une meilleure prise en charge de l'asthme.

RESUMEN

DESARROLLO : Unidades de emergencia.
OBJETIVO : Evaluar la calidad de la atención previa y sus determinantes en pacientes asmáticos que consultan en unidades de emergencia.
DISEÑO : Asmáticos consecutivos que consultaron en unidades de emergencia por exacerbaciones severas agudas fueros interrogados en forma standarizada sobre la severidad de su enfermedad y la terapia recibida en las últimas 4 semanas. Se consignó el uso previo de corticoides inhalados. Otras variables fueron la adherencia al tratamiento informada por el paciente y el ausentismo laboral.
RESULTADOS : Se reclutaron 1156 pacientes atendidos en 13 unidades de emergencia de 11 paises. A sólo el 36% de los asmáticos persistentes atendidos se les había indicado corticoides inhalados en dosis adecuadas. Cifras mejores mostraban los pacientes atendidos regularmente por el mismo médico (OR 2,86 ; IC95% 1,38–5,96) y similarmente al 10% de aquellos atendidos en los sistemas privados de salud. El 44% de los pacientes poseían seguros de salud que cubrían algunos de los medicamentos para el asma. Estos tenían mas posibilidades de recibir adecuadas dosis de corticoides inhalados (OR 1,74 ; IC95% 1,17–2,58) y mostraban mejor adherencia terapéutica comparados con aquellos sin seguros (OR 3,00 ; IC95% 1,64–5,50). El 18% de aquellos con terapia de corticoides inhalados adecuada tenían ausentismo laboral comparado con 59% de aquellos que recibían a lo menos un nivel mas bajo de la terapia recomendada
CONCLUSIÓN : El acceso a la terapia adecuada es un factor crítico en el mejor manejo del asma.