Clinical audit

Prospective audit of a respiratory sleep disorders service at District General Hospital level

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Summary

This study was designed to examine the organisation and outcomes of a District General Hospital respiratory sleep service, since data are lacking on the management of sleep-disordered breathing at this level. Questionnaires and case-notes review were used to assess the management of 119 consecutive patients referred with suspected sleep-disordered breathing. Patients diagnosed with sleep-disordered breathing were assigned nasal continuous positive airway pressure (nCPAP), ear/nose/throat (ENT) surgery or simple measures (eg, weight loss). There were six non-attenders. At 12 months follow-up, 33 patients had been assigned to nCPAP, 25 to ENT surgery, and 37 to simple measures. Of the remainder, nine had alternative diagnoses, two were still being assessed and seven were lost to follow-up. Patients prescribed nCPAP (81% compliance) had significant symptomatic improvements with low dissatisfaction rates (20%); patients on simple measures did not improve (33% dissatisfied); only half assigned surgery had it performed, with 42% awaiting surgery and dissatisfied. Interspecialty referral resulted in major delays (mean 16 weeks). Referral letters were generally unhelpful in deciding on the appropriateness of initial referral (respiratory physician *vs* ENT). nCPAP was generally effective in improving symptoms, with a high level of patient satisfaction, while simple measures did not improve symptoms and were associated with lower satisfaction levels. Waiting times to ENT surgery can be long and patients express significant dissatisfaction. Referral letters are not useful in directing initial referral. Services should be co-ordinated between respiratory and ENT specialties to reduce waiting times and improve patient satisfaction.

Keywords: sleep-disordered breathing; audit; nasal continuous positive airway pressure; snoring

Respiratory sleep disorders are common, with 4-8% of middle-aged men affected by obstructive sleep apnoea¹⁻³ and around one-fifth bothered by habitual snoring.⁴ Increasing numbers of patients are being investigated and treated at District General Hospital level, without the

sophisticated facilities of a major sleep centre that formerly were thought to be essential in such patients.^{5,6} However, data on the optimum approach to the organisation of respiratory sleep services at this level are lacking. Instead, attention has focussed on specific diagnostic techniques or the relative merits of individual treatments.

In order to identify the problems facing a District General Hospital service, we prospectively audited the respiratory sleep disorders service in the Nottingham Health District, a service that could be considered typical of a District General Hospital. We specifically sought to answer several questions: what is the size of the burden on services, where do delays arise during assessment and treatment, are the treatments offered effective, and can General Practitioner referral letters be used to direct initial management?

Methods

The Nottingham Health District (population approximately 600 000) offers services for the management of respiratory sleep disorders, at both the University Hospital and the City Hospital. Both centres have sleep investigation rooms, with trained personnel providing vide-osomnography (infrared video, respiratory sounds and oximetry) and nasal continuous positive airway pressure (nCPAP) titration. Ear, nose and throat (ENT) and neurology services are based at the University Hospital.

Specialties to which patients with snoring or suspected obstructive sleep apnoea were referred (respiratory medicine, neurology and ENT surgery), used study forms to notify investigators at the time they were referred a patient from within the Nottingham Health District and without a previously investigated respiratory sleep disorder. Each patient completed a questionnaire before they were seen in the out-patient clinic on their first hospital visit. Data on investigation and treatment were obtained retrospectively from patient case-notes, rather than from a standardised clinical record form, since we did not want clinicians to alter their usual practice to meet any perceived study requirements.

Each questionnaire included a standard Epworth Sleepiness Scale (ESS),⁷ which scores daytime sleepiness (0-3) in seven everyday situations to derive an overall score from 0 to 21 (mean (SD) score for normal controls being 5.9 (2.2)). There was also an assessment of

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snoring frequency (5-point scale from never to every night), as well as questions regarding choking on waking from sleep (yes/no), sleeping in a separate room from one's partner (yes/no/not applicable), and snorting or gasps during sleep (yes/no). Snorts and gasps often accompany the release of upper airway obstruction at apnoea termination and are often better appreciated than observed apnoeas. A follow-up questionnaire was sent 12 months later to respondents to the first questionnaire. In addition to an ESS and the same questions as the original, patients were asked to comment on any overall change in symptoms (5-point scale from significantly worse to significantly improved) and on how well they felt they had been investigated and treated (5-point scale from very dissatisfied to very satisfied).

At the end of the enrolment period, each specialist was sent a list of all patients they had notified, and asked to check if they had failed to notify any patients referred to them during the enrolment period. All ENT referrals to the respiratory physicians following the start of enrolment, and all patients undergoing sleep studies during the enrolment period and the succeeding 12 months, were screened for any omitted patients. Patients identified retrospectively were not given a questionnaire, since they would have already started investigation and treatment, and their symptoms may have changed in the interim. The same individual examined the referral letters and clinical notes of all patients 12 months following referral.

STATISTICS

The ESSs of each diagnostic group were compared by one-way analysis of variance (ANOVA) with post-hoc analysis using a Student Newman Keuls (SNK) test, while the initial and follow-up ESSs were compared by paired *t*-tests. In these instances, normality was confirmed by the Shapiro-Wilk test. Items of clinical information in referral letters, and categorical data in the initial questionnaire, were compared between groups by $2 \times 3 \chi^2$ tests. McNemar's test was used to compare categorical data between questionnaires (Q_1 , Q_2), for all patients and for individual diagnostic categories. Results are quoted as mean (standard deviation). A significant value was taken as $p < 0.05$.

Results

One hundred and nineteen patients (88 notified prospectively and 31 identified retrospectively) were enrolled over an 8-month period. Six patients never attended hospital. The average age was 48 (12) years, with 98 males (82%). All patients were general practitioner (GP) referrals, apart from one each from departments of Endocrinology, Dermatology, Health Care of the Elderly, and Nephrology. Approximately half (66/128) of the GP practices in the Nottingham Health District referred patients, with 37 referring one case, 14 referring two cases, 11 referring three cases, three referring four cases, and one referring five cases. Twenty-three per cent (92/394)

of GPs referred patients, with 72 referring one case each, 17 referring two cases, and three referring three cases. More than half of patients (72/119, 60%) were referred to a respiratory sleep physician, 45 to an ENT surgeon (38%) and two to a neurologist.

On review at 12 months, patients were subdivided into three main diagnostic categories:

nCPAP group (33 cases): A trial of nCPAP was offered to all patients with a desaturation index ($\geq 4\%$, per hour) of more than 20 dips/h on overnight oximetry (18 cases), and to those patients with less frequent desaturations but who had excessive daytime somnolence (15 cases), particularly if there was also evidence of obstructed breathing on video. Each nCPAP trial was performed in the sleep laboratory and the mask pressure adjusted until a satisfactory mix of clinical effect and patient comfort was achieved. However, two patients declined a trial and six were unable to tolerate nCPAP.

Surgery group (25 cases): Of those patients seen initially by an ENT surgeon, eight were considered to have significant snoring, not associated with excessive daytime somnolence or apnoeas, and with a surgically amenable upper airway problem. They were deemed surgical candidates without the need for a sleep study. The remaining 17 patients underwent overnight monitoring with no evidence of obstructive sleep apnoea and no significant excessive daytime somnolence.

Simple measures group (37 cases): This group consisted of those patients without frequent desaturation on oximetry or no upper airway obstruction on video, who did not have excessive daytime somnolence and whose snoring was not considered severe enough to warrant surgery. Four patients were seen initially by ENT and not thought to require a sleep study. These cases were treated with simple measures alone, eg, weight loss, alcohol avoidance or nasal decongestants.

A further nine cases had alternative diagnoses, two were still awaiting a further specialist's opinion, and seven were lost to follow-up.

REFERRAL LETTERS

Referral letters were available for 111 patients (93%), and the frequency with which each item was mentioned is shown in table 1. The cardinal symptoms of obstructive sleep apnoea are

Table 1 Percentage of referral letters containing information on clinical features

Feature	%
Age/date of birth	91
Is the patient overweight or not?	35
Snoring	89
Observed apnoeas	38
Excessive daytime somnolence	19
Alcohol intake	18
Previous treatment	30
Nasal symptoms	24
Upper airway examination	39

Table 2 Average waiting times

	Number	Waiting time (weeks) *
GP to respiratory physician	72	9.6 (6.1)
GP to ENT surgeon	45	10.8 (9.5)
Respiratory physician to ENT surgeon	13	16.3 (8.4)
ENT surgeon to respiratory physician	36	15.2 (6.0)
Referral receipt to sleep study	95	17.3 (10.4)
Seen by respiratory physician to sleep study	95	4.0 (2.6)
Referral receipt to nCPAP	31**	18.9 (12.3)

*Mean (SD); **two other patients were offered but refused a trial of nCPAP.

snoring, observed apnoeas and excessive daytime somnolence. However, in 64 patients (58%) the presence or absence of only one of these symptoms was mentioned, with reference to two in a further 40 patients (36%). Information on all three symptoms was available in just seven patients (6%). No significant differences were seen between the major diagnostic categories. Importantly, excessive daytime somnolence was mentioned in only 25% of patients on nCPAP, a group where excessive daytime somnolence is almost universally present, and upper airway anatomy was described in only 41% of those considered for surgery.

WAITING TIMES

Waiting times are summarised in table 2. Inter-specialty waiting times were longer than for referrals from GPs, and it was during the former that all losses to follow-up occurred (six patients referred from ENT to a respiratory physician and one patient referred from a respiratory physician to ENT). Excluding six patients who never attended, and six lost to follow-up from ENT to a respiratory physician, 95 of the remaining 107 patients had a sleep study (89%). Where appropriate, nCPAP was commenced 18.9 (12.3) weeks after referral receipt, with 25 of 31 patients (81%) agreeing

to a trial still using it at 12 months. After 12 months, only half of the patients on the waiting-list for surgery, and 40% of those on the waiting-list for sleep nasendoscopy, had undergone the procedure (table 3).

QUESTIONNAIRES

Sixty-six of 82 initial questionnaires (Q_1) were returned (81% response rate, table 4). The ESS differed between diagnostic groups ($p=0.018$, ANOVA) being higher in the nCPAP group than in the other two groups ($p=0.02$ for both comparisons, SNK). Groups did not differ for other symptoms, with most patients being habitual snorers, sleeping in a separate room, and snorting/gasping during sleep. The latter two responses were seen in nearly every surgical patient, reflecting the socially disruptive nature of their illness.

A follow-up questionnaire (Q_2) was sent to 64 of the above patients (two had moved without a forwarding address) with 51 returned (80%). Comparing Q_1 and Q_2 for these 51 patients (table 5), a significant reduction in ESS ($p=0.016$) and a trend towards reduced snoring frequency ($p=0.08$) were seen in the nCPAP group. Patients reported being somewhat (33%) or significantly improved (47%), with most satisfied (27%) or very satisfied (53%) with their management (figure).

Only three of the patients undergoing surgery within 12 months of referral returned Q_2 , a number too small to draw any valid conclusions. However, 10 patients still awaiting surgery or sleep nasendoscopy responded. One patient reported an overall improvement in symptoms, with no change in eight patients and some worsening in one. Forty-two per cent of patients expressed some dissatisfaction about their management (figure). Similarly, there was no significant change in the simple snorers

Table 3 Clinical status at 12 months post-referral for all patients requiring surgery or sleep nasendoscopy

Intervention	Outcome				
Surgery	19	Completed	8	UPPP	3
				Septoplasty and uvulectomy	2
				Septoplasty and SMR	2
				Nasal polypectomy	1
	Awaited		8	UPPP	3
				Septoplasty and uvulectomy	1
				Septoplasty and SMR	2
				Laser palatoplasty	1
	Patient refused	Unfit for surgery (IHD)	2		
Sleep nasendoscopy	10	Done	4	Simple snorers	3
				Referred to respiratory physician	1
	Awaited		6		

UPPP: Uvulopalatopharyngoplasty; SMR: submucosal resection; IHD: ischaemic heart disease

Table 4 Summary of results from questionnaire 1 (Q_1 , time of referral)

	Overall	CPAP	Surgery	Simple measures
Number of cases	66	24	13	27
ESS: mean (SD)	9.8 (5.2)	12.5 (4.6)*	8.4 (4.7)*	8.2(5.2)*
Habitual snorers† (%)	79	75	77	82
Separate bedroom (%)	71	54	85	67
Nocturnal choking/gasping (%)	55	54	54	59
Snorting (%)	77	79	92	74

ESS: Epworth sleepiness score. * $p=0.018$ (ANOVA). †Snoring 6–7 nights/week.

Table 5 Comparison of initial questionnaire (Q_1) with the questionnaire after 12 months (Q_2) for those patients who completed both questionnaires

	CPAP (<i>n</i> = 15)		Awaiting surgery (<i>n</i> = 10)		Simple measures (<i>n</i> = 15)	
	Q_1	Q_2	Q_1	Q_2	Q_1	Q_2
ESS mean (SD)	12.5* (4.6)	8.5* (5.5)	8.4 (4.7)	10.1 (3.5)	8.5 (6.1)	9.5 (6.5)
Snore frequency** (%)	100	60	100	100	100	100
Separate bedroom (%)	47	27	90	90	73	60
Nocturnal choking (%)	47	20	50	40	60	40
Snorting/gasping (%)	80	53	90	80	73	73

ESS: Epworth sleepiness score. * $p=0.016$ (paired *t*-test); ** ≥ 3 nights/week

Figure Patient responses to: (a) any overall change in symptoms over the 12 months from referral, and (b) their perception of how their problem(s) were investigated and treated. Patients are subdivided according to the main diagnostic groups: prescribed nCPAP, awaiting surgery, and treatment by simple measures alone

group (table 5) with most patients reporting no overall change in their symptoms, and 33% dissatisfied with their management (figure).

Discussion

The present study is the first report examining all primary referrals with suspected sleep-disordered breathing within a defined health district. The annual burden on our service extrapolates to 180 referrals, 50 of whom require nCPAP. The study also demonstrates important delays in management of some patients, chiefly those referred between specialties and those awaiting surgery, with many unhappy with the service provided. Good symptom control was seen with nCPAP, and most patients continued to use it at 12 months. Too few patients had surgery to comment on its efficacy, but symptom control in those awaiting surgery, and in those treated by simple methods, was generally unsatisfactory. Referral letters generally had too little information to direct initial management and referral patterns varied, with half of all GP practices not referring patients while some GPs referred up to three.

Most patients on nCPAP have a worthwhile clinical improvement, with a significant reduction in ESS and a trend towards reduced snoring frequency, and most were satisfied with their management (table 5, figure). The

Summary points

- in a Health District covering a population of about 600 000 people, approximately 180 referrals with sleep-disordered breathing would be expected each year, with at least 50 patients requiring a trial of nCPAP
- nCPAP has a compliance rate of about 80% and is associated with significant improvement in symptoms and high patient satisfaction
- simple measures used to treat snorers without significant sleep apnoea are generally ineffective
- most referral letters lack essential clinical information; respiratory physicians and ENT surgeons should centralise referrals, perhaps using a standardised questionnaire

observed compliance rate of 81% at 12 months follow-up compares favourably with other studies.^{8,9} In contrast, there was no overall reduction in ESS, snoring frequency, sleeping in separate rooms and frequency of nocturnal choking in the simple treatment group. Only three of those patients who had surgery by 12 months returned Q_2 (two clinically improved and satisfied, one worse and dissatisfied). Patients still on the waiting list for surgery or sleep nasendoscopy were also advised on simple measures but most had no symptom improvement by 12 months after referral. This group had the greatest dissatisfaction with their management (42%). Responses in the simple treatment and surgery groups could perhaps be improved by increasing the number of patients having nCPAP trials or using other devices considered effective in some patients with snoring or obstructive sleep apnoea, such as a mandibular advancement device.¹⁰ However, the clinical efficacy of the latter remains to be shown conclusively.

Presently, the respiratory medicine and ENT departments do not co-ordinate referrals. Thus, many patients with obstructive sleep apnoea may be referred initially to ENT, and then onto a respiratory physician, resulting in more hospital visits, significant delays in investigation and treatment (average of 16 weeks) and loss to follow-up. Improved clinical data, as provided by a standardised referral form or a patient questionnaire relating to a small number of important clinical risk factors,¹¹ would help to determine the appropriate specialist for initial referral. Patients with socially disruptive snoring, no excessive daytime somnolence and a very low probability of obstructive sleep apnoea based on clinical risk factors¹¹ would be sent directly for surgical opinion, while the remainder would be seen initially by a respiratory physician.

This co-ordinated approach should not increase the respiratory service workload significantly, since most patients already undergo sleep studies, but it should greatly reduce the ENT out-patient workload. In the present study, only 29 of 59 patients seen by ENT (45 GP and 14 respiratory physician referrals) had, or were waiting for, surgery or sleep nasendoscopy. Reducing referrals to ENT by 50% could

shorten the interval to ENT assessment and, consequently, the waiting time to surgery, while shortening the time to diagnosis by a mean of 4 months in those patients not requiring ENT input.

We feel that the results of the present study are representative of the services provided by most District General Hospitals, but acknowl-

edge that some centres may already have a very close working relationship between respiratory and ENT departments. Nevertheless, the study does highlight a number of issues that will be relevant to most centres. Importantly, it demonstrates the effectiveness of nCPAP in improving symptoms, compared to simple measures.

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Medical Anniversary

Leon Calmette, 12 July 1863

Leon Charles Albert Calmette (1863-1933) was born in Nice, France, where his father was a lawyer. He was the youngest of three sons, one of whom became an Army physician and the other a journalist. He studied medicine at Brest, the Far East and in Paris. He was influenced by meeting Patrick Manson (1844-1922) in Hong Kong, and so wrote his MD thesis on filariasis. In 1895 he became director of the newly founded Pasteur Institute in Lille where he produced Bacille Calmette-Guerin for the control of tuberculosis. Camille Guerin was his assistant in Lille. He died in Paris on 29 October 1933. His remains are interred in the crypt of the Pasteur Institute, Paris, alongside those of Pasteur himself. — *DG James*