Partners of patients with sleep apnoea/hypopnoea syndrome: effect of CPAP treatment on sleep quality and quality of life

N McArdle, R Kingshott, H M Engleman, T W Mackay, N J Douglas

Abstract

***Background*—The sleep apnoea/hypopnoea syndrome (SAHS) causes snoring, apnoeas, and restlessness during sleep which partners frequently complain about. A study was undertaken to determine the impact on partners of SAHS and of treatment of the patient with continuous positive airway pressure (CPAP).**

***Methods*—Forty nine partners and patients with SAHS booked for CPAP treatment completed in house and validated questionnaires (Pittsburgh sleep quality index, Short Form 36 self-reported health status) before the patient started treatment. Twenty three couples in whom the index SAHS patient had no driving problems were recruited to a randomised crossover trial with 1 month limbs of CPAP and placebo capsule. At the end of each limb the partners' sleep was monitored by home polysomnography (PSG) and questionnaires were completed.**

***Results*—Before treatment partners frequently reported moderate to severe disturbance from patient snoring/apnoeas/restlessness and had poor sleep quality and self-reported health status. In the crossover study (22 completed) the partners' objective sleep quality did not differ between CPAP and placebo, but they reported benefit from treatment of the patients with CPAP in subjective sleep quality (p=0.05) and disturbance to sleep (p=0.03). The reported change in partners' sleep quality between pre-study and following CPAP treatment correlated positively with CPAP use (r=0.5, p=0.01).**

***Conclusions*—Partners of patients with SAHS have poor sleep quality and self-reported health status but only subjective sleep quality benefits from treatment of the patient with CPAP.**

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Keywords: sleep apnoea; sleep quality; quality of life; sleep partners; continuous positive airway pressure (CPAP)

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Sleep apnoea/hypopnoea syndrome (SAHS) is common, occurring in 2–4% of the middle aged population.[1] The predominant features include daytime sleepiness, altered mood and personality as well as loud snoring, witnessed apnoeas, choking, and restlessness during sleep.[2 3] It is common clinical experience[2 4 5] that partners of patients with SAHS complain of disturbance to their sleep and relationship difficulties because of the patients' symptoms.

The effects of SAHS on the partners' sleep are unclear. Only one study[6] has used objective measures of sleep quality and there are no randomised placebo controlled studies of the effects of treatment of SAHS on partners.[7–11] Our principal hypothesis was that continuous positive airway pressure (CPAP), the current preferred form of treatment for SAHS, would improve the sleep quality of the partners of patients with SAHS. The partners' sleep efficiency index (SEI) and arousal index, measured by polysomnography (PSG), were the principal end points. We also assessed changes in subjective sleep quality, self-reported health status (quality of life), marital satisfaction, and other effects on partners when patients received CPAP treatment. The secondary hypothesis was that sleep quality and quality of life would be impaired in partners before patients with SAHS started treatment.

Methods

SUBJECTS

Consecutive patients with SAHS who were booked for CPAP treatment at the Scottish National Sleep Centre and their partners were recruited if they met the following criteria.

Inclusion criteria

(1) Patients with two or more symptoms of SAHS[3] and an apnoea/hypopnoea index (AHI) of >15/h slept in a sleep study measuring electroencephalography (EEG) or >30 apnoeas and hypopnoeas/h in bed on limited (non-EEG based) diagnostic studies (in our unit limited studies with 5–30 apnoeas and hypopnoeas/h in bed result in a further study with EEG for diagnosis[12]). Apnoeas and hypopnoeas were defined using our usual criteria.[13]

(2) Patients had a bed partner and they shared a bed ⩾2 nights/week (couples just sharing a room were not included).

Exclusion criteria

(1) Medication use or co-existing disorder likely to disturb the patient's or partner's sleep quality, including sleep disorders such as narcolepsy or insomnia (defined in partners as regular use of hypnotic medications or reported sleeping <6 hours/night), neurological disorders, and severe chronic respiratory disease.

(2) The patient or partner was doing regular overnight shift work.

(3) The patient or partner consumed excessive amounts of alcohol, defined as >21 standard units of alcohol/week.
(4) The partner had been diagnosed with deafness or regularly used earplugs at night.

A total of 107 couples met the inclusion criteria during 9 months of study recruitment. Couples were excluded from the study if they had co-existing disease/medications likely to disturb sleep quality (n=23) or for other reasons (n=13) such as regular shift work. The remaining 71 couples were sent baseline questionnaires. If there was clinical concern about driving problems due to sleepiness (n=12), couples were excluded from the crossover study for ethical reasons.

PROTOCOL

Couples were sent a recruitment letter and baseline questionnaires prior to the patient's CPAP titration night. Patients were prescribed the pressure that controlled 90% of apnoeas, hypopnoeas, and flow limited breaths as determined by an AutoSet machine (ResCare Ltd, Abington, UK). All patients received education before CPAP titration and were asked to use CPAP all night.

When couples agreed to the crossover trial, patients were randomised the morning after CPAP titration using a random number table and sealed envelopes to receive either 1 month of placebo capsule (lactose, Nova Laboratories, Wigston, UK) or CPAP treatment. The treatment intervention was reversed during the subsequent month with no washout period. Block randomisation was used to ensure that the order of intervention was balanced. CPAP treatment used the Sullivan Elite machine (ResCare Ltd, Abingdon, UK) to provide a nightly assessment of CPAP use at the prescribed pressure. One placebo capsule was taken in the evening and patients were told that the capsule treatment might improve upper airway muscle function in sleep, as approved by the local ethics subcommittee. Patients received a follow up telephone call after 10 days in both treatment limbs; in the CPAP limb this call was used to sort out any problems with CPAP use.

ASSESSMENTS

Baseline assessments

Baseline questionnaires asked participants to assess their sleep quality using the Pittsburgh Sleep Quality Inventory (PSQI).[14] The PSQI is a validated questionnaire assessing sleep quality over the previous month, which can be used to separate those with poor sleep quality from those with good sleep.[15] Partners were also asked to complete the UK version of the Short Form 36 health survey questionnaire (SF 36)[16] for which there are UK normative values.

An in house questionnaire asked the partner to give a global rating of sleep quality using a four point ordinal scale (very poor, fair, good, or excellent) and to rate sleep disturbance from patient snoring, apnoeas, and restlessness using a four point scale (not at all, mild, moderate, or severe disturbance). Patients were also asked to indicate the main reason they sought medical attention from the following four possible options: (1) sleepiness/tiredness during the day, (2) disturbance caused by snoring, (3) concern about breathing pauses during sleep, or (4) other reasons.

Crossover study assessments

At the end of each month of intervention couples were visited in their home by the researcher. Partners and patients were given questionnaires to complete separately. Questionnaires included the PSQI questionnaire, the SF36 questionnaire, and the Enrich marital satisfaction questionnaire.[17] The Enrich questionnaire surveys 10 domains of marital quality and makes a correction for idealistic distortion; the results are presented as a percentile score based on the US normative values. Partner daytime sleepiness was assessed using the Epworth Sleepiness Scale (ESS)[18] and the Functional Outcomes of Sleep Quality (FOSQ) questionnaire.[19] The FOSQ questionnaire measures the effects of excessive sleepiness on daytime function.

An in house questionnaire asked partners about their sleep quality and sleep disturbance from snoring, apnoeas and restlessness in each intervention month, and about disturbance from CPAP (in the CPAP limb) using the above four point scale. The sleep disturbance from all causes was added to give a total score for sleep disturbance. Partners were also asked what aspect(s) of CPAP had disturbed their sleep. They were asked to estimate the changes in their and the patients' sleep quality and daily functioning by making comparisons between the status in each intervention limb and the status before the study started. Changes were rated on a seven point scale with no change=0 and worsened or improved (mildly, moderately or greatly) scored in a negative or positive direction, respectively. At the end of the study partners were asked which treatment they would prefer the patient to use.

Objective sleep quality was monitored using the Compumedics P-series portable system (Compumedics Sleep Ltd, Abbotsford, Australia). This consists of a number of sensors and electrode channels in a patient interface box which fits into a cloth vest worn by the participant over their nightclothes. The patient interface box connects to a data acquisition recorder placed by the bedside which is run by a 15 hour rechargeable battery. The following signals were recorded: Cz-Pz and C3–C4 EEGs (125 Hz); right and left electro-oculographs (EOGs); bipolar submental electromyograph (EMG); "airflow" by a nasal-oral thermocouple; chest and abdominal excursions by inductance plethysmography; sound by tracheal microphone; right and left leg EMGs and oximetry by finger probe. Gold electrodes were used to record EEG, EOGs, and submental EMG. PSG monitoring was started at the couple's usual bed time and stopped at their usual wake time. This total recording time (TRT) was kept the same, as was the time of the week (week or weekend) on both limbs of the study. Couples were asked not to consume alcohol or caffeinated drinks for 6 hours before their usual

bed time. The morning after sleep monitoring partners had a test of reaction time (simple unprepared reaction time (SURT)[20]) using a laptop computer. The SURT measures reaction times to a visual signal presented at random times over 15 minutes. Partners had a practice run on the first study evening to minimise learning effects. Analyses of the reaction times used the median, reciprocal of the reaction times, and the 95th percentile of the reaction times. Partners were also asked to rate how refreshed they felt in the morning using a five point scale from completely unrefreshed to completely refreshed.

Sleep studies were anonymised and analysed by the researcher blind to the subject name and intervention limb. Sleep stages were scored using the Recthschaffen and Kales rules.[21] EEG arousals were defined as an increase in the EEG frequency to alpha or theta for at least 1.5 seconds with an accompanying rise in EMG, no matter how brief.[22] The quality of the recorded signals was assessed based on criteria used in the Sleep Heart Health Study (SHHS).[23]

STATISTICAL ANALYSIS

Statistical analyses were performed using the SPSS statistical software package, version 9 (SPSS Inc, Chicago, IL, USA). When data were normally distributed, between group comparisons were made using unpaired *t* tests. Data that were ordinal or were not normally distributed were compared using the Mann-Whitney test for between group comparisons and the Wilcoxon's test for within group comparisons. The χ^2 test was used to compare categorical and ordinal data and the sign test was used for proportions from a single sample. Correlations were calculated using the Pearson correlation coefficient. Comparisons on normal data from the crossover trial were made using the general linear model (GLM) repeated measures analysis of variance with treatment as a within subject factor and order as a between subject factor.[24] Treatment × order (differential carryover) effects were managed as recommended by making unpaired comparisons using first limb data only.[24]

Before starting this study a power calculation was made using arousal index data from our data on the effects of tone induced sleep fragmentation on normal subjects.[25] Tones were given every 2 minutes to produce arousals at a frequency mimicking that experienced by a typical patient with SAHS (35 events/h). We estimated that a clinically relevant change in daytime sleepiness in partners would occur if arousals induced by external stimuli such as noise were reduced by 5 arousals/h. With alpha = 0.05 and power = 90% (beta = 10%) we required 22 patients in the crossover study for an estimated effect size of interest of 5 arousals/h and standard deviation of within pair difference of 5.9 arousals/h.[26]

The study had the approval of the local ethics subcommittee. All patients and their partners gave written informed consent.

Results

Of the 71 couples sent baseline questionnaires, 49 patients and 46 partners completed them. Of the 59 couples eligible for the crossover trial, 23 couples started the study and 22 completed it. One patient (AHI=125 events/h, ESS=13) refused to continue with CPAP shortly after starting the crossover study and was excluded from the crossover analysis. The remainder declined the crossover study because of inconvenience or reluctance to be monitored overnight in the home. The mean (SD) age of the partners recruited to the crossover trial was 51 (10) years; three were men.

Baseline assessments

Comparison of baseline clinical characteristics of patients who filled in questionnaires with non-participants showed that the groups were similar; as were participants with non-participants in the crossover study (table 1). Couples in the crossover trial were similar to those only completing questionnaires in: who decided to seek medical attention; the main reason for seeking medical attention; disturbance from patient snoring/apnoeas/restlessness and sleep quality (in house and PSQI) (all p>0.2).

The PSQI found 14 of 41 partners (34%) had "good" sleep whereas eight of 46 (17%) had "good" or "excellent" sleep according to the in house questionnaire. Moderate or severe sleep disturbance from snoring, apnoeas, and restlessness was reported by 32 (69%), 25 (54%), and 26 (55%) partners, respectively. Comparison of the mean (SD) PSQI score for partners of patients with SAHS completing questionnaires with published normative values[14] found partner sleep quality worse than

Table 1 Comparisons of baseline patient characteristics between participants and non-participants in crossover trial and completing questionnaires

Patient baseline characteristics	*Crossover trial participants (n=23)*	*Non-participants in crossover (n= 48)*	*p* value*	*Questionnaire participants (n=51)*	*Non-participants in questionnaire (n=20)*	*p† value*
Mean (SD) age (years)	53 (11)	50 (10)	0.4	53 (11)	48 (8)	0.1
No of men	20	42	0.6	44	18	0.7
Mean (SD) BMI (kg/m^2)	31 (5)	32 (5)	0.9	32 (5)	32 (5)	1.0
Median (IQR) AHI/AH (events/h)	40 (25–65)	41 (28–57)	1.0	41 (28–60)	37 (28–69)	0.7
Mean (SD) ESS	13 (5)	13 (5)	0.7	12 (5)	15 (3)	0.1
Mean (SD) CPAP (cm H_2O)	10 (3)	9 (2)	0.3	9 (2)	9 (2)	0.4

BMI = body mass index; AHI = apnoea/hypopnoea index; ESS = Epworth Sleepiness Scale; CPAP = continuous positive airway pressure.
*p value for participants *v* non-participants in crossover trial.
†p value for participants *v* non-participants in questionnaire.

Table 2 Comparisons of partners' polysomnographic sleep quality, simple reaction time, and feeling refreshed in the morning after monitoring on each intervention limb in the crossover trial

Study night and morning results	CPAP limb (n=22)	Placebo limb (n=22)	p value
Mean (SD) total recording time (min)	489 (45)	489 (45)	1
Mean (SD) sleep latency (min)*	26.3 (13)	32.6 (15)	0.3
Mean (SD) SEI (%)**	78 (11)	77 (11)	0.8
Mean (SD) arousal index (events/h)	24 (11)	25 (12)	0.4
Mean (SD) time in stage 3+4 (min)	43 (24)	43 (26)	0.9
Mean (SD) time in stage REM (min)	83 (28)	90 (25)	0.9
Median (IQR) SURT response time (s)	0.33 (0.28–0.39)	0.36 (0.33–0.38)	0.4
Mean (SD) reciprocal SURT response time (1/s)	2.9 (0.5)	2.9 (0.4)	0.1†
Median (IQR) 95th percentile SURT response time (s)	0.47 (0.44–0.6)	0.50 (0.44–0.58)	0.5
Median (IQR) refreshed in morning††	3 (2.5–4)	3 (2–4)	0.4

SEI = sleep efficiency index; SURT = simple unprepared reaction time.
*Sleep latency data were compared during the first limb of the study only because of a treatment × order effect.
**SEI is calculated as total sleep time/total recording time.
†There was a weak trend favouring better (quicker) partner mean reciprocal reaction times on the CPAP limb.
††Maximally refreshed = 5, maximally unrefreshed = 1.

the normal population (partners 7.9 (3.6), "normal" subjects 2.7 (1.7), mean difference 5.2; 95% CI 3.9 to 6.5, p<0.001).

Baseline SF36 questionnaire results for all respondents were sex weighted and compared with normal values for the middle aged UK population.[16] This showed that partners (n=41) had poorer SF36 role emotional, energy/vitality, role physical, bodily pain, physical functioning (all; p≤0.002) and social functioning (p=0.02). Mean (SD) physical and mental component summary scores were also worse than UK "normal" subjects (physical: partners 40.5 (14.2), "normal" subjects 49.3 (10.2), mean difference 8.8, 95% CI 5.2 to 12.4, p<0.001; mental: partners 45.5 (11.3), "normal" subjects 49.2 (10.3), mean difference 3.7, 95% CI 0.1 to 7.3, p=0.02).

Twenty four of 49 patients gave snoring or concern about apnoeas as their main reason for seeking medical attention (25 of 49 = sleepiness/tiredness).

Crossover study assessments

The mean CPAP use for the month was 4.2 (2.3) hours per night and the mean use on the CPAP study night was 6.7 (2) hours. The median and interquartile range (IQR) number of nights/week couples shared a bed was unchanged (CPAP 7 (6–7); placebo 7 (5–7), p=0.4). The quality of the PSG studies was "outstanding" (n=41) or "excellent" (n=3).[23] No partner had a diagnosis of SAHS or periodic limb movement disorder.

There was no difference between CPAP and placebo on principal outcome measures (SEI: CPAP 78%, placebo 77%, mean difference 1%, 95% CI –2.8 to 3.8, p=0.8; arousal index: CPAP 24, placebo 25, mean difference –1 event/h, 95% CI –3.5 to 1.5, p=0.4) and other PSG measures of sleep quality on the study nights (table 2). GLM assumptions were verified for all analyses. There were no period (learning/acclimatisation) effects. Only sleep latency showed a significant treatment × order (differential carryover) effect (p=0.02) and unpaired comparisons were made on first limb data for this variable.[24] Measures of reaction times after monitoring did not differ between intervention limbs, apart from a weak trend to better partner mean reciprocal reaction time on the CPAP limb (table 2).

Mean CPAP use for the month was found to be a significant covariate in the GLM model of PSG partner SEI (p=0.01) and arousal index (p=0.01), but not for stage 3+4 or sleep latency. Re-analysis of the GLM model with mean CPAP use for the month as a covariable showed that partners had a higher SEI (p=0.03) and a trend to a lower arousal index (p=0.06) on the CPAP limb. There was a positive correlation between reported change (in house; pre-study to CPAP) in partner sleep quality and CPAP use (r=0.5, p=0.01). Patients and partners were similar in their assessment of the partners' change in subjective sleep quality (r=0.6, p<0.001).

Partners' subjective sleep quality was better on the CPAP limb as assessed by the in house questionnaire and there was a trend to better sleep quality on PSQI (table 3). Partners reported less total disturbance to sleep on the CPAP limb (table 3), but 17 partners reported disturbance from CPAP and in six this was moderate or severe. The main cause of disturbance from CPAP was noise from the machine (n=10) or cold air (n=3), and four did not give a cause.

Table 3 Comparisons of partner questionnaire responses in each intervention month of the crossover trial

Partner questionnaire responses	CPAP limb	Placebo limb	p value
Median (IQR) subjective sleep quality score for month	1 (1–2)	1 (0.75–2)	0.05
Median (IQR) PSQI score*	6 (4–10.5)	7 (4.5–11)	0.08
Median (IQR) total sleep disturbance score for month	2 (1.5–5)	5 (3–6)	0.03
Mean (SD) ESS	6.5 (4.5)	5.9 (4.3)	0.3
Median (IQR) FOSQ	14.5 (12.9)	14.7 (15.9)	0.7
Mean (SD) SF36 physical summary score	44.0 (15)	43.5 (13)	0.7
Mean (SD) SF36 mental summary score	46.8 (9)	48.2 (9)	0.4
Median (IQR) Enrich score	45 (39–56)	51 (31–58)	0.6
Median (IQR) partner's reported change in patient's sleep quality	2 (1–3)	0 (0–1)	0.007
Median (IQR) partner's reported change in patient's daily functioning	1 (0–3)	0 (0–1)	0.03

PSQI = Pittsburgh Sleep Quality Inventory; ESS = Epworth Sleepiness Scale; FOSQ = Functional Outcomes of Sleep Quality; SF36 = Short Form 36 questionnaire; Enrich = Enrich marital satisfaction questionnaire.
*PSQI: higher scores = worse sleep quality.

Partner daytime subjective sleepiness, self-reported health status, and marital satisfaction did not differ between limbs (table 3). Partners reported greater improvements in the patients' sleep quality and daily functioning on CPAP than on placebo (table 3). Eighteen partners said that they preferred the patient to be treated with CPAP and four said that they would prefer the (placebo) "capsule" was used (p=0.01).

The follow up SF36 and Enrich questionnaires at 6–9 months in patients on CPAP (n=18) was not different to placebo (mean (SD) 6 month SF36 physical component score 42 (15), p=0.6; 6 month mental component score 47.6 (10), p=0.8; median (IQR) 6 month Enrich score 49 (35–57), p=0.8).

Discussion

This study found that partners of patients with SAHS reported very poor subjective sleep quality and had poor self-reported health status compared with matched middle aged UK population. CPAP treatment for SAHS improved partners' subjective sleep quality and sleep disturbance, but there was no evidence of improved objective sleep quality or benefit on validated measures of self-reported health status or marital satisfaction. The study also shows that partners perceived benefits in patients' sleep quality and daily function with CPAP treatment.

A major finding of this study is that partners of patients with SAHS have poor self-reported health status and poor sleep quality. An early study by Cartwright and colleagues[7] used a control group of divorced spouses (n=7) and compared them with married couples (n=10) from the same pool of SAHS patients and found that the married partners appeared to show poor adjustment in the marital and social/leisure area. These findings were based on a small sample size and no statistical analysis was done. Shapiro and colleagues,[11] using an Illness Intrusiveness rating scale, found that SAHS interferes with couples' quality of life domains with similar intrusiveness to that seen in end stage renal disease. Ulfberg and colleagues[9] examined questionnaire responses from a random sample of 728 of 1032 women in Sweden and found that loud snoring was associated with partner symptoms of insomnia, sleepiness, morning tiredness, and headache. The current study extends these findings by using well validated questionnaires to estimate the extent of impairment in sleep quality and self-reported health status in partners of patients with laboratory diagnosed SAHS.

Considering the high baseline levels of sleep disturbance and poor sleep quality reported by partners, we were surprised to find no improvement in their objective sleep quality when patients received CPAP treatment. Baseline comparisons (table 1, in house questionnaires) do not suggest a selection bias affecting those participating in the crossover study. There were restrictions on alcohol/caffeinated drinks on PSG study nights and this may have meant that SAHS symptoms were milder on study nights than on other nights.[27] A recent study by Beninati and colleagues[6] measured objective quality in 10 partners in the laboratory while sharing a bed with the patient. The patient was treated with CPAP in the second half of the night. These authors found that partners had increased sleep efficiency and fewer arousals during CPAP treatment. Although that study shows that partners may have improved objective sleep quality with CPAP, the numbers were small and it is unclear if unselected couples were recruited. Further, there is no allowance for acclimation from the first to the second half of the night and no placebo control.

The study may have been inadequately powered to detect benefit. We used a crossover design to increase the power of the study and our calculations indicated that there was adequate power to detect a clinically significant reduction in arousal rate from CPAP compared with placebo. However, we did not detect even non-significant trends to improvement in the primary end points (SEI p=0.8, arousal index p=0.4), which suggests that a very much larger sample would have been needed to find any difference that may exist. There were significant improvements in subjective sleep quality over the month; it may be that significant disturbance to the partners' sleep from the patients' SAHS is irregular (but well remembered). Furthermore, PSG recordings were technically very good and studies were conducted in the home environment. There were no period effects, indicating little alteration of the partners' sleep architecture from first night effects. Others have also found minimal evidence of first night effects in studies on normal subjects using home monitoring.[28 29] The PSG assessment of sleep quality was consistent with assessments of partner feeling refreshed and tests of reaction time on the morning after monitoring (table 2).

Previous studies[8 10] found improvements in partner subjective sleep quality, quality of life, alertness, mood, and marital relationships in one.[10] None of these studies incorporated a control group (to allow for placebo effects) or validated questionnaires, and in the study by Kiely and McNicholas[8] there may be recall and selection bias. The current study confirms improved partner subjective sleep quality when patients receive CPAP treatment in a randomised controlled trial.

Standard questionnaires such as the SF36 may not be sensitive to some of the benefits experienced by partners, especially as partners were aware that CPAP had improved the patients' sleep quality and daily function. The Enrich questionnaire may not be able to measure rapid changes in marital attitudes. The SF36 and PSQI questionnaires examine the previous month (the length of the study limbs) and the SF36 has shown CPAP treatment effects among patients in another crossover study with 1 month limbs.[30] Changes to partners' self-reported health status and marital satisfaction from CPAP treatment may take longer to occur than the 1 month of the crossover study. However, our long term follow up questionnaires did not find later improvement

in these measures. Finally, sleep disturbance from SAHS symptoms reported by partners might not be the cause of the impairment in their sleep quality or reported health status.

The patients' main reason for seeking attention was frequently for symptoms that affect the partner rather than the patient. It is therefore likely that partners would influence patient CPAP use, as suggested by a recent study[20] which found that CPAP use was lower among patients whose partners ask them to seek treatment. The current study adds to this finding by showing a positive association between partner reported changes in their sleep quality with CPAP and patients' CPAP use. Although CPAP was not associated with improved objective sleep quality in the group of partners as whole, when CPAP use was included as a covariable there was heterogeneity of benefit from its use. Although causation has not been shown, this suggests that partners gain benefit when CPAP use is good, and this could be due to positive reinforcement from the partners. It may also indicate that, when partners do not benefit, this may influence patients to decrease their use of CPAP.

Partners of patients with SAHS represent a large number of the middle aged population (80% of our clinic population have partners) who have very poor sleep quality (apparently due to patients' nocturnal SAHS symptoms) and poor self-reported health status. Although CPAP treatment is beneficial for most patients with SAHS, the benefit to their partners is less clear. We have not found that CPAP improves the objective sleep quality of partners, but there were improvements in subjective sleep quality and reported sleep disturbance. Some partners report moderate to severe sleep disturbance from CPAP machines, emphasising the need for machines that are quieter and less obtrusive. The use of CPAP by patients with SAHS is positively associated with their partners' sleep quality. Further work is needed to determine whether involving partners more closely in CPAP education can improve its use.

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