

## ACCEPTANCE OF NCPAP IN A SAMPLE OF PATIENTS ADMITTED FOR GERIATRIC REHABILITATION

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### Abstract

**Objective:** Sleep apnea syndrome (SAS) is common in older people. Nasal continuous airway pressure (NCPAP) therapy is the treatment of choice for sleep apnea, but is not always accepted by patients. The rate of successful initiation of NCPAP is unknown in geriatric patients.

**Methods:** All patients admitted for geriatric rehabilitation were considered for sleep studies. Sleep apnea was assessed using an Edentrace (Nellcor, Hayward, CA) multi-channel recording system. SAS was defined as an apnea-hypopnea-index (AHI) of more than five events per hour plus excessive daytime sleepiness, or an AHI of more than fifteen events per hour regardless of reported sleepiness. Disability was assessed using the Barthel Index of Activities of Daily Living.

**Results:** Two hundred sixty nine of 322 consecutive patients (84%) had adequate sleep studies and gave informed consent. SAS was found in 169 subjects (68%). There was no gender difference in the prevalence of SAS. Six subjects (4%) accepted NCPAP therapy. Individuals who accepted NCPAP were younger and less disabled ( $p < 0.03$ ). Multiple logistic regression analysis revealed disability as the only significant factor predicting NCPAP acceptance.

**Conclusion:** NCPAP should not be withheld in the elderly. However, initiation of treatment for SAS remains to be a great challenge in those patients. Geriatric assessment procedures may help better manage older subjects with sleep apnea syndrome.

**Key words:** sleep apnea syndrome, elderly, acceptance of NCPAP, geriatric rehabilitation

### INTRODUCTION

Estimates of prevalence of obstructive sleep apnea (OSA) in the elderly range from twenty to more than sixty percent depending on chosen cut-off values and inclusion criteria of individual studies [1, 2, 3, 4]. Sleep apnea is an established risk factor for cardiovascular disease [5, 6], cognitive impairment [7], depression [8], and disability [9, 10]. OSA also impairs quality of life [11]. Nasal continuous positive airway pressure breathing (NCPAP) has become standard therapy for obstructive sleep apnea [12, 13]. Most evidence supporting the use of NCPAP derives from studies of middle-

aged adults [14, 15]. Studies conducted in the elderly demonstrate that older patients also accept this therapy [16, 17]. NCPAP therapy has been shown to increase alertness, improve cognitive functioning, and decrease sleep disruption from nocturia [17]. Once initiated, NCPAP is well tolerated by older adults, including those with mild to moderate Alzheimer's disease [18].

However, most studies investigating treatment with NCPAP in the elderly were small and included carefully selected subjects [17]. Furthermore, successful initiation of NCPAP therapy was a prerequisite for investigating NCPAP compliance [16]. The rate of acceptance of NCPAP therapy in unselected older subjects with the sleep apnea syndrome (SAS) is unknown. Therefore, in the present study we investigated the prevalence of SAS and the rate of successful initiation of NCPAP therapy in a consecutive sample of older patients referred for geriatric rehabilitation.

### MATERIAL AND METHODS

Consecutive patients admitted for geriatric rehabilitation were eligible for the study if they were medically stable, had no dementia and gave informed consent. The study protocol and informed-consent documents were approved by the institutional review board.

Data on gender, age, co morbidities, and geriatric assessment were used. Arterial hypertension, congestive heart failure, history of stroke, diabetes mellitus, atrial fibrillation, and chronic obstructive pulmonary disease was recorded as co-morbid conditions. Geriatric assessment included evaluation of the activities of daily living (ADLs) using the Barthel-Index [19]. The Barthel Index assesses independence in activities of daily living (ADLs) and is commonly used in research relating to older subjects. It includes 10 domains of functioning in ADLs and is scored from 0 (dependent) to 100 (independent).

Patients were investigated for sleep apnea using an Edentrace (Nellcor, Hayward, CA) multi-channel recorder. The device measures oro-nasal airflow, oxygen saturation, snoring, body position, breathing effort, and heart rate. The Edentrace device has been validated against polysomnography [20, 21]. Recordings between 22:00 and 6:00 were defined as nocturnal readings. It was assumed that most patients would

have been asleep during this time. Recordings with a registration time of at least six hours were accepted. Further evaluation in a sleep laboratory was offered to individuals with suspected sleep apnea. The apnea hypopnea index (AHI) was calculated as the total number of apneas divided by registration time. Daytime sleepiness was assessed using a self-administered questionnaire. The statement 'I feel excessively sleepy during the day' was rated on a five point Likert scale with scores ranging from 'never' to 'almost always'. The responses 'often' and 'almost always' were classified as excessive daytime sleepiness (EDS). Sleep apnea syndrome was diagnosed if the AHI exceeded more than five respiratory events per hour and if the individuals reported EDS. Subjects with an AHI of more than fifteen events per hour were diagnosed as having sleep apnoea regardless of the presence or absence of symptoms [13]. Nasal continuous positive airway pressure (NCPAP) treatment was offered to all subjects with sleep apnea syndrome. We recorded the number of patients with sleep apnea syndrome, the rate of initial acceptance of NCPAP. Furthermore, we compared characteristics of subjects with NCPAP acceptance to subjects with refusal of NCPAP.

Results are given as percentages for discrete data and as means  $\pm$ SD for continuous data. Statistical analysis is by chi square test for categorical data, and t-tests and Mann Whitney U-test for approximately normally distributed data respectively. For simultaneous evaluation of more than two variables multiple logistic regression analysis with forward stepwise inclusion was used. The alpha-level of significance was set at 0.05 (two-tailed). Analyses were performed using SPSS

version 12.0 statistical software (SPSS Inc., Chicago, IL, USA).

## RESULTS

Three hundred twenty two patients were eligible for the study. Two hundred forty-nine (77%) patients gave informed consent, had sufficient respiratory readings, and responded to the questionnaire. The mean age of participants was  $76 \pm 9$  years, 93 (37%) were male and 156 (63%) were female. Female participants were older than male participants (mean age  $74 \pm 10$  and  $78 \pm 8$  years respectively,  $p < 0.01$ ).

Reasons of referral for geriatric rehabilitation were recent stroke ( $n=121$ , 49%), hip fracture ( $n=96$ , 38%), heart failure ( $n=20$ , 8%), and Parkinson's disease ( $n=12$ , 5%). The mean AHI was  $20 \pm 16$  per hour for the whole sample. Male subjects had a significantly higher AHI ( $26 \pm 17$  per hour) than females ( $17 \pm 15$  per hour,  $p < 0.01$ ). SAS according to the above mentioned definition was found in 71/93 (76%) male patients and in 101/156 (65%) female patients ( $p < 0.06$ ).

The Barthel Index (BI) as a measure of the activities of daily living (ADLs) was  $57 \pm 22$  at admission and  $73 \pm 25$  at discharge. There was no gender difference in BI. Subjects with SAS had a significantly lower BI at admission and at discharge compared to subjects without SAS ( $p < 0.09$ ), and stayed significantly longer in hospital ( $34 \pm 20$  days) than individuals without SAS ( $26 \pm 16$  days) ( $p < 0.001$ ).

Table 1 shows the co-morbid conditions of the whole sample. The sample is divided into two subgroups according to the prevalence of sleep apnea

Table 1. Distribution of co-morbid conditions according to prevalence of OSAS.

Co-morbidities	No SAS 80 (32%) n/%	SAS 169 (68%) n/%	P-value
Hypertension	60/75	123/73	n. s.
Congestive heart failure	8/10	29/17	<0.03
Diabetes mellitus	33/41	63/37	n. s.
Atrial fibrillation	19/24	38/22	n. s.
Obstructive pulmonary disease	9/11	19/11	n. s.
History of stroke	42/53	85/50	n. s.
History of myocardial infarction	11/14	32/20	n. s.
History of cancer	4/5	11/7	n. s.

Table 2. Relationship between age and Barthel Index at admission and at discharge, and rate of acceptance of NCPAP therapy. There was no significant difference in the severity of sleep apnea between the groups.

	Acceptance n/% 6/4	Initial Trial n/% 27/16	Primary Refusal n/% 136/80	P-value
Age (yr)	$66 \pm 11$	$73 \pm 8$	$77 \pm 9$	<0.008
BI at admission	$80 \pm 16$	$50 \pm 20$	$59 \pm 21$	<0.002
BI at discharge	$89 \pm 13$	$71 \pm 22$	$76 \pm 22$	<0.03
AHI (n/h)	$30 \pm 16$	$32 \pm 16$	$34 \pm 17$	n. s.

syndrome. The composition of the sample is characteristic of subjects admitted for geriatric rehabilitation with a high prevalence of stroke-survivors and patients with hip fracture.

Of the 169 subjects with SAS, 33 (20%) agreed to an initial trial with NCPAP. In 6 patients (4%) this trial was successful and subjects accepted NCPAP therapy. The subjects with acceptance of NCPAP were significantly younger and less disabled than subjects with refusal of NCPAP therapy. Data are shown in Table 2.

Logistic regression analysis with acceptance of NCPAP as the dependent variable and age, BI at admission and at discharge, length of hospital stay, gender, and comorbidities as independent variables revealed that only BI at admission had a significant impact on successful initiation of NCPAP therapy ( $p < 0.03$ ). Inconvenience with the mask ( $n=40$ , 25%), and acceptance of EDS as an age-related condition ( $n=123$ , 75%) were reported as the main reasons for non-acceptance of NCPAP.

## DISCUSSION

This study shows that a substantial number of patients admitted for geriatric rehabilitation had sleep apnea syndrome. Using well established diagnostic criteria [13], we showed that 68% of patients were affected. Furthermore, there was no significant difference in the prevalence between men and women. These findings confirm the results of other studies showing a high prevalence of sleep apnea in community dwelling elderly [1], nursing home inhabitants [3, 21], elderly stroke survivors [22], and geriatric patients [4]. Taking into account the impact SAS has on several outcomes [24, 25, 26, 27], screening for sleep apnea should become a standard procedure in geriatric medicine.

The goal of treatment for SAS is to improve quality of life and to decrease morbidity and mortality. This goal does not differ from that in middle aged adults. Therefore a therapeutic trial is warranted in all symptomatic older patients with sleep apnea. The treatment of choice for sleep apnea is nasal continuous positive airway pressure (NCPAP) [13]. This treatment has shown to be effective in both elderly subjects [16] and patients with mild to moderate dementia [18]. However, most studies conducted in the elderly had small sample sizes, a retrospective design, and included carefully selected patients [17]. The rates of initial NCPAP acceptance were not reported usually and remain unknown in older subjects [17].

Our investigation reveals that acceptance of NCPAP is low in geriatric patients. Only 4% the individuals in need for treatment accepted this therapy. Logistic regression analysis showed that the ability to perform activities of daily living measured by the Barthel Index was the only factor associated significantly with acceptance of NCPAP. This finding is in concordance with other studies conducted in older subjects [17].

Forty patients did not accept NCPAP because of the inconvenience it caused. Adapting devices to the demands of elderly subjects may increase the rate of acceptance of NCPAP. Furthermore, in a small study of twelve patients a structured education program designed to meet the special needs of elderly subjects

caused a substantial increase in NCPAP use [28]. Such an intervention should be repeated in a larger sample of older subjects.

In conclusion, more research is needed in disabled and cognitively impaired older patients to further clarify the impact of SAS on morbidity and mortality. NCPAP should not be withheld in the elderly. However, treatment for SAS in older subjects remains a great challenge considering the increasing longevity in western populations, the high prevalence of SAS in the elderly, and the low rate of acceptance of NCPAP. The implementation of geriatric assessment procedures may be helpful to manage sleep apnea in these individuals. Geriatric assessment is expected to support case finding and treatment efficiency. These issues should be addressed in future research.

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