# Clinical characteristics and positive airway pressure adherence among elderly European sleep apnoea patients from the ESADA cohort

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**Elderly patients with sleep apnoea seem to adhere to positive airway pressure (PAP) therapy equally well as younger patients. Self-reported daytime sleepiness or insomnia symptoms do not seem to impact PAP adherence but low global functioning predicts poor PAP therapy adherence.** https://bit.ly/3GcXuk5

**Cite this article as:** Lammintausta A, Anttalainen U, Basoglu ÖK, *et al*. Clinical characteristics and positive airway pressure adherence among elderly European sleep apnoea patients from the ESADA cohort. *ERJ Open Res* 2023; 9: 00506-2022 [DOI: 10.1183/23120541.00506-2022].



Received: 28 Sept 2022
Accepted: 18 Dec 2022

## Abstract

*Background* The prevalence of obstructive sleep apnoea (OSA) is growing as the population is ageing. However, data on the clinical characteristics of elderly patients with OSA and their adherence to positive airway pressure (PAP) treatment are scarce.

*Methods* Data from 23 418 30–79-year-old OSA patients prospectively collected into the ESADA database during 2007–2019 were analysed. Information on PAP use ($h \cdot day^{-1}$) in association with a first follow-up visit was available for 6547 patients. The data was analysed according to 10-year age groups.

*Results* The oldest age group was less obese, less sleepy and had a lower apnoea–hypopnoea index (AHI) compared with middle-aged patients. The insomnia phenotype of OSA was more prevalent in the oldest age group than in the middle-aged group (36%, 95% CI 34–38 *versus* 26%, 95% CI 24–27, p<0.001). The 70–79-year-old group adhered to PAP therapy equally well as the younger age groups with a mean PAP use of 5.59 $h \cdot day^{-1}$ (95% CI 5.44–5.75). PAP adherence did not differ between clinical phenotypes based on subjective daytime sleepiness and sleep complaints suggestive of insomnia in the oldest age group. A higher score on the Clinical Global Impression Severity (CGI-S) scale predicted poorer PAP adherence.

*Conclusion* The elderly patient group was less obese, less sleepy, had more insomnia symptoms and less severe OSA, but were rated to be more ill compared with the middle-aged patients. Elderly patients with OSA adhered to PAP therapy equally well as middle-aged patients. Low global functioning (measured by CGI-S) in the elderly patient predicted poorer PAP adherence.

## Introduction

The population of the world is ageing. Driven by falling fertility rates and remarkable increases in life expectancy, population ageing is likely to accelerate. The proportion of people aged ⩾65 years is estimated to grow by 188% from 2010 to 2050 and the proportion of the oldest old by even more [1]. Therefore, the

establishment of a physical and social infrastructure that might foster better health and wellbeing in older age is needed.

Obstructive sleep apnoea (OSA) is a condition characterised by repeated episodes of partial or complete upper airway obstruction during sleep [2] leading to arousals, sympathetic activation and oxygen desaturation [3]. Repeated episodes of upper airway obstruction may lead to sleep fragmentation and nonrestorative sleep. OSA-related symptoms such as excessive daytime sleepiness (EDS), insomnia or morning headaches impair quality of life and may be critical for elderly people's ability to function.

Increasing age has been associated with increased prevalence of OSA [3, 4], although opposite results also exist [5]. Age-related changes in sleep architecture include decreased total sleep time and sleep efficiency accompanied by increased wake after sleep onset and sleep onset latency [6]. According to The Sleep in America Poll 2003, 46% and 50% of community-dwelling adults aged 65–74 and 75–84 years reported insomnia symptoms, respectively [7]. OSA has been associated with an increased risk of type 2 diabetes [8], hypertension [9], stroke [10], cardiovascular mortality [11], cognitive impairment [12] and depression [13]. Furthermore, severe OSA has been associated with an increased risk of fall [14]. Continuous positive airway pressure (CPAP) therapy may improve quality of life [15] and sleep-related symptoms [15], alleviate depressive symptoms [16], delay cognitive decline [17] and reduce the risk of Alzheimer's disease [18]. Therefore, there are both health-related and social and economic incentives to actively treat elderly patients with OSA. However, the data of CPAP adherence in the elderly patients are conflicting [19–21].

Neither the cut-off for the apnoea–hypopnoea index (AHI) nor the clinical characteristics of the elderly patients with OSA who could benefit from positive airway pressure (PAP) treatment are known. Therefore, we aimed to evaluate: 1) the characteristics of elderly patients with OSA compared with younger patients in the large ESADA database, and 2) whether a specific clinical OSA phenotype, gender or a single marker could predict PAP adherence among elderly patients.

## Methods

### *Patients*

Baseline and follow-up data were prospectively collected into the ESADA database during 2007–2019 by a total of 26 sleep laboratories in 17 European countries and Israel. The ESADA database is a European real-life prospective follow-up cohort of patients with OSA. Data from a total of 23 418 patients aged 30–79 years with an AHI of $\geqslant 5 \cdot h^{-1}$ were included in the analysis. Information on PAP use ($h \cdot day^{-1}$) at the first follow-up visit was available for 6547 patients. The methods applied in the ESADA study have been described in detail previously [22].

### *Data collection and sleep studies*

Each study centre adhered to the ESADA protocol and applied its own standard operating procedures. Patients aged 18–80 years with a history of symptoms suggestive of OSA were recruited onto the study. Exclusion criteria included patients with ongoing OSA treatment, a limited life expectancy due to illness unrelated to OSA, or documented alcohol or drug abuse up to 1 year prior to inclusion in the study. Each eligible patient was evaluated at baseline and, if applicable, at clinically relevant follow-up visits according to the routines applied at each centre.

Data were recorded using a structured web-based reporting system. Coded data were transferred and stored in a central database located at the University of Gothenburg, Sweden. A central study monitor provided a training session at each centre to ensure uniform data entry procedures and data quality. The study monitor had access to the database in order to monitor data quality and completeness.

The ESADA database accepted full polysomnography (PSG) or cardio-respiratory polygraphy (PG). PSG devices had a minimum of seven, and PG devices a minimum of four channels (level 3 devices according to the American Sleep Disorders Association) [23]. All sleep data were manually scored according to the rules of the American Academy of Sleep Medicine [24]. In PG recordings, respiratory effort-related arousals were not scored. AHI was defined as the number of apnoeas and hypopneas per hour of actual sleep time in PSG studies or per hour between lights off and lights on in PG studies. PAP use was defined as the average use ($h \cdot day^{-1}$ during the follow-up period) measured by the in-built clock counter of the device and read from the device at the follow-up visit.

Subjective daytime sleepiness was assessed by the Epworth Sleepiness Scale (ESS) [25]. Subjective sleep length was reported in hours to one decimal accuracy and subjective sleep latency in minutes with 1-minute accuracy. The Clinical Global Impression Severity (CGI-S) scale was used to reflect the

clinician's assessment of the disease impact on patient's global functioning [26]. The CGI-S used in the current study used a 7-point scale ranging from 1 being "normal, not at all ill" to 7 being "among the most extremely ill patients" [26]. Physicians were allowed to use all available clinical information to rate the overall condition of an OSA patient.

For the current analyses we divided patients into four categories based on subjective daytime sleepiness and nocturnal sleep complaints suggestive of insomnia [27]. The categories were: 1) EDS without sleep complaints other than OSA, 2) non-EDS, non-insomnia without sleep complaints other than OSA, 3) EDS-insomnia, and 4) and insomnia phenotype. EDS was defined as ESS>10. Criteria for insomnia-like symptom burden in phenotypes "EDS-insomnia" and "insomnia" were fulfilled if a patient had a physician-diagnosed insomnia, subjective sleep latency of ⩾30 min, self-reported sleep duration ⩽6 h and/or use of hypnotics defined within the Anatomical Therapeutic Chemical Classification (ATC) code N05. Therefore, patients labelled as having insomnia in this study may not fulfil the ICD (International Classification of Diseases) or DSM (Diagnostic and Statistical Manual of Mental Disorders) criteria.

### *Ethical considerations*

The study was reviewed and approved by a local ethics committee at each participating centre. All patients gave their written, informed consent. Patient data were coded and de-linked before entry into the central database.

### *Statistics*

The data were analysed as an entire file and as a split file according to 10-year age groups. The basic characteristics were also analysed separately in PSG or PG groups. Data are presented as means and 95% CIs. Comparisons among groups were performed using independent-samples t-tests and ANOVA, or the Kruskal–Wallis test as appropriate for continuous variables. The Chi-square test was used for categorical variables. The impact of age, gender, body mass index (BMI), AHI, ESS score and CGI-S score on PAP usage was analysed using linear regression. For this purpose, gender was coded as a dummy variable with female-sex coded as the reference 0 and males as 1. The p-value <0.05 was considered statistically significant. The statistical analyses were performed using IBM SPSS Statistics 27.0 (IBM Corp., Armonk, NY, USA).

## Results

The data comprised 2473 (10.6%) 30–39-year-old patients with an AHI of ⩾5 events·h$^{-1}$, 5169 (22.1%) patients aged 40–49 years, 7426 (31.7%) patients aged 50–59 years, 5943 (25.4%) patients aged 60–69 years and 2407 (10.3%) patients aged 70–79 years. The proportion of females was 27.1% (n=6351) in the total cohort and 34.5% (n=830) among the 70–79-year-olds. Of the patients, 53% were studied by PSG and 47% by PG. The median for the timing of the follow-up visit was 5 months after baseline (IQR 2–12).

Compared with the age group of 40–49-year-old patients, the 70–79-year-olds had a lower mean BMI (31.1 *versus* 33.2 kg·m$^{-2}$, p<0.01), lower ESS score (8.7 *versus* 10.4, p<0.01), higher CGI-S (2.8 *versus* 2.4, p<0.01) and slightly lower AHI (34.4 *versus* 36.5 events·h$^{-1}$, p<0.01). The mean nightly oxygen saturation ($S_{pO_2}$) level was slightly lower among the 70–79-year-olds (91.9%) than among the 40–49-year-olds (92.7%); and the 70–79-year-old age group also have the lowest $S_{pO_2}$ (table 1). Baseline

**TABLE 1** Body mass index (BMI), Epworth Sleepiness Scale (ESS) score, apnoea–hypopnoea index (AHI), mean and lowest nightly oxygen saturation levels and 4% oxygen desaturation index (ODI4) ODI4 in patients according to the 10-year age groups at baseline

| Age group | 30–39 years (n=2473) | 40–49 years (n=5169) | 50–59 years (n=7426) | 60–69 years (n=5943) | 70–79 years (n=2407) | p-value |
|---|---|---|---|---|---|---|
| **BMI kg·m$^{-2}$** | 32.74 (32.45–33.03) | 33.23 (33.04–33.43) | 32.43 (32.28–32.58) | 32.03 (31.87–32.19) | 31.11 (30.87–31.35) | <0.001 |
| **ESS score** | 10.29 (10.08–10.50) | 10.40 (10.25–10.54) | 9.97 (9.85–10.09) | 9.25 (9.11–9.38) | 8.70 (8.50–8.90) | <0.001 |
| **AHI events·h$^{-1}$** | 35.24 (34.08–36.39) | 36.49 (35.75–37.24) | 35.01 (34.45–35.56) | 34.56 (33.98–35.14) | 34.43 (33.57–35.29) | <0.001 |
| **Mean $S_{pO_2}$ %** | 93.15 (93.00–93.30) | 92.72 (92.62–92.82) | 92.45 (92.37–92.53) | 92.15 (92.07–92.24) | 91.85 (91.71–91.98) | <0.001 |
| **Lowest $S_{pO_2}$ %** | 79.80 (79.38–80.23) | 78.61 (78.31–78.91) | 78.24 (78.00–78.47) | 77.65 (77.40–77.90) | 77.65 (77.28–78.03) | <0.001 |
| **ODI4 events·h$^{-1}$** | 31.41 (30.19–32.62) | 33.04 (32.23–33.85) | 31.87 (31.25–32.48) | 31.59 (30.96–32.23) | 32.06 (31.10–33.01) | 0.037 |
| **CGI-S** | 2.19 (2.13–2.26) | 2.43 (2.38–2.48) | 2.56 (2.52–2.60) | 2.72 (2.68–2.77) | 2.84 (2.77–2.92) | <0.001 |

Data are presented as mean (95% CI) unless otherwise stated. $S_{pO_2}$: oxygen saturation measured by pulse oximetry; CGI-S: Clinical Global Impression Severity scale.

**TABLE 2** Epworth Sleepiness Scale (ESS) score and Clinical Global Impression Severity scale (CGI-S) score results of 30–79-year-old patients on positive airway pressure (PAP) therapy at baseline and at first follow-up visit according to the 10-year age groups

| Patients on PAP therapy | 30–39 years (n=571) | 40–49 years (n=1396) | 50–59 years (n=2127) | 60–69 years (n=1766) | 70–79 years (n=687) | p-value for differences across age groups |
|---|---|---|---|---|---|---|
| ESS score at baseline | 11.28 (10.84–11.72) (n=567) | 11.24 (10.96–11.52) (n=1377) | 10.51 (10.29–10.73) (n=2091) | 9.96 (9.72–10.20) (n=1745) | 9.57 (9.19–9.96) (n=675) | <0.001 |
| ESS score at 1st follow-up visit | 6.89 (6.41–7.36) (n=453) | 6.99 (6.69–7.29) (n=1147) | 6.49 (6.27–6.72) (n=1696) | 6.38 (6.14–6.62) (n=1370) | 7.23 (6.83–7.62) (n=536) | <0.001 |
| p-value for differences within age group | p<0.001 | p=<0.001 | p<0.001 | p<0.001 | p<0.001 | |
| CGI-S at baseline | 2.47 (2.35–2.60) (n=511) | 2.64 (2.56–2.72) (n=1237) | 2.73 (2.65–2.79) (n=1800) | 2.82 (2.75–2.89) (n=1481) | 2.91 (2.80–3.02) (n=563) | <0.001 |
| CGI-S at 1st follow-up visit | 2.14 (2.02–2.26) (n=346) | 2.25 (2.17–2.33) (n=804) | 2.32 (2.25–2.38) (n=1167) | 2.42 (2.35–2.49) (n=939) | 2.58 (2.47–2.69) (n=377) | <0.001 |
| p-value for differences within age group | <0.001 | <0.001 | <0.001 | <0.001 | 0.013 | |

Data are presented as mean (95% CI).

values are reported separately in PSG and PG (see Table S1 in the Supplementary data). As expected, PG was associated with lower AHI in all age groups. However, CGI-S was higher among the PG group compared with the PSG group.

At baseline, the ESS scores were lower among the 70–79-year-olds than among the 40–49-year-olds (9.57, 95% CI 9.19–9.96 *versus* 11.24, 95% CI 10.96–11.52, respectively, p<0.001). ESS results did not differ at the first follow-up visit between the 40–49-year-old and the 70–79-year-old age groups (6.9, 95% CI 6.6–7.2 and 7.2, 95% CI 6.8–7.6), but the ESS score decreased proportionally more in the 40–49-year-olds than in the 70–79-year-olds following PAP therapy. CGI-S improved in all age groups during PAP treatment (table 2).

The oldest age group had a longer PAP usage time than the 40–49-year-old group (mean PAP use 5.59 h·day$^{-1}$, 95% CI 5.44–5.75 *versus* 5.30 h·day$^{-1}$, 95% CI 5.19–5.41, p=0.005) (figure 1).

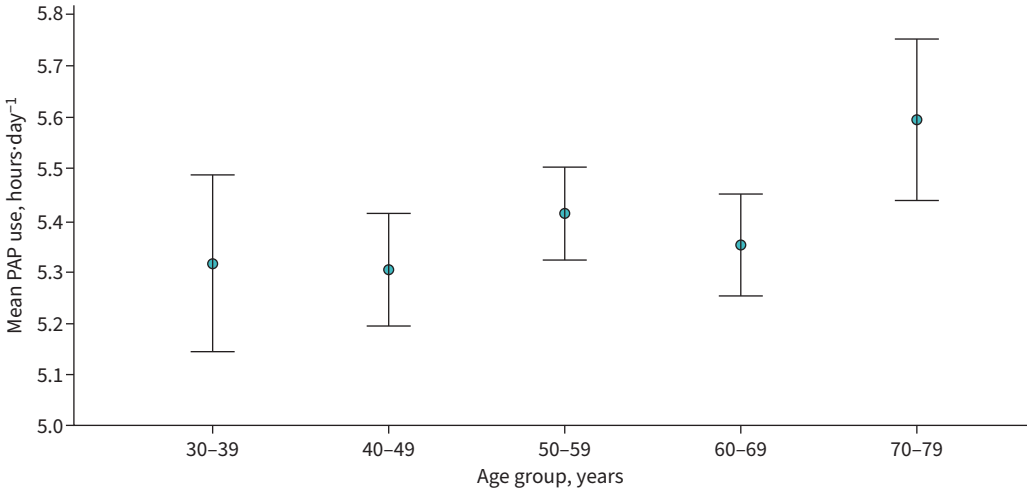


**FIGURE 1** Mean positive airway pressure (PAP) use at the first follow-up visit according to the 10-year age groups. Error bars represent 95% confidence intervals. p=0.035 for the differences across all groups.

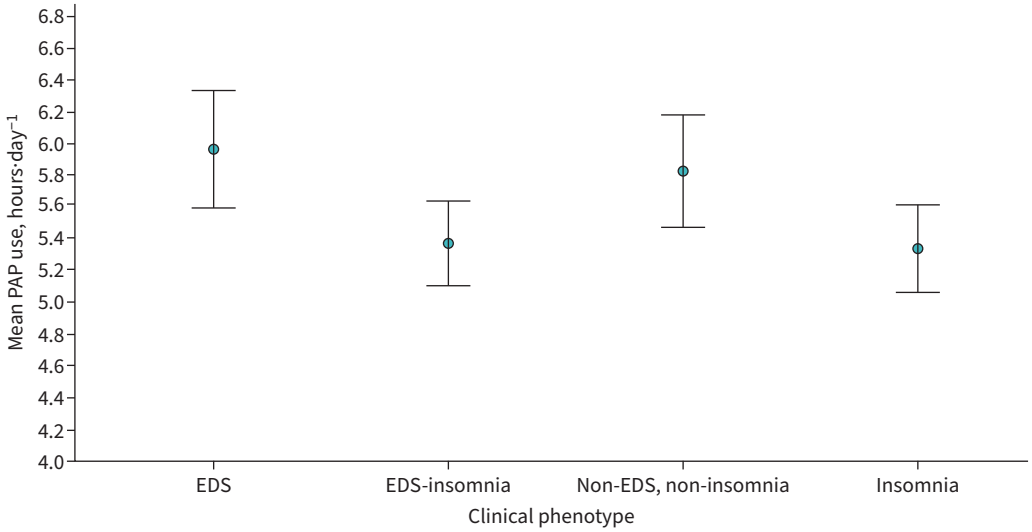


FIGURE 2 Mean positive airway pressure (PAP) use according to the clinical phenotype at the first follow-up visit in 70–79-year-old patients with obstructive sleep apnoea. Error bars represent 95% confidence intervals. Differences are statistically insignificant. EDS: excessive daytime sleepiness.

The insomnia phenotype was more prevalent in the oldest age group compared with the middle-aged group (36%, 95% CI 34–38 *versus* 26%, 95% CI 24–27, p<0.001 for both). The EDS and EDS-insomnia phenotypes, however, were less prevalent in the oldest age group compared with the 40–49 years age group (15%, 95% CI 13–16 and 20%, 95% CI 18–2 *versus* 24%, 95% CI 23–25 and 24%, 95% CI 23–25, respectively, p<0.001 for both) (see Table S2 in the Supplementary data).

Figure 2 presents the mean PAP use at the first follow-up visit according to clinical phenotype in the oldest 10-year age group. There were no significant differences in mean PAP use between the clinical phenotype groups. The mean PAP use for the EDS group was 5.96 h·day$^{-1}$ (95% CI 5.60–6.32), 5.37 h·day$^{-1}$ (95% CI 5.11–5.63) for the EDS-insomnia group, 5.83 h·day$^{-1}$ (95% CI 5.47–6.18) for the non-EDS-non-insomnia group and 5.34 h·day$^{-1}$ (95% CI 5.06–5.61) for the insomnia phenotype group. The patients with the EDS-insomnia and insomnia phenotypes seemed to use PAP a little less, but the 95% CIs were overlapping.

A CGI-S score of 6–7 (*i.e.* markedly to severely ill) was found in 5% of the oldest age group and for 2–4% in other age groups at baseline. The degree of OSA severity did not influence the degree of PAP use. ESS and CGI-S improved during PAP treatment in both moderate and severe OSA groups. The ESS and CGI-S were slightly higher in the severe OSA group but these parameters did not differ between the groups at the follow-up visit (table 3).

The impact of gender, age, BMI, AHI, ESS and CGI-S at baseline as predictors of PAP use at the first follow-up visit for the 70–79-year-old patients with OSA is presented in table 4. Only CGI-S at baseline

TABLE 3 Mean (95% CI) ESS and CGI-S at baseline and PAP use, ESS and CGI-S at first follow-up visit in two groups according to AHI in patients aged 70–79 years

| Patients (70–79 years) | AHI 15–30 events h$^{-1}$ | AHI >30 events h$^{-1}$ | p-value |
|---|---|---|---|
| **ESS score at baseline (n=1830)** | 8.17 (7.80–8.54) | 9.36 (9.07–9.65) | p<0.001 |
| **CGI-S at baseline (n=1192)** | 2.73 (2.61–2.85) | 3.03 (2.93–3.14) | p<0.001 |
| **ESS score follow-up 1 (n=530)** | 7.38 (6.72–8.04) | 7.22 (6.73–7.71) | p=0.703 |
| **CGI-S at follow-up 1 (n=376)** | 2.40 (2.23–2.58) | 2.62 (2.49–2.76) | p=0.047 |
| **PAP use h·day$^{-1}$ (n=613)** | 5.47 (5.14–5.80) | 5.71 (5.53–5.89) | p=0.211 |

ESS: Epworth Sleepiness Scale; CGI-S: Clinical Global Impression Severity scale; PAP: positive airway pressure; AHI: apnoea/hypopnoea index.

**TABLE 4** Predictors of positive airway pressure (PAP) compliance at first follow-up visit in patients aged 70–79 years

| Patients (70–79 years) | β | 95% CI | Standardised β | p-value |
|---|---|---|---|---|
| Gender | 0.214 | −0.163–0.590 | 0.049 | 0.265 |
| Age years | 0.021 | −0.042–0.085 | 0.028 | 0.507 |
| BMI kg·m$^{-2}$ | 0.016 | −0.016–0.048 | 0.048 | 0.317 |
| AHI events·h$^{-1}$ | 0.006 | −0.003–0.015 | 0.064 | 0.171 |
| ESS score | 0.000 | −0.034–0.035 | 0.000 | 0.992 |
| CGI-S | −0.299 | −0.427– −0.172 | −0.195 | <0.001 |

BMI: body mass index; AHI: apnoea–hypopnoea index; ESS: Epworth Sleepiness Scale; CGI-S: Clinical Global Impression Severity scale.

was a significant predictor of PAP use. The higher the CGI-S score, the more affected the patient was and the less PAP therapy was adhered to. Gender did not have a significant impact on adherence. The impact of these factors as predictors of PAP use at the first follow-up visit was similar in the other age groups. Among the 40–59-year-olds, AHI was a significant predictor for PAP use in addition to baseline CGI-S (see Table S3 in the Supplementary data).

## Discussion

The results of this large clinical OSA cohort revealed that the clinical presentation of elderly patients aged 70–79 years differs from that of middle-aged patients with OSA. Elderly patients were less obese, less sleepy, had more symptoms of insomnia and had less severe OSA. However, clinicians judged them to be more ill compared with middle-aged patients with OSA. Of interest, the adherence to PAP therapy among the elderly seemed to be even higher than in younger patients. Furthermore, higher CGI-S, reflecting the worse global functioning of a patient according to the clinician's rating, predicted lower PAP adherence. Age, gender, EDS, OSA severity, or clinical phenotypes based on EDS and insomnia symptoms did not affect PAP adherence in the elderly group.

The baseline ESS score was lower in the older age group. Indeed, it has previously been reported that the ESS score seems to reflect daytime sleepiness less well among the elderly [28]. The higher ESS score of the middle-aged patients found in our study and previous studies may also reflect the differences in life standards and situations and may be aggravated by work-related stress. Furthermore, work-related stress may also be reflected in the compliance of insomnia phenotype patients, especially in the younger age groups. However, our study also showed that the insomnia phenotype of OSA was more prevalent among the elderly. This is not surprising since insomnia disorder is more prevalent among elderly than younger people and may reflect comorbid insomnia disorder, and not only insomnia symptoms related to OSA. Interestingly, insomnia-like symptoms may affect the usefulness of ESS as a tool for assessing OSA symptoms among the elderly. However, the results on the prevalence of the OSA phenotypes among the elderly may be affected by the poor capacity of the ESS score to reflect EDS among the elderly. Better, or more specific, tools are needed.

Our results confirmed the results of previous smaller studies [29, 30] addressing adherence to CPAP therapy in elderly patients with OSA, but also produced contradictory results to some other studies [20]. In our study, elderly people aged 70–79 years adhered to PAP therapy at least as well as the middle-aged patients. The transition to statutory retirement has been connected with a decrease in sleep difficulties [31]. It may be argued whether CPAP compliance may also therefore be affected by working status. ESS scores improved during PAP therapy in line with previous findings [21]. OSA severity seemed not to affect PAP adherence in the elderly, which is in line with findings in male patients of 65 years or older [32]. Of interest, the clinical phenotype of OSA did not influence PAP adherence in the elderly patients. This is contrary to previous reports in younger patients suggesting lower adherence to CPAP therapy in patients with OSA with insomnia-like symptoms [27, 33]. Our results suggest different aetiologies of insomnia symptoms among elderly and younger patients with OSA. Our findings emphasise that even elderly people with a seemingly low ESS score deserve a PAP trial.

Somewhat unexpectedly, the ESS score did not predict adherence to PAP therapy. On the contrary, a higher CGI-S score predicted poorer adherence to PAP therapy, suggesting a role as a novel useful tool when assessing the initiation of PAP treatment in elderly patients. The global functioning of the elderly patient should always be considered when initiating PAP therapy.

Our study has several strengths. First, the study was a multi-centric real-life study and included unselected patients, which strongly increases the generalizability of our findings. Second, to our knowledge, this is the largest cohort of patients with OSA aged over 70 years. Third, our data reflects easily identified clinical aspects of OSA, including respiratory event frequency, daytime and night-time symptoms and assessment of global functioning. Fourth, data have been collected in the context of a standardised clinical protocol.

The study also has limitations. First, there are no universally accepted scoring guidelines for the CGI-scale. Second, several clinicians were involved in the CGI-S rating and variable clinical experience may have affected CGI-S rating. The CGI-scale was part of the study protocol but a specific training session was not offered to all physicians involved during the course of the study. Third, the follow-up material in the ESADA is somewhat pre-selected to include follow-up visits in patients adherent with PAP.

Our results highlight the clinician's global impression of functional ability and health when assessing the feasibility of PAP therapy for an elderly OSA patient. Further studies are needed on the subjective and objective effects of PAP therapy among the elderly to further guide the patient selection process for PAP therapy. Until then, it seems that even elderly people with OSA and good general wellbeing may be considered for PAP therapy.

Provenance: Submitted article, peer reviewed.

Acknowledgements: Part of the findings were presented as a poster at Sleep Europe 2022.

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Data availability statement: The data that support the findings of this study are available from the corresponding author upon reasonable request.

Human ethics approval declaration: The study was reviewed and approved by a local ethics committee at each participating centre. All patients gave their written, informed consent.

Conflict of interest: A. Lammintausta has reported a grant from Turku University Foundation. U. Anttalainen has reported a grant from EU Horizon 2020 (Sleep Revolution) and lecture fee and support for attention in a scientific meeting from ResMed, membership at the advisory board of Wello Oy and the National Task Force the Current Care Guidelines of Adult Sleep Apnoea. M.R. Bonsignore has reported honoraria for lectures Bioprojet and Jazz, and is on the advisory board of Bioprojet. L. Grote has reported an unrestricted collaboration grant with the ESADA network from Bayer AG, Germany, grants from Swedish Heart and Lung Foundation, LUA-ALF Gothenburg Region, EU Horizon 2020 (Sleep revolution), EUROSTAR (Apnoeaway and WATCH-IT), clinical trial contract and license on pharmacological treatment in OSA for Desitin, lecture fees from Astra Zeneca, Lundbeck, ResMed and Philips, chairing National guidelines for treatment in OSA and the National quality registry for sleep apnoea (SESAR), being a steering group member of the European quality registry for sleep apnoea (ESADA), LRPC member for the European Respiratory Society, Assembly 4 and member of examination committee for the European Sleep Research Society. J. Hedner has reported grants from ResMed Inc., Philips Respironics and Bayer Pharma to develop the ESADA database (grants for institution), speaker bureau of Desitin GmbH and Itamar Medical, two granted patents related to pharmacological therapy in OSA and a paid appointment with a DSMB for Respicardia. T. Saaresranta has reported grants from Finnish Anti-Tuberculosis Association Foundation, Jalmari and Rauha Ahokas Foundation, Tampere Tuberculosis Foundation, Research Foundation of the Pulmonary Diseases, EU Horizon 2020 (Sleep Revolution) and a Governmental grant 13542 of the Turku University Hospital (grants for institution), lecture fees from the Finnish Medical Society Duodecim, Chiesi, ResMed and Jazz Pharmaceuticals; and chairing the National Task Force for Current Care Guidelines for Adult Sleep Apnoea. The other authors have nothing to declare.

Support statement: A. Lammintausta was supported by a grant from The Turku University Foundation. This study was partially supported by the Governmental grant 13542 of the Turku University Hospital, The Finnish Anti-Tuberculosis Association Foundation, The Jalmari and Rauha Ahokas Foundation, The Tampere Tuberculosis Foundation and The Research Foundation of the Pulmonary Diseases. The ESADA network is a Clinical Research Collaboration funded by the European Respiratory Society and by unrestricted grants from ResMed, Philips and Bayer Pharmaceuticals. Funding information for this article has been deposited with the Crossref Funder Registry.

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