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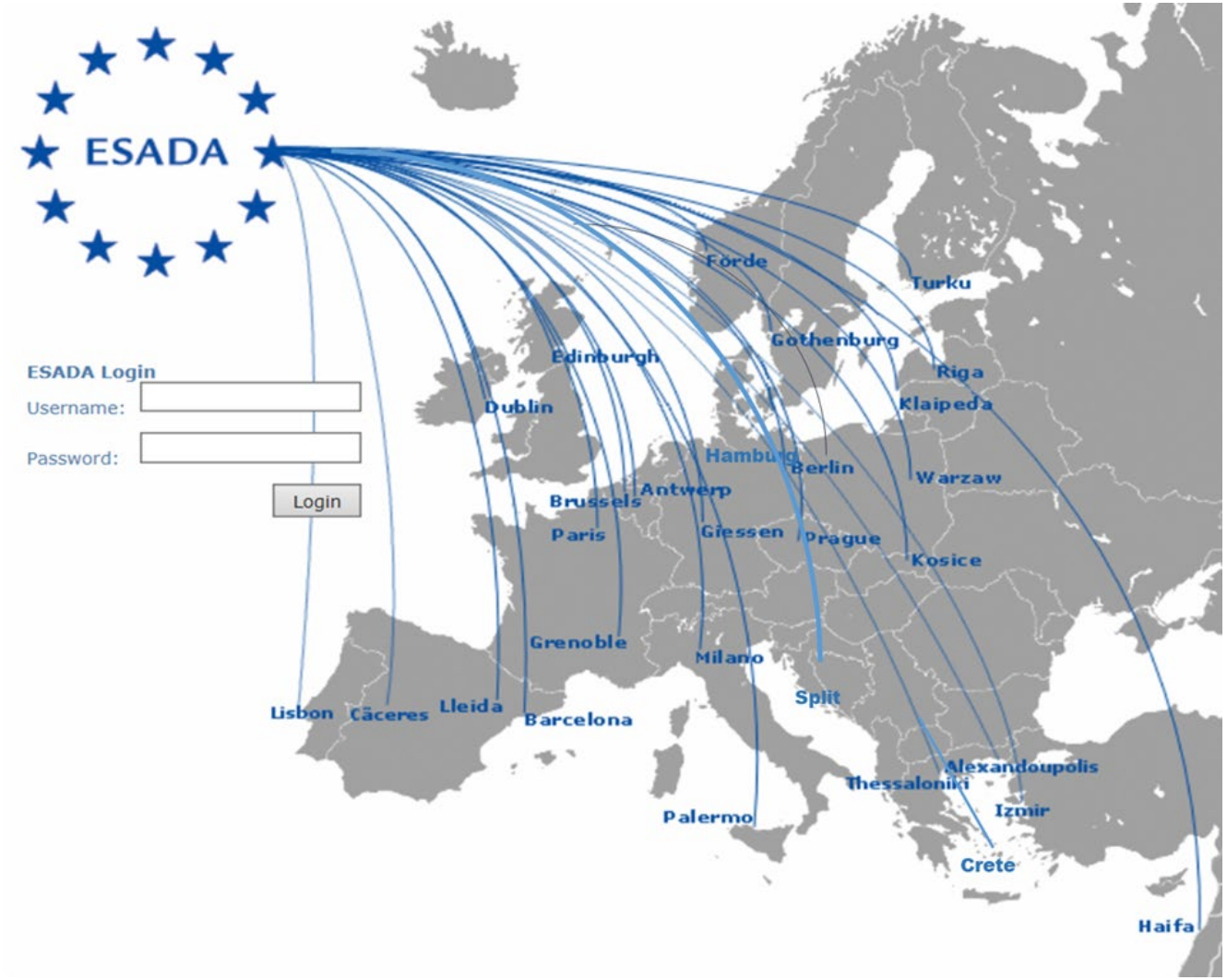

"Blow or bite" – Predictors of treatment recommendations in mild to moderate Obstructive Sleep Apnea in the European Sleep Apnea Database (ESADA)

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Sweden

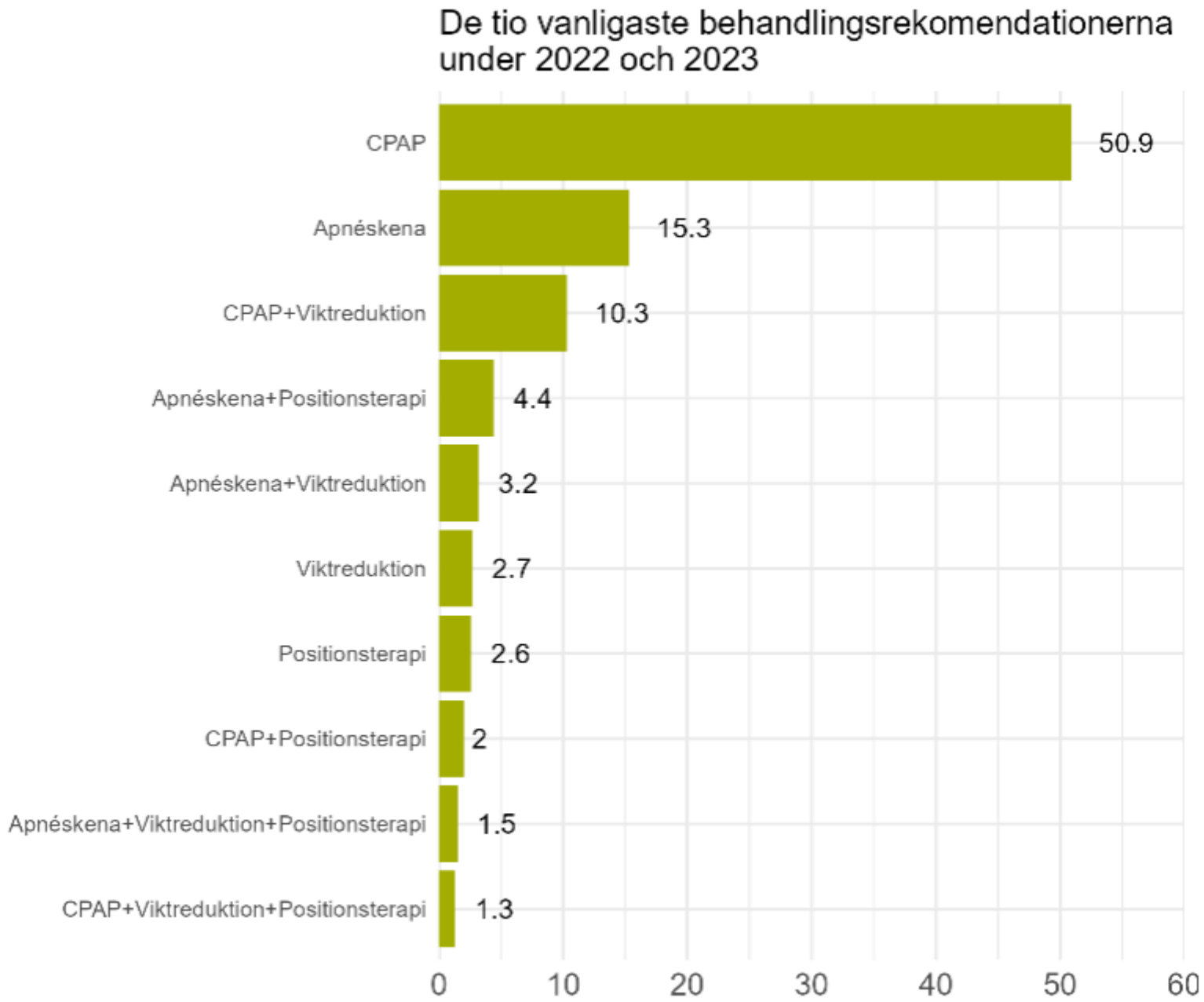
Main treatment options for obstructive sleep apnea

CPAP

- Complete elemintation of OSA: AHI and hypoxia
- Improvement of sleep quality
- Subjective improvement
- Mild blood pressure reduction in hypertensive OSA patients
- Often preferred by the doctor

Mandibular Advancement Devices (MAD)

- 50% reduction in OSA: AHI and hypoxia
- Partial improvement of sleep quality
- Comparable improvement in ESS and HrQoL
- Mild blood pressure reduction in hypertensive OSA patients
- Preferred by patients


De tio vanligaste behandlingsrekomendationerna under 2022 och 2023
CPAP
50.9
Apnéskena
15.3
CPAP+Viktreduktion
10.3
Apnéskena+Positionsterapi
4.4
Apnéskena+Viktreduktion
3.2
Viktreduktion
2.7
Positionsterapi
2.6
CPAP+Positionsterapi
2
Apnéskena+Viktreduktion+Positionsterapi
1.5
CPAP+Viktreduktion+Positionsterapi
1.3
0
10
20
30
40
50
60

European Respiratory Society guideline on non-CPAP therapies for obstructive sleep apnoea

Winfried Randerath[1,20], Johan Verbraecken[2,20], Christel A.L. de Raaff[3], Jan Hedner[4], Simon Herkenrath[1], Winfried Hohenhorst[5], Tina Jakob[6], Oreste Marrone[7], Marie Marklund[8], Walter T. McNicholas[9,10], Rebecca L. Morgan[11], Jean-Louis Pepin[12], Sofia Schiza[13], Nicole Skoetz[6], Dan Smyth[14,15], Jörg Steier[16], Thomy Tonia[17], Wojciech Trzepizur[18], Piet-Heijn van Mechelen[14] and Peter Wijkstra[19]

Task force recommendation

"In adult patients with OSA, we suggest that CPAP should be used as compared to MAD (conditional recommendation, very low quality of evidence)"

Remarks

- "In mild to moderate OSA, the difference in AHI becomes less important, and therefore, due to equal effects on sleepiness and quality of life, both devices can be considered equally"

- "Altogether, those considerations lead the panel to regard CPAP and MAD as equal in patients with mild to moderate OSA. With increasing severity of OSA, comorbidities or odontological concerns, CPAP should be considered in this group of patients."

Method

10109 patients with mild to moderate OSA

30 centers with information on OD availability and reimbursement

- Demographics
- Anthropometrics
- Sleep center information
- Car license
- Smoking status
- Alcohol consumption

1 Demographics

Laboratory values 2

- HDL & LDL cholesterol
- Triglycerides
- C-reactive protein
- Creatinine
- Urine albumin
- HbA1c

- Comorbidities
  - ❑ Cardiovascular
  - ❑ Metabolic
  - ❑ Sleep disorders
  - ❑ Pulmonary
  - ❑ Other
- Mortality

3 Epidemiology

Physical Examination 4

- Vital signs
- Neck circumference
- Waist circumference
- Lung function
- Blood gas tests

- Clinical Global Impression (CGI)
  - ❑ Improvement
  - ❑ Severity
- Epworth Sleepiness Scale (ESS)

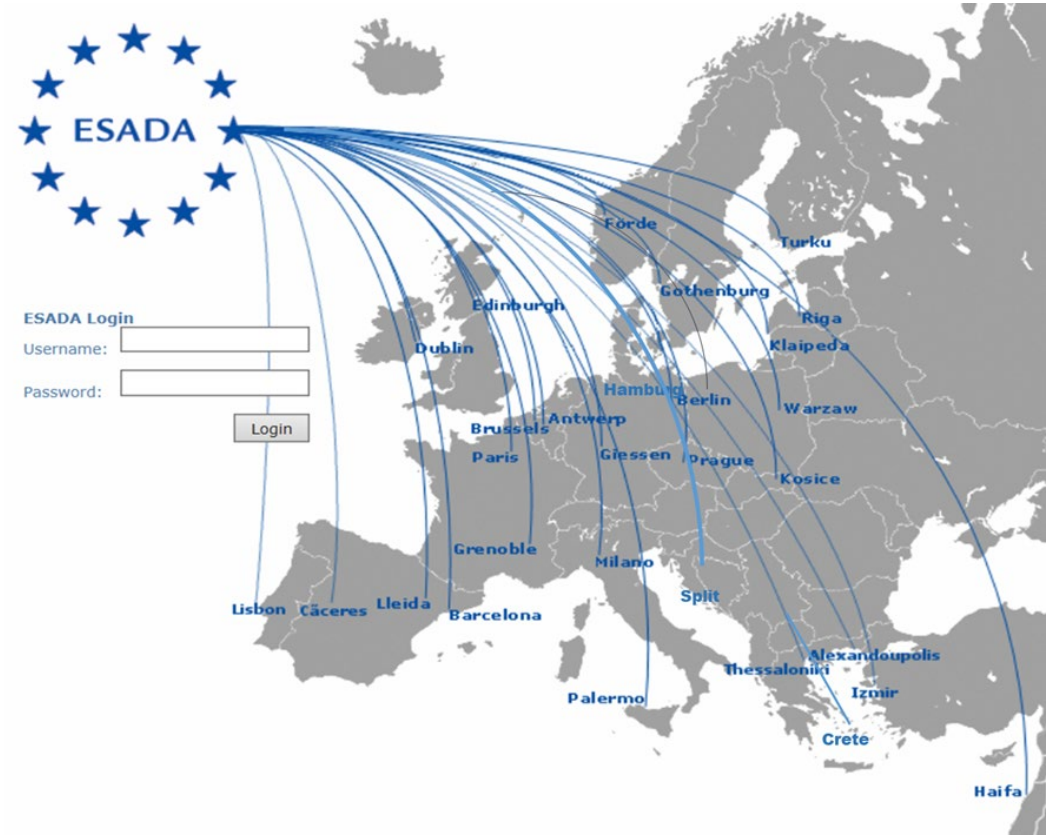
5 Questionnaires

Sleep study data 6

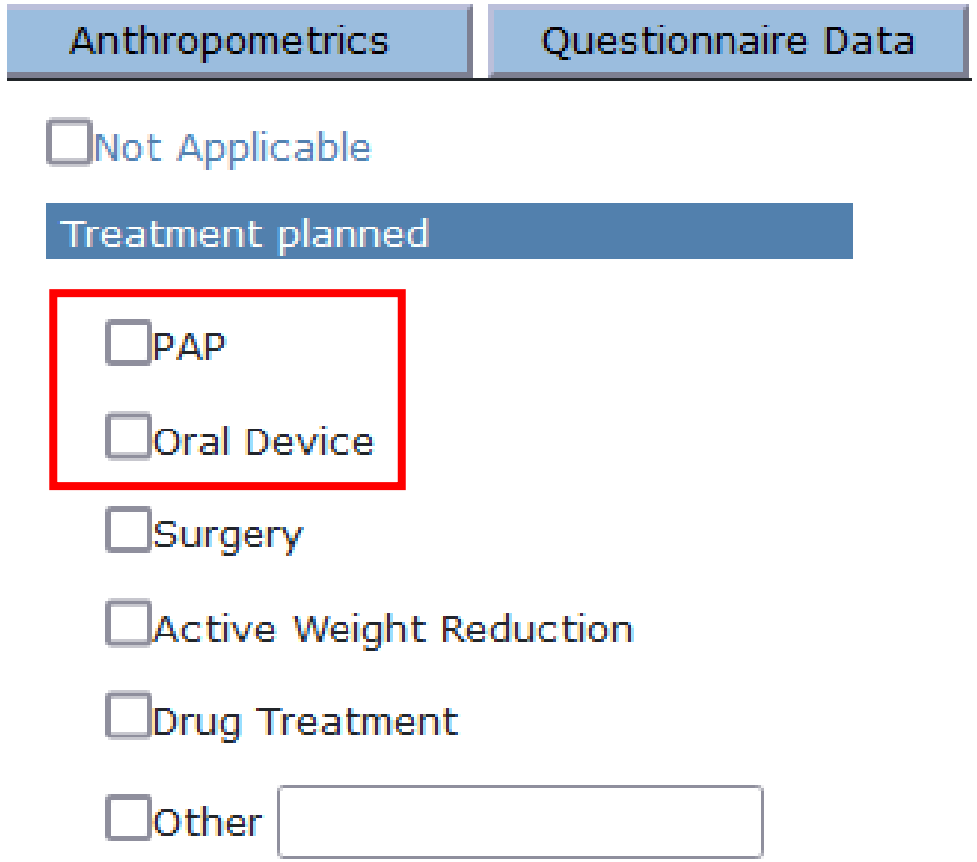
- AHI, ODI and RDI
- Mean and lowest SaO_2
- Time below 90%
- Total sleep time
- Sleep efficiency
- Sleep stage 1, 2, 3 , 4 and REM
- PLM (Arousal) index
- Respiratory Arousal Indey
- Spontaneous Arousal Index
- Analyzed and subjective sleep time

- OSA treatment
  - ❑ PAP
  - ❑ Oral device
  - ❑ Surgery
  - ❑ Active weight reduction
  - ❑ Drug treatment
- Concomittant medication

7 Medication



Method



ESADA cohort patients with mild to moderate OSA, 2007-2022

- Factors associated with recommended MAD instead of PAP treatment were analyzed with a generalized linear regression model (GLM) including age, gender, BMI, ESS score, AHI

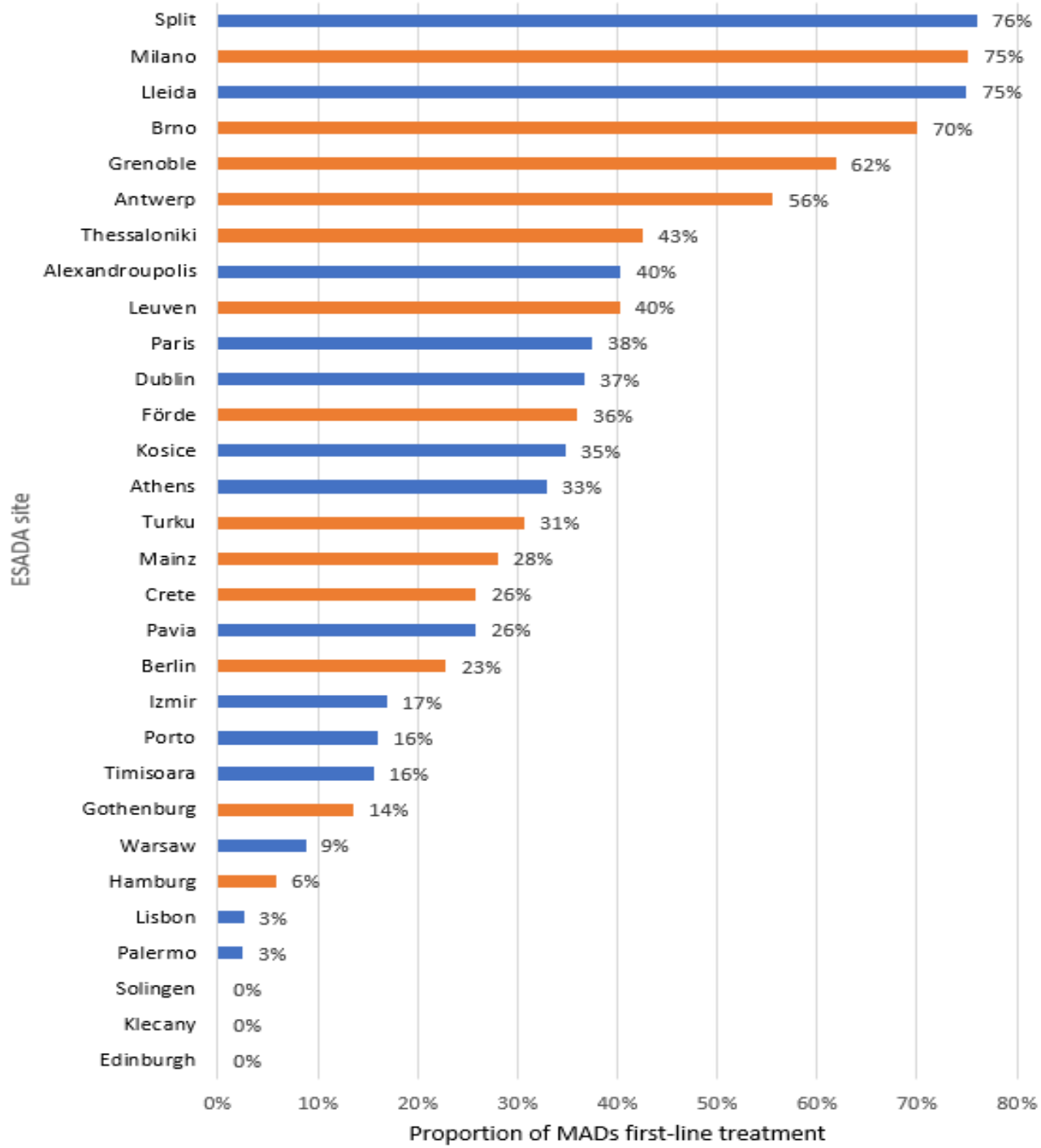
Questionnaire to collaborators at ESADA sites

- MAD avialability:
- MAD reimbursement
- Role of patient preference in treatment choice

Results

Clinical characteristics in patients receiving PAP or MAD treatment

Primary recommended treatment			
	PAP N = 6618	MAD N = 3491	Significance unparied t-test or Chi^2 test
	Mean value or percentage		
Age (yrs)	54.4	52.4	<0.001
BMI (kg/m2)	31.1	29.5	<0.001
Females (%)	33.2	34.0	<0.001
Hypertension (%)	44.1	35.2	<0.001
Insomnia (%)	3.5	2.4	<0.001
AHI (events/hour)	19.1	11.9	<0.001
ODI (events/hour)	16.9	10.5	<0.001
ESS (points)	9.2	8.0	<0.001
MAD availability (%)	87.3	96.9	<0.001
MAD reimbursement (%)	47.8	59.2	<0.001


ESADA site
Split 76%
Milano 75%
Lleida 75%
Brno 70%
Grenoble 62%
Antwerp 56%
Thessaloniki 43%
Alexandroupolis 40%
Leuven 40%
Paris 38%
Dublin 37%
Förde 36%
Kosice 35%
Athens 33%
Turku 31%
Mainz 28%
Crete 26%
Pavia 26%
Berlin 23%
Izmir 17%
Porto 16%
Timisoara 16%
Gothenburg 14%
Warsaw 9%
Hamburg 6%
Lisbon 3%
Palermo 3%
Solingen 0%
Klecany 0%
Edinburgh 0%
0% 10% 20% 30% 40% 50% 60% 70% 80%
Proportion of MADs first-line treatment

Main analysis and sensitivity analyses	Entire cohort, N=9258	
Factors predicting prescription of MAD over PAP	OR (95% CI)	P
AHI classes		
Mild compared to moderate OSA *= AHI included as a continuous variable	**5.4** (4.8-6.1)	<0.001
ODI classes		
Negligible hypoxia (ODI <5)	**2.1** (1.8-2.6)	<0.001
Mild hypoxia (ODI 5≤15)	1.5 (1.3-1.7)	<0.001
Moderate/severe hypoxia (ODI 15+)	1	
EDS (ESS score)		
No EDS (ESS 0-6)	**2.4** (2.0-2.9)	<0.001
Mild EDS (ESS 7-10)	1.9 (1.5-2.2)	<0.001
Moderate EDS (ESS 11-15)	1.2 (1.0-1.4)	0.034
Severe EDS (ESS 16-24)	1	-

Main analysis and sensitivity analyses	Entire cohort, N=9258	
Factors predicting prescription of MAD over PAP	OR (95% CI)	P
Weight classes (BMI kg/m2)		
Normal weight (<25)	**1.4** (1.2-1.7)	<0.001
Overweight (25≤30)	1.4 (1.2-1.6)	<0.001
Obesity (30≤35)	1.2 (1.0-1.4)	0.045
Morbid obesity (≥35)	1	-
Blood pressure		
Normotension compared to hypertension	**1.1** (1.0-1.2)	0.133
Accessibility of MAD		
High compared to limited	**2.3** (1.8-2.9)	<0.001
Reimbursement for MAD		
High compared to limited or none	**1.5** (1.4-1.7)	<0.001

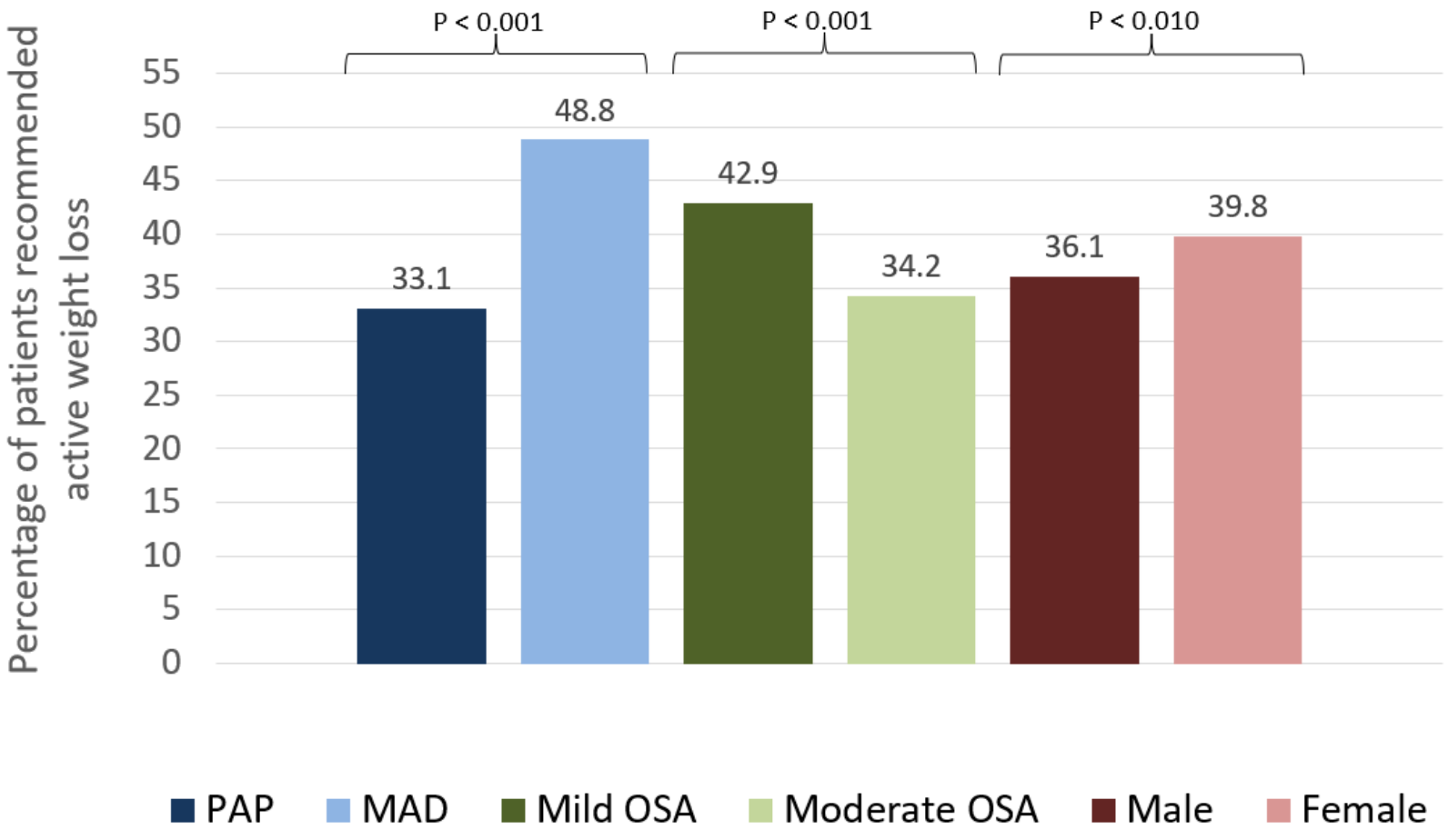
Primary recommended treatment by MAD accessibility and reimbursement policy at the corresponding site for each case.

Primary recommended treatment			
	MAD % (N)	PAP % (N)	Total N
High MAD accessibility	**37.2** (3276)	62.8 (5526)	8802
Low MAD accessibility	**11.6** (106)	88.4 (805)	991
Total (N)	3382	6331	9713**
p value for group differences based on accessibility: <0.001***			
MAD generally reimbursed	**39.8** (2001)	60.2 (3029)	5030
MAD generally not reimbursed	**29.5** (1381)	70.5 (3392)	4683
Total (N)	3382	6631	9713**
p value for group differences based on reimbursement: <0.001***			

Primary recommended treatment by the impact of patient preference on MAD or PAP as first-line treatment at the corresponding site for each case.

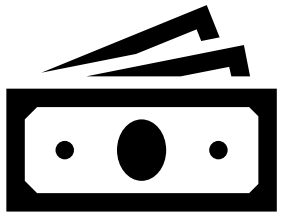
Primary recommended treatment			
	MAD % (N)	PAP % (N)	Total N
Patient preference decides choice of MAD vs PAP	**46.1** (1790)	53.9 (2095)	3885
Patient preference does not decide choice of MAD vs PAP	**30.2** (1376)	69.8 (3173)	4549
Total (N)	3166	5268	8434**
p value for group difference: <0.001***			

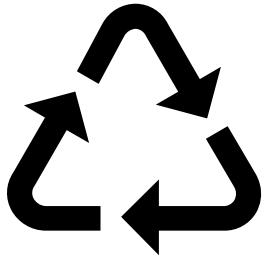
Proportion of obese patients with mild and moderate OSA recommended a combination therapy including “active weight reduction”

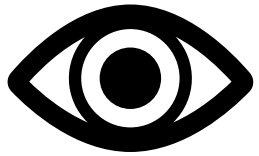


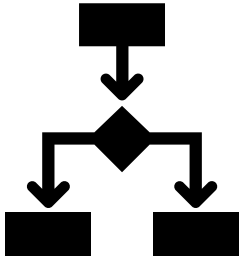
Further considerations

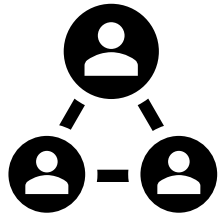
- MAD must be custom made with high initial cost
- Untolerated PAP devices can easily be recycled to the next patient
- MAD do not as of yet enable the same degree of clinical monitoring as PAP regarding adherence and residual apneas
  - Delayed recognition of treatment failure
  - Delayed intiation of second line treatment
- Is there established clinical infrastructure, routines and competence for the follow-up of a patient with MAD?











Conclusions

- PAP is prescribed twice as often as MADs
- Clinical factors predicting first-line prescription of MAD are congruent with current evidence.
- High variations of MAD prescription rates within Europe
- Accessibility, reimbursement policies and patient participation impact on MAD prescriptions
- MADs are most likely underutilized in some regions
- Sleep clinics, dental care providers and policy makers need to collaborate towards making MADs a feasible treatment option across the continent.

VÄSTRA GÖTALANDSREGIONEN

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Thank you!

Table 1: Clinical characteristics of patients with mild or moderate OSA receiving PAP or MAD as primary treatment in the ESADA cohort as a whole and split by OSA severity.

Recommended primary treatment in mild to moderate OSA						
	Whole cohort		Mild OSA		Moderate OSA	
	PAP N=6618	MAD N=3491	PAP N=1838	MAD N=2579	PAP N=4780	MAD N=912
	Mean or % (SD)		Mean or % (SD)		Mean or % (SD)	
Age (yrs)	54.4 (12.2)	52.4 (13.5)	52.2 (12.4)	51.4 (13.3)	55.2 (12.0	55.1 (13.6)
BMI (kg/m2)	31.1 (5.9)	29.5 (5.6)	30.4 (5.9)	29.3 (5.7)	31.4 (5.9)	29.9 (5.5)
Neck circumference (cm)	40.8 (3.9)	39.8 (3.8)	40.2 (3.9)	39.6 (3.8)	41.0 (3.9)	40.6 (3.8)
Females (%)	33.2	34.0	36.1	35.8	32.1	29.2
Hypertension (%)	44.1	35.2	38.1	33.4	46.4	40.3
ESS (total score)	9.2 (5.0)	8.0 (4.7)	9.5 (5.1)	8.2 (4.8)	9.2 (5.0)	7.5 (4.6)
AHI (events/hour)	19.1 (6.5)	11.9 (5.7)	10.5 (2.8)	9.1 (2.8)	22.3 (4.1)	20.0 (4.0)
ODI (events/hour)	16.9 (11.5)	10.5 (9.9)	9.8 (7.5)	8.2 (8.0)	19.8 (11.6)	16.9 (11.6)
Mean SpO2	93.4 (0.3)	94.2 (0.4)	93.9 (2.7)	94.3 (2.2)	93.1 (2.5)	93.8 (2.3)
Lowest SpO2	81.8 (0.1)	85.0 (0.1)	83.7 (6.6)	85.5 (5.7)	81.1 (7.2)	83.3 (6.4)
T90	6.9 (0.2)	2.7 (0.2)	3.3 (10.8)	2.3 (9.3)	7.1 (15.1)	3.8 (10.3)
MAD accessibility (%)	87.3	96.9	89.9	96.8	86.3	97.1
MAD reimbursement (%)	47.8	59.2	46.8	58.4	48.2	61.5