Examining The Association Of Self-Reported Condition Severity And Excessive Daytime Sleepiness Severity With Health-Related Outcomes Among Individuals With Narcolepsy In The United States

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Background

- Excessive daytime sleepiness (EDS), a cardinal symptom of and diagnostic criterion for narcolepsy,[1, 2] is often used as an endpoint in clinical trials
- Despite all individuals with narcolepsy having EDS, other symptoms of narcolepsy include cataplexy (in the case of Type 1 narcolepsy), sleep-related hallucinations, sleep paralysis, and disrupted/disturbed nighttime sleep[2]
- Therefore, EDS severity alone may not represent a holistic assessment of patients' perceptions of the severity of their narcolepsy
- As such, EDS may not be a reliable indicator of improvement in health outcomes among the narcolepsy population

Objective

To evaluate whether self-reported severity of narcolepsy or a validated measure of EDS was a better predictor of health-related outcomes among individuals with narcolepsy in the United States (US)

Methods

Retrospective, cross-sectional data from the 2023 US National Health and Wellness Survey (NHWS) was used to identify individuals with narcolepsy

- Self-reported physician diagnosis of narcolepsy
- Experienced narcolepsy in the past 12 months

Measures

- Self-reported severity of narcolepsy (mild, moderate, severe)
- EDS severity: Epworth Sleepiness Scale (ESS), range: 0 to 24; scores of 11 or higher = excessive daytime sleepiness (11-12 = mild EDS, 13-15 = moderate EDS, 16-24 = severe EDS)[3]
- Depression (Patient Health Questionnaire-9 [PHQ-9], range: 0 to 27) and Anxiety (7-item Generalized Anxiety Disorder Assessment [GAD-7], range: 0 to 21); higher scores indicate greater severity
- Health-related quality of life (HRQoL): RAND-36 mental and physical health composites (range: 0 to 100), EQ-5D index (range: 0 to 1.0), EQ visual analog scale (VAS) (range: 0 to 100); higher scores indicate better HRQoL
- Work productivity and activity impairment (WPAI): higher scores are indicative of greater impairment
- Healthcare resource use (HCRU): number of office-based visits, ER visits, and hospitalizations in past 6 months
- Total direct medical costs

Generalized linear models were used to examine association of self-reported severity and ESS scores with health-related outcomes, with statistical significance set at $p < 0.05$

Results

- A total of 209 respondents with narcolepsy were included in analyses

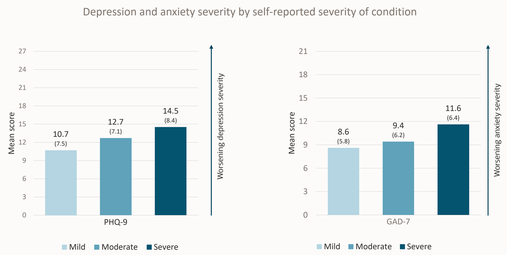
Demographic characteristics	
Age, mean (SD)	43.7 (16.3)
Sex at birth, female, n (%)	112 (53.6)
Race/ethnicity, n (%)	
White (Non-Hispanic)	116 (55.5)
Black (Non-Hispanic)	45 (21.5)
Hispanic	31 (14.8)
Another race or origin	17 (8.1)
Married/living with a partner, n (%)	95 (45.5)
University degree or higher, n (%)	85 (40.7)
Employed, n (%)	113 (54.1)
Household income ≥ $100K, n (%)	45 (21.5)
Commercially insured, n (%)	88 (42.1)
Insured by Medicaid or Medicare, n (%)	83 (39.7)
Not insured, n (%)	20 (9.6)

- Mean (SD) ESS score was 13.8 (6.1)

Health and clinical characteristics	
CCI score, mean (SD)	1.87 (3.58)
Days exercising, past month, mean (SD)	6.89 (8.18)
BMI, mean (SD)	29.5 (8.5)
Overweight or obese (BMI ≥25 kg/m²), n (%)	150 (62.2)
Current or former smoker, n (%)	97 (46.4)
Self-reported severity of narcolepsy, n (%)	
Mild	96 (45.9)
Moderate	76 (36.4)
Severe	37 (17.7)
EDS category, n (%)	
No EDS (ESS score 0-10)	63 (30.1)
Mild EDS (ESS score 11-12)	19 (9.1)
Moderate EDS (ESS score 13-15)	37 (17.7)
Severe EDS (ESS score 16-24)	90 (43.1)

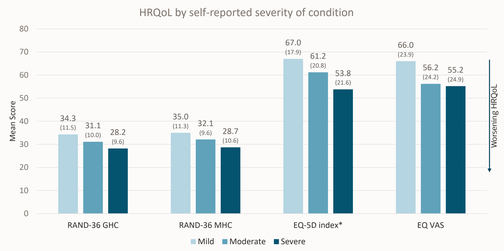
Abbreviations: BMI, body mass index; CCI, Charleson comorbidity index; **SD, standard deviation**

- Depression and anxiety severity are highest among those who rated the severity of their narcolepsy as severe



Footnote: Standard deviations are shown in parentheses.
Abbreviations: GAD-7, 7-item Generalized Anxiety Disorder Assessment; PHQ-9, 9-item Patient Health Questionnaire

- HRQoL was poorest among respondents who rated the severity of their narcolepsy as severe



Footnote: *Converted to 0-100 score. Standard deviations are shown in parentheses.
Abbreviations: GHC, global health composite; HRQoL, health-related quality of life; MHC, mental health composite; VAS, visual analog scale

Self-reported severity of narcolepsy was a significant predictor of depression severity, anxiety severity, worse HRQoL, including poorer global health and mental health (RAND-36 GHC and MHC scores), health state utilities (EQ-5D scores), and self-rated health (EQ VAS scores), and absenteeism, presenteeism, and overall work productivity impairment

- ESS score was not statistically significantly associated with any of these measures

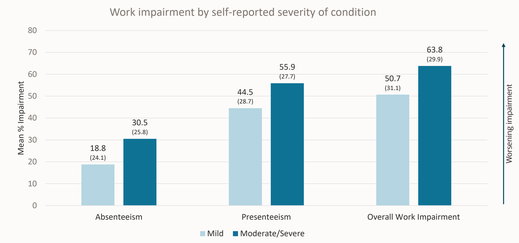
ESS score was a significant predictor of number of office-based visits and number of hospitalizations in the past 6 months as well as total direct medical costs

- Self-reported severity of narcolepsy was not statistically significantly associated with these measures

	Self-Reported Severity			ESS score		
	Test statistic	DF	*P*	Test statistic	DF	*P*
PHQ-9 score	3.50	2	**0.032**	2.85	1	0.093
GAD-7 score	3.30	2	**0.039**	0.19	1	0.660
RAND-36 GHC score	4.72	2	**0.010**	0.49	1	0.483
RAND-36 MHC score	4.80	2	**0.009**	0.56	1	0.453
RAND-36 PHC score	2.26	2	0.107	0.11	1	0.736
EQ-5D Index score	6.27	2	**0.002**	0.00	1	0.944
EQ VAS score	4.18	2	**0.017**	1.56	1	0.213
Absenteeism (%)	6.08	1	**0.015**	0.63	1	0.428
Presenteeism (%)	4.28	1	**0.039**	0.01	1	0.941
Work Productivity Impairment (%)	4.99	1	**0.028**	0.07	1	0.794
Activity Impairment (%)	1.50	2	0.226	1.04	1	0.309
# of office-based visits, past 6 months	0.70	2	0.705	5.13	1	**0.024**
# of ER visits, past 6 months	0.12	2	0.944	0.21	1	0.644
# of hospitalizations, past 6 months	5.42	2	0.067	8.99	1	**0.003**
Total direct medical costs	5.80	2	0.055	8.07	1	**0.005**

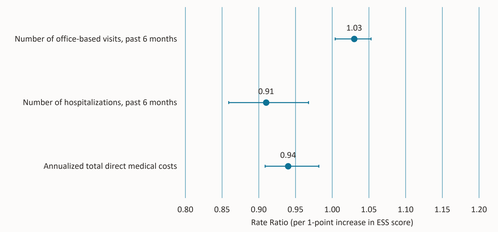
Footnote: Chi-square is reported for HCRU and direct costs; F value is reported for all other outcomes
Abbreviations: DF, degrees of freedom; ER, emergency room; GAD-7, 7-item Generalized Anxiety Disorder Assessment; GHC, global health composite; HCP, healthcare provider; HCRU, healthcare resource use; MHC, mental health composite; PHC, physical health composite; PHQ-9, 9-item Patient Health Questionnaire; VAS, visual analog scale

- Work productivity impairment was higher for those who rated the severity of their narcolepsy as moderate or severe



Footnote: standard deviations are shown in parentheses.

- Greater excessive daytime sleepiness (as measured by ESS score) was associated with more office-based physician visits, but fewer hospitalizations and lower direct medical costs



Abbreviations: ESS, Epworth Sleepiness Scale

In the present study, greater self-reported severity of condition was associated with greater depression and anxiety symptoms, poorer HRQoL, and greater work impairment

That greater daytime sleepiness was associated with fewer hospitalizations and lower direct medical costs warrants further investigation and may undermine the utility of ESS score as a measure of burden

These findings highlight the value of incorporating a more holistic understanding of patients' burden and cautions against relying only on measures that capture severity of just one symptom of a condition

References

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