COPD patients' physical activity and sleep patterns may predict engagement in pulmonary rehabilitation

MAYO CLINIC

Physical Activity and Sleep Phenotypes as Predictors of Adherence to a Pulmonary Rehabilitation Program

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BACKGROUND

- Pulmonary rehabilitation (PR) is recognized as the most effective nonpharmacological intervention for enhancing quality of life in individuals with chronic obstructive pulmonary disease (COPD).[1]
- Traditional in-person PR, while effective, is often limited by transportation challenges, disruption to routines, and fatigue, leading to poor adherence and high dropout rates.
- At-home PR programs, supported by remote patient monitoring and health coaching, can overcome many of the barriers associated with traditional in-person PR models.[1]
- Our team previously demonstrated that a novel, at-home PR intervention successfully increased physical activity (PA) in patients with COPD; however, program adherence and retention remained key challenges.[1]

OBJECTIVES

- We investigated determinants of adherence to the PR program, focusing on physical activity and sleep phenotypes, which have each been previously associated with COPD-related outcomes.[2]

METHODS

- In a multicenter clinical trial, 375 COPD patients over the age of 40 completed a 12-week RPM program with health coaching.
- Prior to the program, baseline PA and sleep were measured with wrist-worn ActiGraph GT3Xs for one week.
- During the program, participants were asked to perform 3 daily exercises, 6 days a week: two 6-minute indoor walks and a 12-minute upper extremity yoga routine.
- Program dropout was defined as the final week in which participants engaged in any program activity.
- K-means clustering identified latent PA and sleep phenotypes during participants' baseline assessments based on maximum steps per minute and movement during sleep (movement index).
- Associations between phenotypes and adherence (dropout risk) were evaluated using a Cox proportional hazards model adjusted for demographics and disease severity.

RESULTS

- A total of 140 COPD participants with baseline ActiGraph data were included. Of these, 71 (51%) were male and 69 (49%) were female, with a median age of 70 years (IQR: 64–77). Overall, 39 participants (28%) did not complete the program.

Physical Activity and Sleep Phenotypes

- An optimal K of 3 clusters was identified using a scree-plot of within-cluster sum of squares.
- Median values – Cluster **0**: 52 max steps per minute, movement index of 23; Cluster **1**: 71 max steps per minute, movement index of 10; Cluster **2**: 46 max steps per minute, movement index of 12.

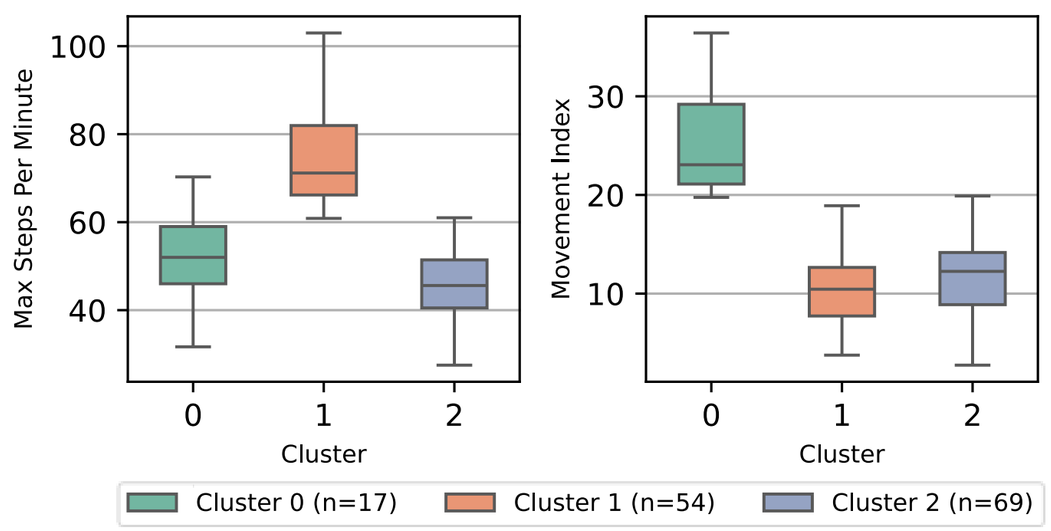

Figure 1. Boxplots characterizing each clusters max steps per minute and movement index.

Association with Adherence

- A Cox proportional hazard model revealed a significant association between clusters and risk of dropout.

Covariate	Odds Ratio	95% CI	P
Cluster 0	2.88	1.12 – 7.40	**0.03**
Cluster 1	0.82	0.36 – 1.87	0.64
Age	0.98	0.94 – 1.03	0.45
Sex (is male)	0.89	0.45 – 1.74	0.73
Previous smoker	0.80	0.31 – 2.05	0.64
mMRC Dyspnea Scale	1.52	0.95 – 2.43	0.08
Hospitalizations (n)	1.18	0.91 – 1.51	0.21
ED visits (n)	1.23	0.98 – 1.54	0.07
Taking prednisone	0.53	0.22 – 1.26	0.15
Intervention-first arm	0.69	0.36 – 1.36	0.29

Table 1. Cox proportional hazard model results

CONCLUSION

- A phenotype characterized by high nocturnal movement was the strongest predictor of dropout in a home-based PR program for COPD patients.
- These findings highlight the need to individualize such programs through additional support or symptom management strategies to enhance engagement and outcomes.

REFERENCES

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DISCLOSURES

The authors report no relevant conflicts of interest.