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“Assessing Frailty in Chronic Lung Disease: A Cross-sectional study of the All of Us Dataset”

Background: Frailty – an increased vulnerability to stressors due to age-related decline – is a useful construct in both clinical and population medicine¹. In chronic disease, frailty has been associated with greater symptom burden, reduced function, and worse outcomes². By defining this phenomenon in the context of chronic lung disease we gain vital insight that both informs current disease characteristics and guides future research.

Objective: Determine the prevalence of frailty in a chronic lung disease cohort compared to a control cohort in the All of Us dataset.

Methods: A 33-item deficit index was developed based upon the accumulation of deficits model of aging^{3,4} using survey, measurement, EHR, and observation data found within the All of Us database. This was applied to a community-dwelling control cohort (excluding participants with any chronic lung disease) and an experimental cohort (including patients with asthma, chronic Obstructive Pulmonary Disease, Interstitial Lung Disease, Bronchiectasis, Cystic Fibrosis, pulmonary hypertension, and pulmonary sarcoidosis). The deficit index scores were confirmed to be correlated with age by using a generalized additive model (GAM) regression analysis, and the mean deficit index scores were compared using a Welch’s unpaired t-test. All data extraction and analysis were done using Jupyter software.

Results: There were 27,541 participants in the control group and 9,048 in the chronic lung disease group who met all inclusion and exclusion criteria and had sufficient frailty data. The mean deficit index demonstrated a significant, positive, non-linear correlation with age in both cohorts, supporting its validity as a frailty measure. The mean frailty index score, (median), and age were 0.16, (0.14), and 64, and 0.23, (0.21), and 66 for the control and chronic lung disease groups, respectively. These differences were significant with a p-value of <0.0001 and 95% CI of -0.07038700 (-0.07296905, -0.06780495).

Conclusion: Frailty was significantly more prevalent among individuals with chronic lung disease compared to a community-dwelling control population, using a deficit index frailty score in the All of Us national dataset. These findings underscore the importance of frailty assessment in this population and support further investigation into contributing factors and potential interventions.

References

1. Fried, L. P., Tangen, C. M., Walston, J., Newman, A. B., Hirsch, C., Gottdiener, J., Seeman, T., Tracy, R., Kop, W. J., Burke, G., & McBurnie, M. A. (2001). Frailty in Older adults: Evidence for a Phenotype. *The Journals of Gerontology. Series A, Biological Sciences and Medical Sciences*, 56(3), M146-56. <https://doi.org/10.1093/gerona/56.3.m146>
2. Koons, B., Greenland, J. R., Diamond, J. M., & Singer, J. P. (2020). Pathobiology of frailty in lung disease. *Translational Research*, 221, 1–22. <https://doi.org/10.1016/j.trsl.2020.04.001>
3. Searle, S. D., Mitnitski, A., Gahbauer, E. A., Gill, T. M., & Rockwood, K. (2008). A standard procedure for creating a frailty index. *BMC Geriatrics*, 8(1). <https://doi.org/10.1186/1471-2318-8-24>
4. Wong, Chelsea N, et al. "Frailty among Sexual and Gender Minority Older Adults: The All of Us Database." *The Journals of Gerontology Series A*, vol. 78, no. 11, 24 July 2023, pp. 2111–2118, <https://doi.org/10.1093/gerona/glad149>. Accessed 14 May 2025.