Spirometric Transition Probabilities in Former World Trade Center (WTC) Workers and Volunteers

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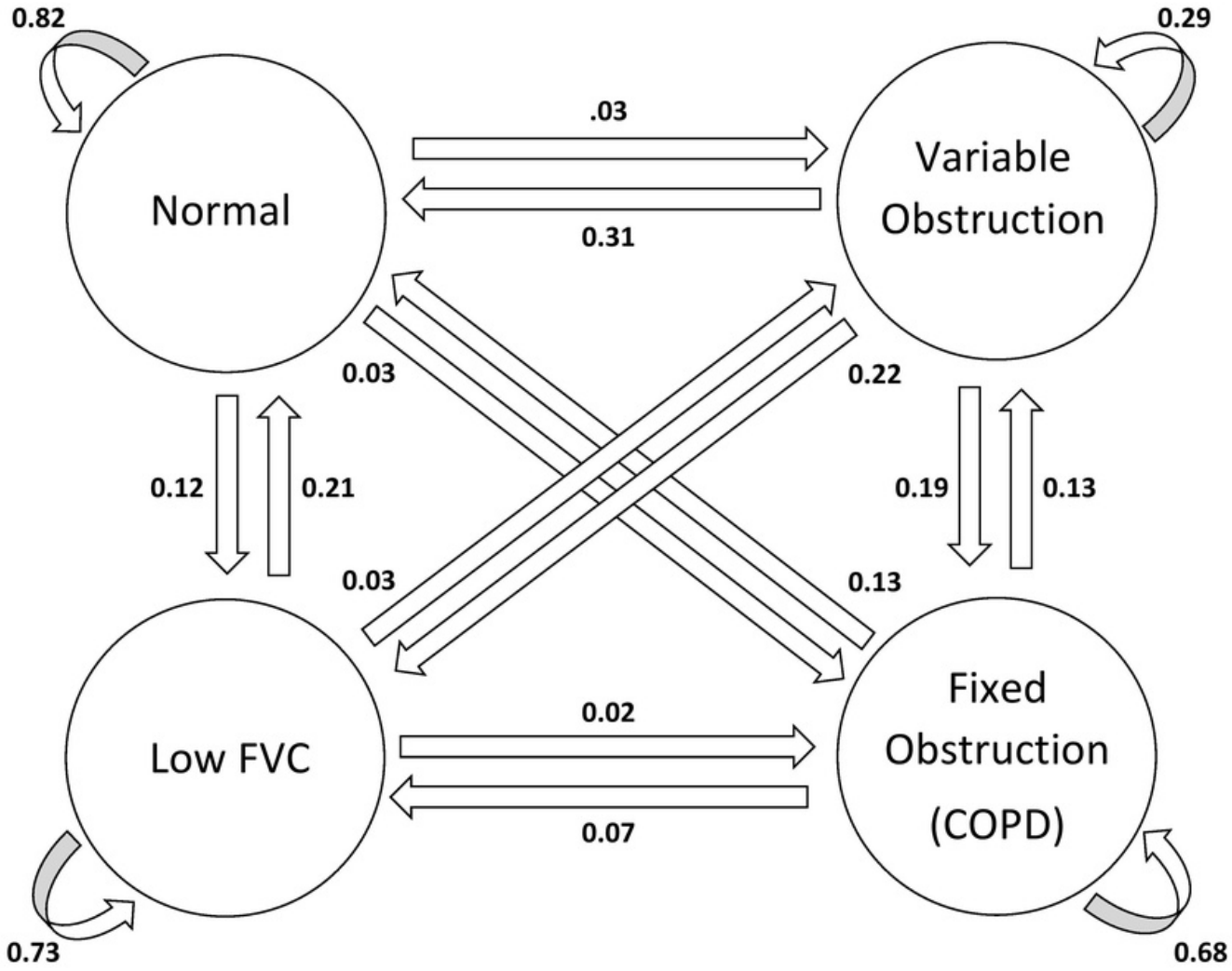
Background: Workers and volunteers who participated in the rescue and recovery of the World Trade Center (WTC) disaster site in 2001-2002 manifest a heterogenous group of chronic lower airway diseases, with variable spirometric patterns. We examined systematically the observed transitions among those spirometric patterns. Methods: from the WTC Chest Imaging Archive cohort (n=1641), we selected a group of 624 former WTC rescue and recovery workers with at least 3 periodic spirometries with bronchodilator (BD) testing performed between 2002 and 2017. We used the NHANES-III prediction equations, to derive four spirometric categories: (1) normal: pre-BD FEV_1, FVC, and FEV_1/FVC ratio>lower limit of normal (LLN); (2) COPD/fixed obstruction: post-BD FEV_1/FVC ratio<0.7; (3) low FVC: FVC<LLN, and normal FEV_1/FVC ratio; and (4) variable obstruction: pre-BD FEV_1/FVC ratio below LLN, and no COPD. We created a multi-state Markov-like model to analyze probabilities of transition between those 4 spirometric categories. The subjects contributed a total of 1248 possible spirometric transitions for this analysis. Results: Substantial stationary probabilities of stability were observed for normal (0.81) and low FVC (0.74) patterns, less for COPD (0.67), and least, as expected, for variable obstruction (0.25). At least 80% of the observed transitions involved the normal and low FVC patterns. Resolution of disease (i.e. normalization of spirometric abnormality) was seen most frequently with variable obstruction and low FVC states and less commonly with COPD (transition probabilities of 0.32, 0.20, and 0.12 respectively). COPD pattern may transition to normal, variable obstruction, and low FVC states (transition probabilities of 0.12, 0.11, and 0.09 respectively). Discussion: As reported previously, low FVC is the most frequent abnormal spirometric pattern in the WTC workers, and is relatively stable. Risk factors for the transitions remain to be explored. Transitions to COPD are infrequent among the WTC workers, and contrary to general perception, the COPD pattern pattern has considerable instability.



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