Development of an Algorithm for the Interpretation of Longitudinal Spirometry

E. Hnizdo[1], T. Yan[2], H.W. Glindmeyer[3]. [1]National Institute for Occupational Safety and Health, Morgantown, WV; [2]Constella Group, Morgantown, WV; [3]Tulane Medical School, New Orleans, LA. Email: exh6@cdc.gov

Rationale: Interpretation of longitudinal spirometry in workplace monitoring is often complicated because of unknown quality of spirometry data and the lack of practical and valid statistical tools. We are developing and evaluating the performance of an algorithm for the interpretation of longitudinal spirometry. **Method:** The algorithm was developed using annual spirometry data from ~14,000 workers and evaluated on a subset of 2,577 with >8 years of follow-up. The algorithm is based on monitoring longitudinal data precision to keep it at an acceptable level, and on a referent limit of longitudinal decline which takes into account the data precision and a rate of decline for healthy individuals. **Results:** The sensitivity of the method to identify individuals with long-term FEV1 decline >90 mL/year increased during the first eight years of follow-up: 4%, 22%, 20%, 29%, 37%, 47%, 51%, and 60%. The likelihood ratio (LR), comparing the likelihood of a positive test when the individual has a long-term decline >90 mL/yr with the likelihood of a positive test when the individual has long-term decline ≤90 mL/yr, increased during the first eight years of follow-up: 1.4, 6.6, 3.9, 9.7, 9.8, 9.7, 11.9, and 12.7. The values were similar for the development of impairment 60% pred. FEV1. **Conclusion:** The algorithm has a good predictive capacity and allows early identification of procedural errors and early identification of individuals at risk of developing moderate to severe lung function impairment for preventive intervention. The algorithm is now being tested in workplaces using specialized computer software. *The findings and conclusions in this abstract have not been formally disseminated by NIOSH and should not be construed to represent any agency determination and policy.*

This Abstract is Funded by: None.

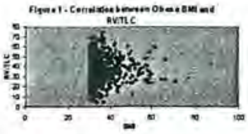
Correlation of Body Mass Index, Trapped Air and Airway Resistance

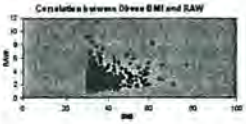
T. Madappa[1], J. Nascimento[1], M.O. Ali[1], S. Lowenstein[1], M. Rogers[1], K.D. Lessnau[1]. [1]Lenox Hill Hospital, New York, NY.

Rationale: It has been stated that an increase in body mass index (BMI) results in a decrease of RV/TLC and an increase of airway resistance (Raw). A restrictive pattern is usually seen in obese patients due to their body habitus limiting respiratory excursion.

Methods: This is an observational study using a database of 1483 patients acquired from our Pulmonary Function Test (PFT) Laboratory. The patients were divided into an obese (>30) group and a non-obese (18-25) group. Patients with a BMI 25-30 were excluded. From the PFT's performed, the Raw and RV/TLC in both groups were complied and linear correlations and regressions were performed. Body plethysmography (Sensormedics, Yorba Linda, CA) was used for measurement of the lung volumes and airway resistance.

Results: We evaluated the scatter plots between the two groups. See figures 1 and 2.





Conclusion: We did not observe a decrease of RV/TLC with increasing body weight although obesity is considered to cause restrictive lung mechanics. Obesity also did not affect plethysmographic airway resistance.

This Abstract is Funded by: None.

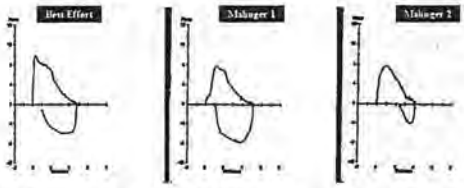
Are Pulmonary Fellows Able To Malinger Abnormal Pulmonary Function Tests?

J. Nascimento[1], T. Madappa[1], M.O. Ali[1], S. Lowenstein[1], M. Rogers[1], K.D. Lessnau[1]. [1]Lenox Hill Hospital, New York, NY.

Rationale: It has been speculated that patients can falsify the results of pulmonary function testing (PFT) by altering their breathing mechanics to generate abnormal findings. A motivating factor for malingering may be the application for disability. We studied whether pulmonary fellows can willingly generate abnormal pulmonary function tests.

Methods: This is an observational study performed at one teaching hospital. Pulmonary fellows underwent PFT testing in the laboratory and full studies were conducted. The fellows had one maximal effort as baseline and additional studies with submaximal performances, attempting to malinger.

Results: We found that spirometric flow rates, plethysmographic airway resistance and methacholine challenge testing flow rates could be altered (see figure). In contrast, plethysmographic and gas dilutional lung volumes, lung diffusion and oscillometry could not be altered.



Conclusions: We conclude that it is possible to malinger and generate data that suggest true pulmonary pathology. Additional PFT testing, such as oscillometry, may be useful if malingering is suspected.

This Abstract is Funded by: None.

Concurrent Measurement of Single Breath, Rebreathe and Plethysmographic Lung Volume in Emphysema

F.M. Milite[1], D.J. Lederer[1], G. DeMercado[1], L. Fernandez[1], P. Fani[1], R.C. Basner[1]. [1]Columbia University College of Physicians and Surgeons, New York, NY. Email: fmm2103@columbia.edu

The extent to which a 10 second single breath helium (He) dilution measurement of total alveolar volume (VA_{SB}) represents recruitable gas dilution alveolar volume and gas compressible alveolar volume in patients with emphysema remains poorly defined. Thirty seven consecutive stable outpatients (15F, 22M, 46-81 yrs) with clinical + radiographic evidence of emphysema and an obstructive defect (mean FEV1/FVC=0.38) therefore underwent spirometry followed by plethysmographic volume measurement (VA_{pleth}) and measurement of VA_{SB} and rebreathe He dilution lung volume (VA_{RB}). Twelve normal subjects were similarly studied. For the emphysema patients, mean ± SD VA_{SB} = 4.4±0.6L, VA_{RB} = 6.3±1.5L, and VA_{pleth} = 6.9±1.6L, all BTPS, p=<.0001 (repeated measures ANOVA). VA_{SB} underestimated VA_{RB} by a mean of 1.9L (95% limits of agreement, -.15-4.01) and underestimated VA_{pleth} by a mean of 2.5L (.05-4.86). VA_{SB} / VA_{pleth} was correlated with FEV1% predicted (r=0.71), FEV1/FVC (r=0.62), and FEV1/SVC (r=0.60), all p<.0001. VA_{SB} / VA_{RB} was similarly correlated with spirometry as well as with plethysmographic RV/TLC (n=36, r=-0.34, p=.006). VA_{RB} underestimated VA_{pleth} by a mean of 0.5L (-1.12-2.18). VA_{RB} / VA_{pleth} was not significantly correlated with spirometry measures. VA_{SB} explained 65% of the variance of VA_{RB}: adj R-sq=0.65. VA_{pleth} explained 88% of the variance of VA_{RB}: adj R-sq=0.88; $VA_{RB} = -0.30 + (0.87 * VA_{pleth})$. For normals, in contrast with the emphysema patients, VA_{SB} was sufficient to predict VA_{RB}: adj R-sq=0.94; $VA_{RB} = -0.47 + (1.1 * VA_{SB})$. These results suggest that VA_{SB} underestimates recruitable gas dilution volume and compressible thoracic gas volume in patients with emphysema as airway obstruction and gas trapping increase. VA_{pleth}, however, accurately reflects, and is an independent predictor of, recruitable gas dilution volume irrespective of severity of airflow obstruction.

This Abstract is Funded by: None.

ATS

ABSTRACTS

ATS 2007
International Conference

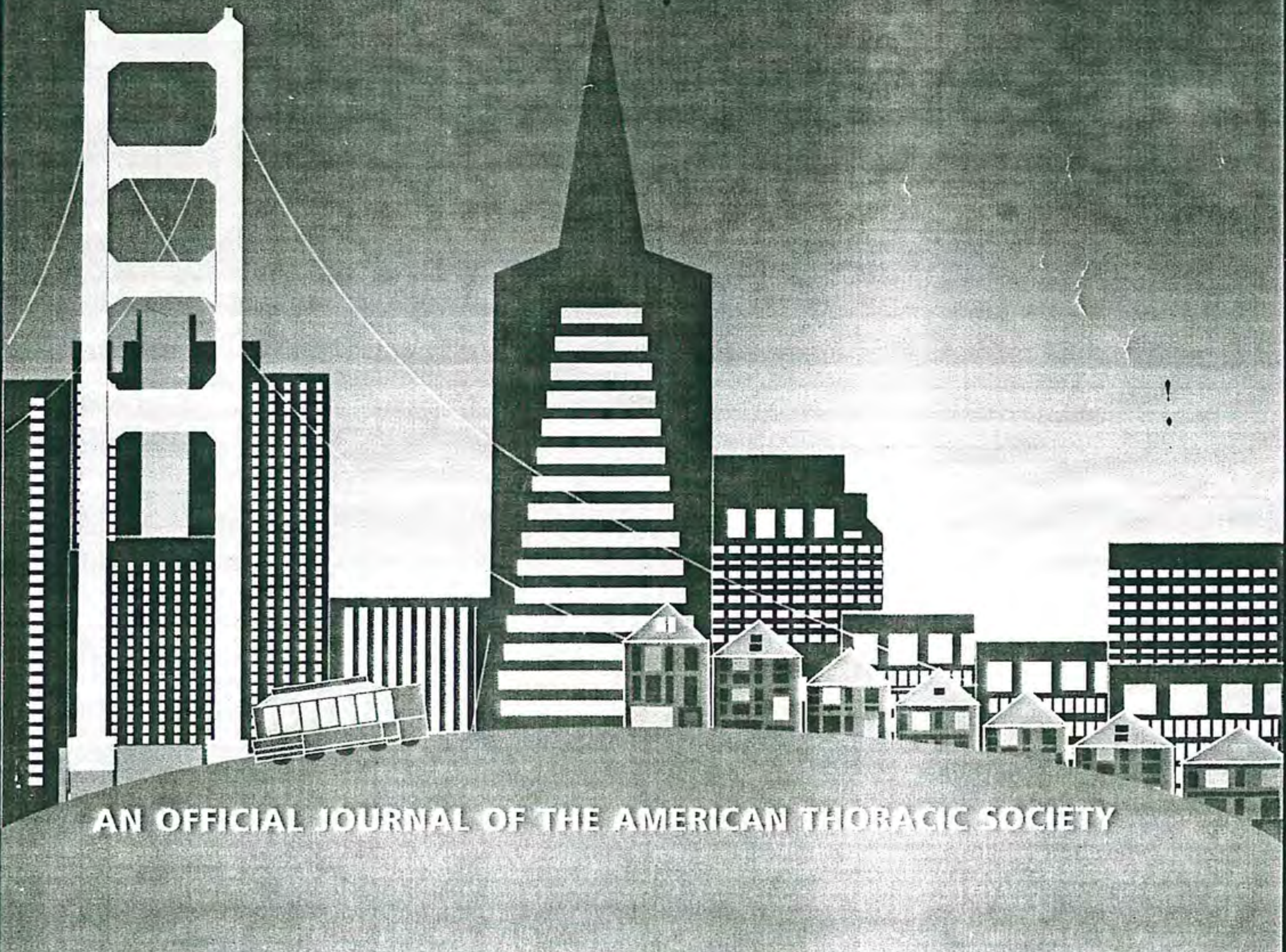
May 18-23
San Francisco, California

VOLUME 175
ABSTRACTS ISSUE
APRIL 2007

www.thoracic.org

AMERICAN JOURNAL OF

Respiratory and Critical Care Medicine



AN OFFICIAL JOURNAL OF THE AMERICAN THORACIC SOCIETY