

## Flutter-Type Mucus-Clearance Devices and Pulmonary Function in the Elderly

The aging of the population is not just a national phenomenon, it is a global reality. Age 85 and older is the fastest growing segment of the population in the United States and worldwide.<sup>1</sup> Unless you are a neonatal or pediatric respiratory therapist, it would be hard to ignore the fact that our patients are getting older and some are indeed quite elderly. In 2003 the United States Census Bureau reported that 35.9 million adults in the United States were 65 and older.<sup>2</sup> Since 2003 the aging population has grown even larger. Research on aging is primarily focused on the biology of aging and the psychosocial aspects of aging. Gerontology research far outweighs geriatric research. And in geriatric research it is not common to see subjects over age 85 included in randomized clinical trials. For these reasons it is refreshing to see in this issue of the Journal the report by Wang et al on clinical research on pulmonary function in healthy subjects 85 years and older.<sup>3</sup>

The American Recovery and Reinvestment Act of 2009, recently signed by President Obama, allocated funds for all areas of aging research. The categories in which research ideas are being solicited cover a wide range of health and science concerns. Realistically, there are challenges in conducting interventional research in older adults. Older adults deemed “healthy” may have pre-clinical, not-yet-diagnosed disease. Levels of ability/disability present challenges, especially in frail elders. Comprehension of the indications for and the goals of research may be difficult for some older adults. Even normal age-related changes such as weaker muscles, altered vision, and reduced hearing may interfere with clinical research. If the older adults you would like to involve in clinical research reside in assisted-living facilities, scheduling around recreational activities and daily patterns may be problematic. Also there can be ethical issues associated with the principle of autonomy, disclosure, and the ability to give informed consent. Nevertheless, the aging population should not and cannot be ignored when it comes to clinical research.

Wang et al<sup>3</sup> conducted a novel randomized controlled interventional study with healthy subjects between the ages of 85 and 95 years, to investigate the use of a new flutter-type mucus clearance device and its effect on pulmonary function in relatively healthy elders. The study was conducted in a nursing home in China, over a period of 28 days. The subjects were screened ahead of time, and Wang et al

excluded persons with diagnosed pulmonary or heart disease or other pathologies. Spirometry was the primary end point. Secondary end points were episodes of fever, antibiotic use, and hospital visits during the 28-day period. Initially, all intervention-group and control-group participants had baseline pulmonary function studies. Forced vital capacity (FVC), FEV<sub>1</sub>, and peak expiratory flow were repeated until 3 acceptable and reproducible results were obtained. Of interest is that no reference ranges were used to document predicted values in these elderly subjects. For decades, pulmonary-function reference values in the elderly were derived by extrapolating values from reference equations for middle-aged adults. Those extrapolated values often overestimated the true lung volumes of healthy older adults.<sup>4</sup> More recently, and with the increased awareness of the growing elderly population, additional studies have established the pulmonary-function normal values for older people, but few studies have included people over age 85.<sup>5-7</sup> Additionally, the quality of spirometry in older adults—from whom it was once deemed almost impossible to get reproducible spirometry values—is now being given the attention it deserves. Pezzoli et al and Bellia et al found that about 80% of adults ages 65–100 years can perform spirometry according to the American Thoracic Society guidelines.<sup>8,9</sup>

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In the Wang et al study,<sup>3</sup> the FVC and FEV<sub>1</sub> values are considerably lower than I would expect. In fact, if the Global Initiative for Chronic Obstructive Lung Disease guidelines were used for interpretation, all of the subjects would be diagnosed with airway obstruction. That, however, is not the salient point. The take-home message is that the FVC improved, and it improved significantly, in the intervention group, which used a simple flutter-type mucus-clearance device of a new design that incorporates a flexible adaptor between the flutter vibration generator and the mouthpiece. This adaptation makes it easier for older subjects to use, because they can adjust the angle of the device rather than adjust their body position for maximal efficacy. The subjects used the flutter device with active but not forceful exhalations, for 5–10 breaths in 5-min sessions, for an average of 3 sessions per day, for

28 days. On day 28, in the intervention group the mean  $\pm$  SD FVC had improved from  $1.78 \pm 0.72$  L to  $2.06 \pm 0.73$  L. The other spirometry values improved also, but not significantly. The number of fevers, occurrences of antibiotic therapy, and hospital visits were 0, 1, and 2 in the intervention group, and 2, 3, and 3 in the control group, and those differences are not significant.

The data generated from the Wang et al study<sup>3</sup> demonstrate that an FVC increase is possible with the regular use of a simple, noninvasive airway-management device. For older adults in assisted-living facilities who are still relatively active, this may be a desirable activity that could preserve some of their pulmonary function. Although the sample size was small ( $n = 55$ ) and the study period short (28 d), the study may open the door to more possible research in 85-and-older people, who are rarely included in clinical research. Perhaps that needs to change.

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The author has disclosed no conflicts of interest.

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## REFERENCES

1. Arenson C, Busky-Whitehead J, Brummel-Smith K, O'Brien JG, Palmer MH, Reichel W, editors. *Reichel's care of the elderly*, 6th edition. Cambridge: Cambridge University Press; 2009
2. Wan H, Sengupta M, Velkoff VA, DeBraros KA; US Census Bureau. Current Population Reports: Special Studies. 65+ in the United States: 2005. Washington DC: US Government Printing Office; December 2005:23-209. <http://www.census.gov/prod/2006pubs/p23-209.pdf>. Accessed August 27, 2010.
3. Wang QX, Zhang XY, Li Q. Effects of a flutter mucus-clearance device on pulmonary function test results in healthy people 85 years and older in China. *Respir Care* 2010;55(11):1449-1452.
4. Garcia-Rio F, Dorgham A, Pino JM, Villasante C, Garcia-Quero C, Alvarez-Sala R. Lung volume reference values for women and men 65 to 85 years of age. *Am J Respir Crit Care Med* 2009;180(11):1083-1091.
5. Baltopoulos G, Fildis G, Karatzas S, Georgiakodis F, Myrianthefs P. Reference values and predictive equations for FVC and FEV<sub>1</sub> in the Greek elderly. *Lung* 2000;178(4):1432-1750.
6. Ostrowski S, Grzwya-Celinska A, Mieczkowska J, Rychlik M, Lachowska-Kotowska P, Lopatyński J. Pulmonary function between 40 and 80 years of age. *J Physiol Pharmacol* 2005;56(Suppl 4):127-133.
7. Sharp DS, Enright PL, Chiu D, Burchfiel CM, Rodriguez BL, Curb JD. Reference values for pulmonary function tests of Japanese-American men aged 71 to 90 years. *Am J Respir Crit Care Med* 1996;153(2):805-811.
8. Pezzoli L, Giardini G, Consonni S, Dallera I, Bilotta C, Ferrario G, et al. Quality of spirometric performance in older people. *Age Ageing* 2003;32(1):43-46.
9. Bellia V, Sorino C, Catalano F, Augugliario G, Schichilone N, Pistelli R, et al. Validation of FEV<sub>6</sub> in the elderly: correlates of performance and repeatability. *Thorax* 2008;63(1):60-66.