

# Clinical implications of cognitive impairment in chronic obstructive pulmonary disease

*"Patients with cognitive difficulties, if undetected and untreated, have lower adherence to their treatment and follow-up regimens, and as a consequence may deteriorate more rapidly and have worse health outcomes."*

Chronic obstructive pulmonary disease (COPD) is a prevalent chronic illness that causes significant morbidity and mortality. In a recent study, we found that severe COPD (defined as need for oxygen therapy or activity limitation) is associated with poorer cognition over time [1]. Our finding is consistent with results from other smaller studies that have examined the relationship between COPD and cognition [2,3]. Cognitive decline, in the setting of COPD, can have significant implications on treatment and prognosis. Clinicians need to be aware of these issues when caring for patients with COPD.

## Treatment implications

COPD is a disabling disease that leads to a decline in physical function because of decreased pulmonary reserve and dyspnea [4-7]. The performance of mobility-related activities such as ambulation and housework often decline with worsening COPD. Our finding that cognitive decline occurs more often among those with severe COPD further complicates matters. For patients with severe COPD who are already physically disabled, the additional difficulty with mental tasks can further threaten their ability to live independently.

Most literature describing the clinical impact of cognitive decline focuses on neurodegenerative diseases, such as Alzheimer's disease, or vascular dementia, which are the cognitive disorders more commonly seen in the elderly population [8-11]. These studies have demonstrated that cognitive decline, measured using objective cognitive tests, correlates with and predicts functional decline [12-14]. The tasks that require more mental capabilities, such as money management and medication management, are more greatly affected [8]. While studies have not directly measured the effect of cognitive decline on COPD management and outcomes, we can estimate the effect of cognitive decline on

impairment of function among this population using these same scales and applying them to the COPD population [1].

Cognitive decline among patients with COPD may lead to further functional decline and poorer self-care. Patients with severe disease, in particular, need to have cognitive and functional abilities to perform complex self-management behaviors such as adhering to medications including inhalers and oxygen, following action plans, smoking cessation, exercise and other routine care. In addition, patients with severe COPD often have multiple co-morbid chronic conditions, which further complicate treatment regimens and plans. Patients with cognitive difficulties, if undetected and untreated, have lower adherence to their treatment and follow-up regimens, and as a consequence may deteriorate more rapidly and have worse health outcomes. This rapid deterioration could indeed lead to even worse cognitive functioning. It is therefore important for clinicians to be sensitive to the cognitive change of COPD patients.

\*\*\*\*\*  
*"For COPD patients who frequently miss appointments, medication or have frequent hospitalizations, the use of a cognitive screen for identifying cognitive impairment may be even more important."*  
 \*\*\*\*\*

In clinical practice, the use of a cognitive screen can help to identify patients with cognitive difficulties. Commonly used tools, such as the Mini-Mental Status Examination [15] and the Short Portal Mental Status Questionnaire [16], are short and easy to use at the bedside. For COPD patients who frequently miss appointments, medication or have frequent hospitalizations, the use of a cognitive screen for identifying cognitive impairment may be even more important. The identification of cognitive impairment should



**William W Hung<sup>1,2†</sup>**

<sup>†</sup>Author for correspondence:

<sup>1</sup>Department of Geriatrics and Adult Development,  
One Gustave L Levy Place,  
Box 1070, Mount Sinai School  
of Medicine, New York,  
NY, USA

Tel.: +1 212 241 9210

Fax: +1 212 860 9737

william.hung@mssm.edu

<sup>2</sup>James J Peters VA Medical  
Center, NY, USA



**Juan P Wisnivesky<sup>1</sup>**

<sup>1</sup>Department of Geriatrics and  
Adult Development,  
One Gustave L. Levy Place,  
Box 1070, Mount Sinai School  
of Medicine, NY, USA

be followed by interventions that help improve functioning and adherence. On the other hand, periodic cognitive screening for patients with COPD is more controversial. To our knowledge, no prior studies have examined the effect of periodic cognitive screening on patient outcomes among patients with COPD. In light of our finding that there is cognitive decline over time among those with severe COPD [1], it is reasonable to consider periodic cognitive testing in this population. Whether testing is needed in patients with milder forms of COPD should be further explored given the low prevalence of cognitive decline in this population.

■■■■■■■■  
*“Assessment of medical decision-making ability, and early discussion and appointment of an alternate healthcare decision maker, are all aspects of care important for severe COPD patients who may suffer from cognitive decline over time.”*  
 ■■■■■■■■

Cognitive impairment may affect a patient's ability to make medical decisions. Medical decision-making requires cognitive abilities to understand medical information and appreciate consequences of decisions. Assessment of medical decision-making ability, and early discussion and appointment of an alternate healthcare decision maker, are all aspects of care important for severe COPD patients who may suffer from cognitive decline over time. Based on lessons learned from caring for geriatric patients with cognitive impairment, coordination of care targeting medication and treatment adherence using a visiting nurse, telephone reminders or multidisciplinary involvement may lead to improved patient outcomes. However, further research is necessary to evaluate the best strategies for caring for these patients.

### Prognostic implications

COPD and cognitive impairment are both independently associated with increased mortality and morbidity [17], but the effect of co-morbid cognitive impairment in COPD is not clear. Although it is likely that those with cognitive impairment have poorer self-management and thus, worse outcomes, this association has not been clearly demonstrated in the literature. A prior study has demonstrated that drawing impairment of a landmark test, which is a test

of executive cognitive ability, predicts mortality [18]. However, the mechanism underlying this association is unknown. Cognitive impairment in COPD could be just a marker for more severe COPD; alternatively, cognitive decline could modify the course of COPD. Further studies are required to distinguish between these two potential mechanisms. Furthermore, it is unclear whether cognitive decline among those with severe COPD is reversible, or can be mitigated using existing therapies and medications. Considering that the mechanism of cognitive impairment in COPD may be related to hypoxia and alterations in cerebral perfusion, oxygen therapy may help to alleviate progression or reverse cognitive decline in COPD. Additionally, therapies targeted at vascular risk-factor modification may also impact cognition in COPD. Further studies are also required to address these issues.

### Future perspective

Severe COPD is associated with cognitive decline. A logical next step to further understand the impact of cognitive decline would be to prospectively examine the relationship between cognition, COPD self-management, morbidity outcomes (frequency of exacerbations and functional impairment and healthcare utilization), and mortality among patients with COPD in a longitudinal study. Once the impact of cognitive decline on COPD outcomes is clarified, research should focus on the mechanisms underlying this association and potential targets for interventions. In conclusion, there is increased evidence that COPD is a chronic disease that affects multiple systems and body functions, one of which is cognition. Further understanding of cognitive impairment in COPD can ultimately help improve the care of patients with severe COPD.

### Financial & competing interests disclosure

*Dr William Hung has no relevant financial interest to disclose. Dr Juan Wisnivesky received an honorarium for serving on a research advisory board for EHE International and was a recipient of an unrestricted research grant from GlaxoSmithKline. The authors have no other relevant affiliations or financial involvement with any organization or entity with a financial interest in or financial conflict with the subject matter or materials discussed in the manuscript apart from those disclosed.*

*No writing assistance was utilized in the production of this manuscript.*

## Bibliography

- 1 Hung WW, Wisnivesky JP, Siu AL, Ross JS: Cognitive decline among patients with chronic obstructive pulmonary disease. *Am. J. Respir. Crit. Care Med.* 180(2), 134–137 (2009).
- 2 Incalzi RA, Gemma A, Marra C *et al.*: Verbal memory impairment in COPD: its mechanisms and clinical relevance. *Chest* 112, 1506–1513 (1997).
- 3 Incalzi RA, Corsonello A, Pedone C *et al.*: Construct Validity of Activities of Daily Living Scale: A clue to distinguish the disabling effects of COPD and congestive heart failure. *Chest* 127, 830–838 (2005).
- 4 Corsonello A, Pedone C, Incalzi RA: Functional status in chronic obstructive pulmonary disease. *Am. J. Med.* 120(10), E9 (2007).
- 5 Reardon Z, Lareau SC, ZuWallack R: Functional status and quality of life in chronic obstructive pulmonary disease. *Am. J. Med.* 119(10A), S32–S37 (2006).
- 6 Eisner MD, Iribarren C, Yelin EH *et al.*: Pulmonary function and the risk of functional limitation in chronic obstructive pulmonary disease. *Am. J. Epidemiology* 167(9), 1090–1101 (2008).
- 7 Eisner MD, Blanc PD, Yelin EH *et al.*: COPD as a systemic disease: impact on physical functional limitations. *Am. J. Med.* 121(9), 789–796 (2008).
- 8 Grigsby J, Kaye K, Baxter J *et al.*: Executive cognitive abilities and functional status among community-dwelling older persons in the San Luis Valley Health and Aging Study. *J. Am. Geriatr. Soc.* 46(5), 590–596 (1998).
- 9 Dodge HH, Kadowaki T, Hayakawa T *et al.*: Cognitive impairment as a strong predictor of incident disability in specific ADL-IADL tasks among community-dwelling elders: the Azuchi Study. *Gerontologist* 45(2), 222–230 (2005).
- 10 Gama EV, Damian JE, Molino J *et al.*: Association of individual activities of daily living with self-rated health in older people. *Age Ageing* 29(3), 267–270 (2000).
- 11 Barberger-Gateau P, Commenges D, Gagnon M *et al.*: Instrumental activities of daily living as a screening tool for cognitive impairment and dementia in elderly community dwellers. *J. Am. Geriatr. Soc.* 40(11), 1129–1134 (1992).
- 12 Warren EJ, Grek A, Conn D *et al.*: A correlation between cognitive performance and daily functioning in elderly people. *J. Geriatr. Psychiatry Neurol.* 2, 96–100 (1989).
- 13 Cromwell DA, Eagar K, Poulos RG: The performance of instrumental activities of daily living scale in screening for cognitive impairment in elderly community residents. *J. Clin. Epidemiol.* 56, 131–137 (2003).
- 14 Ford GR, Haley WE, Thrower SL *et al.*: Utility of Mini-Mental State Exam scores in predicting functional impairment among white and African-American dementia patients. *J. Gerontol. A Biol. Sci. Med. Sci.* 51(4), M185–M188 (1996).
- 15 Folstein MF, Folstein SE, McHugh PR: 'Mini-mental state'. A practical method for grading the cognitive state of patients for the clinician. *J. Psychiatr. Res.* 12(3), 189–198 (1975).
- 16 Pfeiffer E: A short portable mental status questionnaire for the assessment of organic brain deficit in elderly patients. *J. Am. Geriatr. Soc.* 23, 433–441 (1975).
- 17 van Gelder BM, Tijhuis MA, Kalmijn S, Giampaoli S, Kromhout D: Decline in cognitive functioning is associated with a higher mortality risk. *Neuroepidemiology* 28(2), 93–100 (2007).
- 18 Antonelli-Incalzi R, Corsonello A, Pedone C *et al.*: Drawing impairment predicts mortality in severe COPD. *Chest* 130(6), 1687–1694 (2006).