The authors respond:

We appreciate and agree with Mr Haynes's comment that bronchodilator responsiveness and air flow obstruction may exist in the absence of wheezing. Indeed, as pointed out in 1974 by Loke and Anthonisen[1] and as observed in a cohort of 1,129 individuals with alpha-1 antitrypsin deficiency who underwent serial spirometry with bronchodilator testing[2] the prevalence of reversible air flow obstruction in patients with emphysema is high (approximately 60–70% on serial testing). Further confounding the relationship between wheezing and lung function is the fact that wheezing can occur in the absence of air flow obstruction, as in forced maneuvers,[2,3] and in individuals with vocal cord dysfunction syndromes.[4]

Foregoing bronchodilator treatment in an asthma or COPD patient because he or she is not wheezing at the time of assessment runs the risk of under-treating air flow obstruction, but a policy of administering bronchodilators whenever ordered overlooks the issue raised in our series: that many hospitalized patients are prescribed to receive bronchodilators in the absence of any evidence of asthma, COPD, or wheezing. Indeed, though beyond the scope of the discussion in the report that Mr Haynes cites, our protocols respect the consistent administration of bronchodilators to patients prescribed to receive these medications at home or who have a history of obstructive lung disease.[5,6] In this regard, omitting a bronchodilator treatment with such a patient would be regarded in the reported series (and in our practice in general) as a missed treatment, regardless of whether wheezing was present. As we suspect Mr Haynes would agree, bronchodilators may sometimes be prescribed in the absence of even the most liberal indication. Indeed, it could be argued that in such patients, prescribing bronchodilators represents *over-ordering* and demonstrates the widely observed phenomenon of *misallocation* of respiratory care treatments,[7] which has been so amply demonstrated in available studies.[8,9] To this extent, foregoing bronchodilators with patients lacking any indication could be regarded as appropriate care and might not be construed as a missed medication. In the context of this issue we examined the impact of not counting these patients as having missed medications and observed that the already low prevalence of missed medications decreased further, from 3.5% to 2.9%.[10]

Overall, while recognizing that missed medications can pose risk related to under-treating patients truly in need and likely to benefit from their administration, we emphasize that the frequency of missed medications was low in our series,[10] even when we count missed therapies strictly as those deemed indicated by clinically attentive protocols. At the same time we wish not to lose sight of the fact that omitting bronchodilator treatments to patients who lack air flow obstruction or wheezing remains a reasonable, in fact laudable, clinical goal as we try to optimize the allocation of respiratory care services.

James K Stoller MD MSc FAARC
Douglas K Orens MBA RRT
Lucy Kester MBA RRT FAARC
Section of Respiratory Therapy
Department of Pulmonary and
Critical Care Medicine
The Cleveland Clinic Foundation
Cleveland, Ohio

REFERENCES

1. Loke J, Anthonisen NR. Effect of intermittent positive pressure breathing on steady state chronic obstructive pulmonary disease. Am Rev Respir Dis 1974;110(6 Pt 2):178–182.
2. Survival and FEV_1 decline in individuals with severe deficiency of $alpha_1$-antitrypsin. The Alpha-1-Antitrypsin Deficiency Registry Study Group. Am J Respir Crit Care Med 1998;158(1):49–59.
3. King DK, Thompson BT, Johnson DC. Wheezing on maximal forced exhalation in the diagnosis of atypical asthma: lack of sensitivity and specificity. Ann Intern Med 1989;110(6):451–455.
4. Aboussouan LS, Stoller JK. Diagnosis and management of upper airway obstruction. Clin Chest Med 1994;15():35–53.
5. Stoller JK, Haney D, Burkhart J, Fergus L, Giles D, Hoisington E, et al. Physician-ordered respiratory care vs physician-ordered use of a respiratory therapy consult service: early experience at The Cleveland Clinic Foundation. Respir Care 1993; 38(11):1143–1154.
6. Stoller JK, Mascha EJ, Kester L, Haney D. Randomized controlled trial of physician-directed versus respiratory therapy consult service-directed respiratory care to adult non-ICU inpatients. Am J Respir Crit Care Med 1998;158(4):1068–1075.
7. Stoller JK. Misallocation of respiratory care services: Time for a change (editorial). Respir Care 1993;38(3):263–266.
8. Stoller JK. Respiratory therapist-driven protocols: rationale and efficacy. West J Med 1997;167(6):408–410.
9. Stoller JK. The rationale for respiratory care protocols: an update. Respir Care 1998; 43(9):719–723.
10. Stoller JK, Orens DK, Kester L. Missed bronchodilator medication treatments in respiratory therapy: frequency and underlying causes. Respir Care 2003;48(2):110–114.