can vary. Inflammation control can be improved by a leukotriene modifier or small dose theophylline, in which case a rapid acting β_2 agonist used only as needed.

- *Severe, persistent symptoms*. Add corticosteroid tablets in the morning to this regimen.

Principle 3: Treat exacerbations early

- Increase inhaled steroid dose 2–4-fold for 2 weeks. Use β_2 agonist regularly as well.
- With no improvement in 1–2 days, add corticosteroid tablets 20–40 mg in the morning for 10 days.
- Prevent further exacerbations by adjusting regular treatment; give long acting β_2 agonist, leukotriene modifier, or small dose theophylline for longer periods of time.

Principle 4: Educate the patient, provide a written self-management plan

- If disease control is not optimal, guide the patient to use peak flow measurements at home.
- If symptoms increase and morning peak flow decreases by more than 30% or by more than 15% on two consecutive mornings, treat like an exacerbation.

LUNG ALERT

Is the time taken for sputum cultures to become negative in multidrug-resistant TB related to treatment outcome?

▲ Holtz TH, Sternberg M, Kammerer S, *et al*. Time to sputum culture conversion in multidrug-resistant tuberculosis: predictors and relationship to treatment outcome. *Ann Intern Med* 2006;**144**: 650–69

Periodic sputum culture is used to monitor treatment efficacy in multidrug resistant tuberculosis (TB), and conversion of cultures from positive to negative for *Mycobacterium tuberculosis* is the most important indicator of progress. However, few studies have reported or evaluated sputum culture conversion status as an interim indicator of final treatment outcome. This study examined this and factors influencing the time to conversion.

This retrospective study looked at all patients with drug resistant TB identified from the Latvian national tuberculosis registry who began treatment with second line anti-TB drugs under the WHO DOTS-plus strategy in 2000 and who had positive sputum cultures at this time (n = 167). 77% of the cohort achieved sputum culture conversion, 23% did not. The median time to initial conversion was 83 days. Those who did not convert were more likely to have a previous history of treatment for multidrug resistant TB, to have a history of incarceration, and to have resistance to a greater number of drugs at treatment initiation.

Univariate and multivariate regression analysis showed that previous treatment for multidrug resistant TB, bilateral cavitations on initial chest radiography, high colony count on initial sputum culture, and resistance to more drugs at the time of initiation were associated with a significantly longer time to initial sputum culture conversion. HIV status had no such predictive value. The median initial sputum culture conversion time was 48 days among those who were cured or completed treatment versus 169 days among those with a poor outcome (death, treatment default and treatment failure; $p<0.001$). Conversely, a good treatment outcome was seen in 86% of those 129 who achieved sputum conversion within 60 days compared with 51% of those who did not do so within that period.

This study suggests that early sputum conversion is indeed a positive predictor of a successful outcome. These findings lend credence to the usefulness of monitoring sputum cultures as a means of assessing treatment efficacy and give rise to the possibility of identifying patients who might benefit from more aggressive intervention from the offset. The authors point out that limitations of their study include up to four missing sputum cultures in 75% of patients and, because of the nature of the study, the inability to count the actual number of days to sputum conversion as cultures were performed monthly.

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