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## Outcomes and costs of out-patient MDR-TB care in the USA

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We recently published an analysis of the characteristics and costs of in-patient care for multidrug-resistant tuberculosis (MDR-TB) in the United States, which extended previous analyses of a population-based sample of MDR-TB cases reported to the US Centers for Disease Control and Prevention from 2005 to 2007 and treated through 2012.<sup>1,2</sup> These analyses did not focus on patients who were treated only in out-patient settings. Out-patient outcomes are important to document because the evidence behind the conditional recommendation by the World Health Organization to treat MDR-TB patients using mainly ambulatory care rather than hospitalization is of very low quality.<sup>3</sup> The rationale for the recommendation was to reduce resource use and treatment delays, which contribute to transmission in facilities and the community.

We performed a secondary analysis of the population-based sample of 135 US MDR-TB patients to describe the characteristics, outcomes, and costs for 37 patients treated only in out-patient settings versus those with some in-patient care. Compared to patients receiving some in-patient care, patients aged 15–24 years ( $n = 24$ ) had greater odds of out-patient-only treatment than patients aged  $\geq 25$  years ( $n = 111$ ) (odds ratio [OR] 2.8, 95% confidence interval [CI] 1.1–6.9). No patient with human immunodeficiency virus (HIV) infection, end-stage renal disease, or cancer, and one diabetic patient had out-patient-only care. Patients with acid-fast bacilli sputum smear-positive TB (OR 0.24, 95% CI 0.10–0.56), cavitary (OR 0.26, CI 0.11–0.64), multilobe (OR 0.19, 95% CI 0.08–0.46), or miliary (0%) disease had lower odds of out-patient-only treatment.

While the numbers of patients were small, there was no significant association between sputum culture conversion or acquired drug resistance and outpatient-only care. None of the

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12 patients who died during treatment or the two who experienced serious adverse reactions, resulting in treatment discontinuation, were treated in out-patient settings only. Excluding those who died (one at diagnosis and 12 during treatment), who were significantly more likely to be aged  $\geq 65$  years or have HIV infection, there were no significant differences in treatment completion of outpatient-only and hospitalized patients (OR 0.57, 95% CI 0.20–1.64). Including deaths among those who did not complete treatment, and controlling for age  $\geq 65$  years and HIV status, treatment completion was not significantly affected by out-patient-only treatment (adjusted OR 0.97, 95% CI 0.35–2.66). Out-patient-only treatment completion averaged \$104 000 (median \$79 000) in 2015 US dollars, vs. \$210 000 (median \$167 000) for patients with some in-patient care. Not surprisingly, US MDR-TB patients treated entirely in out-patient settings were younger, had fewer comorbidities, and were less likely to die, and completed treatment successfully at half the cost of those with some in-patient care.

In the United States, where the risk of nosocomial transmission is lessened due to the use of negative-pressure isolation rooms while patients are infectious and infection control measures are in place, nearly three fourths of MDR-TB patients are hospitalized at some point to reduce MDR-TB transmission in the community or to provide the complicated care required for adequate treatment, especially for patients with comorbidities. Some MDR-TB patients may be retained in out-patient care because they are less sick, resulting in significantly lower costs, but still good outcomes.

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