adjunctive corticosteroid therapy for tuberculous pleural effusions, and a number of studies have examined the risks and benefits of this approach [308]. Four have been prospective, double blind, and randomized [309–311], one of which was conducted in patients with HIV infection [312]. In all 4 studies, prednisone (or prednisolone) administration did not confer a beneficial effect on residual pleural thickening or prevention of other long-term pleural sequelae. In one study, an increased risk for Kaposi sarcoma was noted with the use of prednisolone in HIV-associated tuberculous pleurisy [312]. Based on these randomized clinical trials and a systematic review, there is no evidence to support the routine use of adjunctive corticosteroids in patients with tuberculous pleurisy.

Tuberculous empyema, a chronic, active infection of the pleural space containing a large number of tubercle bacilli, usually occurs when a cavity ruptures into the pleural space. Treatment consists of drainage (often requiring a surgical procedure) and antituberculous chemotherapy [313]. The optimum duration of treatment for this unusual form of tuberculosis has not been established.

#### Tuberculous Meningitis

Tuberculous meningitis remains a potentially devastating disease associated with a high morbidity and mortality in children and adults, despite prompt initiation of adequate chemotherapy [314]. HIV-infected individuals appear to be at increased risk for developing tuberculous meningitis, but the clinical features of the disease are similar to those in tuberculous meningitis patients without HIV infection [315–317]. High short-term morbidity and mortality is reported regardless of HIV serostatus [315–317]; however, 9-month survival was further decreased in HIV-infected patients compared with HIV-uninfected patients in one cohort study [318].

Chemotherapy for tuberculous meningitis is initiated with INH, RIF, PZA, and EMB in an initial 2-month phase. After 2 months of 4-drug therapy, for meningitis known or presumed to be caused by susceptible strains, PZA and EMB may be discontinued, and INH and RIF continued for an additional 7–10 months, although the optimal duration of chemotherapy is not defined. Based on expert opinion, repeated lumbar punctures should be considered to monitor changes in cerebrospinal fluid cell count, glucose, and protein, especially early in the course of therapy. In children with tuberculous meningitis, the AAP lists an initial 4-drug regimen of INH, RIF, PZA, and ethionamide or an aminoglycoside for 2 months (in place of EMB), followed by 7–10 months of INH and RIF [77]. There are no data from controlled trials to guide the selection of EMB vs an injectable or ethionamide as the fourth drug for tuberculosis meningitis [78]. Most societies and experts recommend the use of either an injectable or EMB. For adults, based on expert opinion, our writing committee prefers using EMB as the fourth drug. Fluoroquinolones, as well as higher doses of intravenous RIF, are being evaluated in adults with tuberculous meningitis [291, 319]; a large randomized controlled trial (ISRCTN61649292) is under way to evaluate the impact on reducing mortality of levofloxacin combined with higher-dose rifampicin during the intensive phase of treatment [320]. Selected complications of tuberculous meningitis warranting neurosurgical referral include hydrocephalus, tuberculous cerebral abscess, and clinical situations in which there is paraparesis [78].

A number of studies have examined the role of adjunctive corticosteroid therapy in the treatment of tuberculous meningitis [79–91]. Our updated systematic review found a mortality benefit from the use of adjuvant corticosteroids (See Supplementary Appendix B, Evidence Profile 15). Therefore, we recommend adjunctive corticosteroid therapy with dexamethasone or prednisolone tapered over 6–8 weeks for patients with tuberculous meningitis (Recommendation 8: *strong recommendation; moderate certainty in the evidence*).

#### Disseminated Tuberculosis

Based on expert opinion, a standard daily 6-month regimen (Table 2) is adequate for tuberculosis at multiple sites and for miliary tuberculosis; however, supporting data from controlled clinical trials are limited. Some experts believe concurrent corticosteroid therapy is indicated for treating severe respiratory failure or adrenal insufficiency caused by disseminated tuberculosis [321–323], though the role of adjunct corticosteroid treatment in patients with miliary tuberculosis remains unclear [324]. Patients with disseminated tuberculosis may have concomitant neurologic complications, with indolent symptoms of CNS involvement, which should be appropriately worked up [325]. Treatment recommendations for tuberculous meningitis are followed when there is CNS involvement.

#### Genitourinary Tuberculosis

Renal tuberculosis is treated primarily with medical rather than surgical therapy, and expert opinion is that a standard daily 6-month regimen (Table 2) is adequate [326–329]. If ureteral obstruction occurs, procedures to relieve the obstruction are indicated. In cases of hydronephrosis and progressive renal insufficiency due to obstruction, renal drainage by stenting or nephrostomy is advised by experts [330]. Nephrectomy is considered when there is a nonfunctioning or poorly functioning kidney, particularly if hypertension or continuous flank pain is present. Dose adjustment is required in patients with coexistent renal failure. Tuberculosis of the female or male genital tract responds well to standard chemotherapy, although surgery may be indicated for residual, large, tubo-ovarian abscesses.

A positive urine culture for *M. tuberculosis* is a component of the diagnostic assessment of genitourinary tuberculosis [331]. A positive urine culture for *M. tuberculosis* is also sometimes seen in tuberculosis patients with advanced HIV infection, and may reflect disseminated disease and/or occult genitourinary tract involvement. Rarely, a positive culture may occur in the