latent TB.[45] Some caution should be exercised in prescribing rifampin in patients receiving glucocorticoids, as rifampin may decrease the bioavailability of glucocorticoids.
- Infection with the helminth *Strongyloides stercoralis* should be screened for and treated in at-risk individuals prior to the initiation of immunosuppression, especially glucocorticoids. The diagnosis, treatment, and prevention of hyperinfection from *Strongyloides* has recently been reviewed.[46] Eosinophilia, and high serum IgE levels, may raise suspicion in an otherwise asymptomatic individual from an endemic area. *Strongyloides* may be transformed from an asymptomatic infection to a potentially lethal systemic disease (hyperinfection syndrome) by exposure to as little as a few days of glucocorticoid therapy. In patients at risk of harboring asymptomatic *Strongyloides* in whom glucocorticoid therapy is contemplated, screening is advised. The least expensive type is stool examination for ova and parasites. In the event that screening is unavailable or delayed in a high-risk patient, some have advocated for empiric treatment with ivermectin or second-line agents if ivermectin is contraindicated or unavailable.

Vaccinations and prophylaxis

Adults and children with GN and NS (as well as CKD in general) are at increased risk of invasive pneumococcal infection, and they as well as their household contacts should receive pneumococcal vaccination with the heptavalent conjugate vaccine (7vPCV) and the 23-valent polysaccharide vaccine (23vPPV) as well as the annual influenza vaccination. The response does not seem to be impaired by concurrent glucocorticoid therapy. Vaccination with live vaccines (measles, mumps, rubella, varicella, rotavirus, yellow fever) is contraindicated while on immunosuppressive or cytotoxic agents and should be deferred until prednisone dose is <20 mg/d and/or immunosuppressive agents have been stopped for at least 1–3 months. Following treatment of the first episode of SSNS, nonimmunized children should be vaccinated with live vaccines as soon as possible, especially varicella zoster virus.

Patients receiving complement antagonists should be vaccinated with both a meningococcal conjugate vaccine (MenACWY) and a serogroup B meningococcal vaccine (MenB). As these vaccinations may confer only partial protection from meningococcal infection, the Centers for Disease Control recommend consideration of concomitant meningococcal antibiotic prophylaxis (https://www.cdc.gov/meningococcal/clinical/eculizumab.html).

Exposure to varicella can be life-threatening, especially in children. Treatment should be given with zoster immune globulin if exposure does occur, and antiviral therapy with acyclovir or valaciclovir begun at the first sign of chickenpox lesions (see Chapter 4, SSNS for additional details on management in children). Herpes zoster prevention is recommended. The live, attenuated Zostavax® vaccine is contraindicated in patients who are immunosuppressed and immunodeficient. The newer recombinant Shingrix vaccine is safe, but immunosuppression may reduce its efficacy.

Immunize healthy household contacts with live vaccines to minimize the risk of transfer of infection to an immunosuppressed child, but avoid direct exposure of the child to gastrointestinal, urinary, or respiratory secretions of vaccinated contacts for 3–6 weeks after vaccination.

As noted below, prophylactic trimethoprim–sulfamethoxazole (TMP-SMX) should be administered during periods of high-dose prednisone therapy to prevent *Pneumocystis* infection. This strategy may also apply to other immunosuppressive agents such as rituximab.

Practice Point 1.8.1: Use pneumococcal vaccine in patients with glomerular disease and nephrotic syndrome, as well as patients with chronic kidney disease (CKD). Patients and household contacts should receive the influenza vaccine. Patients should receive herpes zoster vaccination (Shingrix).

Practice Point 1.8.2: Screen for tuberculosis (TB), hepatitis B virus (HBV), hepatitis C virus (HCV), human immunodeficiency virus (HIV), and syphilis in clinically appropriate patients (Chapter 7).

Practice Point 1.8.3: Strongyloides superinfection should be considered in patients receiving immunosuppression who once resided in endemic tropical environments and who have eosinophilia and elevated serum immunoglobulin E (IgE) levels.

Practice Point 1.8.4: Prophylactic trimethoprim–sulfamethoxazole (TMP-SMX) should be considered in patients receiving high-dose prednisone or other immunosuppressive agents (rituximab, cyclophosphamide).

Atovaquone or pentamidine may be substituted for the sulfa-allergic. This suggestion is mainly based on studies of immunosuppressed patients without glomerular disease.

Research recommendations

- Further studies concerning prevention and treatment of infections developing in patients with glomerular disease receiving immunosuppressive agents
- Additional research to better understand the management of immunosuppression-induced hypogammaglobulinemia

1.9 Outcome measures

Remissions, kidney failure, mortality

A definitive assessment of the efficacy of a treatment for GN requires the demonstration that kidney failure has been prevented or substantially delayed, mortality reduced, or quality of life improved. The Standardised Outcomes in Nephrology