Aspiration or biopsy is essential to guide antimicrobial therapy. Consultation with a clinical microbiologist or an infectious diseases physician in challenging cases is advisable. Additional pharmacological considerations include CNS penetration and parenteral administration. Empirical therapy should be commenced after aspiration while awaiting culture results and should be guided by likely pathogens. Antimicrobial therapy - general principles:

- Choice of antimicrobials should be guided by culture results, given the diversity of pathogens and the need for prolonged therapy (6-8 wks).
- Additional pharmacological considerations include CNS penetration and parenteral administration.
- Empirical therapy should be commenced after aspiration while awaiting culture results and should be guided by likely pathogens.

Antimicrobials - non-immunocompromised patients without prior neurosurgery:

- For empirical therapy following aspiration, use:
  - Benzylpenicillin 2.4 g (child: 60 mg/kg up to 2.4 g) IV, 4-hourly PLUS ceftriaxone 4 g (child: 100 mg/kg up to 4 g) IV, daily or ceftriaxone 2 g (child: 50 mg/kg up to 2 g) IV, 12-hourly OR cefotaxime 2 g (child: 50 mg/kg up to 2 g) IV, 6-hourly.

Antimicrobials - non-immunocompromised patients with prior neurosurgery:

- For post-neurosurgical brain abscess, use:
  - Vancomycin 12.5 mg/kg up to 500 mg (child <12 years: 15 mg/kg up to 500 mg) IV, 6-hourly (current evidence for this indication is based on 6 hourly dosing) PLUS EITHER
celfazidime 2 g (child: 50 mg/kg up to 2 g) IV, 8-hourly OR meropenem 2 g (child: 40 mg/kg up to 2 g) IV, 8-hourly.
- Additional tests for culture negative brain abscess include HIV serology, serum crytococcal antigen, and toxoplasmosis titre.
- Modify therapy on the basis of Gram stain and culture results.
- The duration of treatment depends on clinical response and radiological evidence of resolution.

- In selected cases brain abscesses can be treated with antimicrobials alone, particularly when the causative agent is known and the lesion is <2.5 cm.
- Medical management may also be necessary when the lesion is inaccessible or surgical intervention poses unacceptable risk.
- Steroids should not be routinely used but are often used if oedema is severe.

Treatment of the immunocompromised patient:

(i) Nocardiosis
- Brain abscess is a common manifestation of disseminated nocardiosis in the immunocompromised.
- For Nocardia asteroides and other species susceptible to sulfonamides, IV or oral trimethoprim + sulfamethoxazole is the usual initial treatment: trimethoprim + sulfamethoxazole 160 + 800 mg (child: 4 + 20 mg/kg up to 160 + 800 mg) IV or orally, 6-hourly for 3 to 4 weeks FOLLOWED BY trimethoprim + sulfamethoxazole 160 + 800 mg (child: 4 + 20 mg/kg up to 160 + 800 mg) orally, 12-hourly for 3 to 6 months.
- Combination therapy with trimethoprim + sulfamethoxazole PLUS amikacin has shown promise as empirical therapy, and in difficult cases that were slow to respond to trimethoprim + sulfamethoxazole alone.
- Alternative therapy using drugs such as amoxyclillin + clavulanate, meropenem, ceftriaxone, minocycline, amikacin or linezolid have all been reported to be successful in small numbers of cases, particularly for some of the more unusual species.

Ongoing treatment for 6 to 12 months with oral trimethoprim + sulfamethoxazole may be needed.

(ii) Toxoplasmosis:
- In AIDS, cerebral infection with Toxoplasma gondii is common. Use: sulfadiazine 1 to 1.5 g (child: 50 mg/kg up to 1.5 g) orally or IV, 6-hourly PLUS pyrimethamine 50 to 100 mg (child: 2 mg/kg up to 50 to 100 mg) orally, for the first dose, then 25 to 50 mg (child: 1 mg/kg up to 50 mg) orally, daily.
- Duration of therapy is for 3 to 6 weeks depending on clinical response. Relapse is common, so maintenance therapy with half the above dosages is necessary while the patient is immunosuppressed.
- For patients allergic to sulfonamides, substitute for sulfadiazine, clindamycin 600 mg (child: 15 mg/kg up to 600 mg) orally or IV, 6-hourly.

Pyogenic brain abscess is characterised by a localised suppurative infection of parenchymal CNS tissue which evolves to necrosis and frank suppuration. The initial stage, characterised by vascular congestion, petechial haemorrhage, cerebral oedema and tissue softening is demonstrable by MRI. As cerebritis progresses, CT findings become abnormal, revealing a capsule like hyperaemic zone surrounding the area of inflammation. As the abscess matures, a dense capsule is formed. In relatively avascular areas of the brain, capsule formation is delayed. Once it forms, however, the capsule resolves slowly.

In the preantibiotic era, contiguous foci (middle ear, sinuses, mastoids) caused most brain abscesses; however, more commonly now cases are due to distant foci of infection or originate for unknown sites.

With haematogenous spread, abscesses tend to seed along the middle cerebral artery distribution.

- Variable signs and symptoms of brain abscess relate to variations in location, size, and rapidity of development. At one extreme, the course may span weeks with few constitutional symptoms. At the other extreme, a previously asymptomatic brain abscess may rupture into the subarachnoid space and cause death within hours.
- Brain abscess usually progresses subacutely for 7 to 14 days. Classic symptoms include excruciating headache, low grade fever, and focal neurological signs.
- Occasionally, a patient has no symptoms referable to the CNS and fever may be absent in as many as 50% of cases.

Parameningeal focus spread to brain abscess as inflammatory process erodes through bone and meningeal tissues.

- Chronic otitis, sinuses or post-traumatic dural foci in patients with chronic extrameningeal supplicative foci or illicit IV drug use predisposes to brain abscess. In as many as a third of patients there is no obvious source of infection.

- Ongoing treatment for 6 to 12 months with oral trimethoprim + sulfamethoxazole may be needed.

- CNS complications of brain abscess relate to both tissue inflammation and increased ICP from a space occupying lesion.
- Non-specific complications common to all critically ill patients include aspiration, GI bleeding and thromboembolism.
- Specific complications include focal neurological deficits, altered mental state or seizures, and pulmonary AV fistulae.

- CT and MRI are both useful in monitoring progress of a brain abscess. An expanding lesion may be aggressively drained or a stable or shrinking abscess can be observed.
- CT scanning has some limitations particularly if performed without contrast. It may miss early cerebritis and the cerebellum and brainstem may be poorly seen.

In particular, it may miss lesions 1.5 cm or smaller as are typically seen in endocarditis.