Bacterial meningitis is a pyogenic infection of the cerebral ventricles and the subarachnoid space with bacteria usually confined to the nutrient-rich cerebrospinal fluid. Brain parenchyma is usually not affected in uncomplicated bacterial meningitis (even when the illness follows a fulminant course). Pathogens such as Listeria monocytogenes may cause encephalitis or brain abscess in adults. The main pathways of infection are:

1. **Vascular** (via the blood brain barrier):
   - Most likely pathogens are pneumococci, meningococci, Listeria, Escherichia coli (neonates), group B streptococci, and *H. influenzae*.

2. **Transdural**:
   - Most likely pathogens are pneumococci, gram-negative enteric bacilli, *Staphylococcus* (including coagulase-negative staph), and *H. influenzae*.

**Routes of infection**:

- **Empirical therapy**:
  - Most patients with bacterial meningitis exhibit only modest impairment of cognition on presentation. Several days of malaise, fever, and headache are typical and meningismus is usually present.
  - The CSF indices are almost always abnormal and granulocyte count or culture usually reveals the infecting pathogen unless the patient is immunocompromised or receiving antimicrobial therapy.
  - For uncommon reasons, pyogenic meningitis follows a more fulminant course in some patients. These patients experience rapid deterioration in signs and symptoms within 48 hours. In addition to having fever, headache, and meningismus, they exhibit early impairment of sensorium ranging from lethargy to coma.

- **Clinical course**:
  - Initial manifestations of the illness may be subtle with low-grade fever or headache; however, once meningial symptoms (vomiting, severe headache and stiff neck) develop, the clinical course is dramatic with patients appearing toxic and higher integrative functions often deteriorating rapidly.
  - Acute meningitis as an infectious disease emergency with a delay in antibiotic therapy being associated with adverse outcomes.

- **Pathogenesis**:
  - Common causes of this syndrome are pyogenic meningitis (pneumococcal, meningococcal, *Listeria* and *H. influenzae*).
  - Uncommon causes are viral encephalitis (especially herpetic simplex), subarachnoid haemorrhage and brain abscess with rupture.

Rare causes are viral meningitis, granulomatous meningitis (cryptococcal, mycobacterial), carcinomatous meningitis and brain tumour.

**Subacute meningitis**:

- Infections with a more gradual progression of signs and symptoms of CNS involvement represent the subacute CNS infection syndrome. Headaches can be mild to severe, neck stiffness can be minimal or marked. Patients with this syndrome are typically oriented and clinically stable at the onset of illness with a gradual progression of symptoms over 4-48 hours. Although bacterial meningitis can also cause this syndrome, it is more often caused by other pathogens or non-infectious processes.

**Complications**:

- General complications include adrenal insufficiency due to infection (Waterhouse-Friderichsen syndrome) and renal failure due to ATN in the setting of hypotension.

**Investigation**:

- Imaging (NEJM 2005;353:44-63 recommendations):
  - Cranial imaging should precede lumbar puncture in patients who have:
    - New onset seizures
    - Immunocompromise
    - Severe impairment of conscious state (GCS<10) if imaging is not readily available
  - LP should be given preference to neuroimaging in all patients except those warning signs of a space-occupying lesion (new seizures, papilloedema, focal neurology).

**Management**:

- For patients with immediate penicillin or cefotaxin hypersensitivity, use:
  - Vancomycin 12.5 mg/kg up to 500 mg (child < 12 years: 15 mg/kg up to 500 mg IV).
  - 6-hourly monitoring (monitor blood levels and adjust dose accordingly; slow infusion required).

- Pseudobacterial meningitis is caused by virulent host inflammatory response which may be blocked by corticosteroids. Corticosteroids are not helpful in bacterial meningitis.

**Public health considerations**:

- Respiratory isolation is required for 24 hours for patients with known or suspected meningococcal disease.
- Patients are isolated for 24 hours following meningococcal disease.
- Respiratory protection is indicated for close contacts who are defined as those living in the same household or having close social contact or health care workers who perform intubation or ET tube management.