• Fenestrated – Have holes in endothelium but have continuous BM
  ▪ Kidney and gut mucosa
• Sinusoids – Incomplete BM and Large intracellular gaps
  ▪ Have a glycocalyx that is -vely charged – has a barrier function

- Endothelial BM
  ▪ Polarised cells with distinct expression of receptors on apical and luminal sides
  ▪ Endothelial luminal membrane resides on a BM and is associated with extracellular matrix – collagen (4,3,1), fibronectin, laminin

- Endothelial intracellular junctions – tighter on arterial side – looser on post capillary venules
  ▪ 3 barriers to paracellular transport (cell to cell connection)
    ▪ Tight junctions
      ▪ Claudins (Cldns) – the more the tighter the junctions
      ▪ Occludins (ocln)
      ▪ Junctional adhesion molecules
    ▪ Adherens junctions
    ▪ Gap junctions – connexions
  ▪ Junctional proteins and integrins (cell to BM) are connected to the actin cytoskeleton of the EC – allows some communication

- Continuous endothelium
  ▪ Paracellular transport - Water & small solutes (<3mm) pass between ECs
  ▪ Transcytosis - Allows passage of larger solutes e.g. albumin (uses transendothelial channel)
  ▪ Caveolae - Smooth membrane invaginations and vesicles = highest density in capillary EC (vesicles move through the membrane and dump on the other side)
  ▪ Transendothelial channels

- Fenestrated continuous endothelium
  ▪ Glomerular endothelium, vessels within endocrine & exocrine glands gastric & intestinal mucosa
  ▪ Fenestrae/pores have a diaphragm – may increase selectivity of the pore – no albumin or peptide hormones (angiotensin)
  ▪ Fenestrations permit greater transendothelial transport of fluids ad solutes – not macromolecules

- Sinusoidal endothelium
  ▪ Liver, spleen, bone marrow
  ▪ Smaller ECs – clear colloids and soluble waste macromolecules from the circulation
  ▪ Large fenestrations
  ▪ BM has gaps
  ▪ High endocytic activity in clathrin-coated pits – (receptor mediated and fluid phase endocytosis
  ▪ For mass transport – allow bulk flow

- Vesicular-Vacuolar organelles (VVO)
  ▪ A major route for transport of fluids and solutes across the endothelium particularly in inflammatory situations
  ▪ From transcellular channels when they connect
  ▪ Particularly at post capillary venules
  ▪ Vacuoles join together and allow large bulk transport (leukocytes, large molecules)

Endothelium and haemostasis
• Provides a non-thrombogenic surface to maintain blood flow
  ▪ Inhibits the activation of coagulation factors
  ▪ Breaks down clots that start to form
  ▪ Inhibits platelet adhesion/activation

• Anti-coagulant properties of endothelium
  ▪ Tissue factor pathway inhibitor – binds to FXa, FVIIa, TFa to block activation of the extrinsic pathway
  ▪ Anti-thrombin III – localised with hepara sulphate proteoglycans (glycocalyx) binds and inactivates thrombin
  ▪ Thrombomodulin – converts thrombin into a Protein C activator