complications of invasive arterial pressure monitoring

- General:
  - Systemic pulse wave moves out from the aortic valve at 6-10 m/s.
  - During its passage into the peripheral vasculature, there is a progressive increase in systolic and reduction in diastolic pressures, as standing and reflected waves become incorporated into the waveform.
  - MAP is arguably the most relevant index to monitor for three reasons:
    1. MAP is least dependent on measurement site or technique.
    2. MAP is least altered by measurement dampening.
    3. MAP determines tissue blood flow via autoregulation (apart from the left ventricle, which autoregulates from diastolic pressure).

- Problems with NIBP measurement:
  1. Oscillometry overestimates low pressures and underestimates high pressures, although for the normotensive range 95% CIs are +/-15 mmHg.
  2. Dysrhythmias increase the likelihood of error.
  3. Narrow cuffs overestimate while wide cuffs underestimate blood pressure.
  4. Repeated cuff insufflations can cause skin ulceration, oedema, and bruising, more so when the conscious state is impaired.
  5. Ulnar nerve injury is possible with low cuff placement.

- System requirements:
  - General:
    - Phlebostatic axis represents the zero point and is located at the 4th ICS in the midaxillary line.
    - Ideally, the natural resonant frequency of the system should exceed 30 Hz for heart rates up to 180 bpm and 20 Hz for heart rates up to 120 bpm.
  - Dampening and frequency measurement:
    - Arterial waveform analysis.

complications of CVP monitoring

1. Risk factors for complications:
   - Increased central venous pressure (CVP) due to right heart failure.
   - Obstructed venous return due to deep vein thrombosis (DVT).
   - Infection due to the presence of an indwelling catheter.

2. Clinical signs of complications:
   - Signs of right heart failure (e.g., dyspnea, edema).
   - Evidence of infection (e.g., fever, leukocytosis).

3. Management of complications:
   - Treat underlying conditions (e.g., manage systemic infection).
   - Remove the catheter if infection is suspected.
   - Consider antibiotic therapy.

4. Precautions:
   - Regularly check for signs of infection and document the results.
   - Keep the insertion site clean and dry.
   - Avoid injecting or withdrawing fluids through the catheter.

5. Complications of CVP monitoring:
   - Hemorrhage due to catheter insertion or removal.
   - Infection at the insertion site.
   - Thrombosis or DVT due to catheter-related blood flow disturbances.
   - Pulmonary embolism due to clot dislodgment.
   - Hypotensive or hypertensive episodes due to abrupt changes in blood volume or pressure.