What is the most common problem with patient monitors? Describe an example from your experience and how the issue was resolved.

**Capnography**

**Accuracy**

-Interpretation challenges can occur as it can be influenced by various factors including equipment, patient movement and physiological variations.

-It also provides valuable information about patient’s ventilation but does not give a complete profile of the patient’s respiratory function.

-Technical issues such as calibration errors or equipment failure can affect the accuracy of capnography readings (1).

**Pulse Oximetry**

**Accuracy and Reliability**

Pulse Oximeters that use two wavelength spectrophotometry can give inaccurate readings:

-Smokers have an artificially high reading

- Presence of methemoglobin: hemoglobin is oxidized from its ferrous (Fe2+) state to ferric (Fe3+) which cannot bind oxygen

-Environmental issues: colored nail polishes shivering, tremors, cold rooms, elevating the probe higher than the heart, electrical frequencies, dirty sensor, mechanical interference from blood pressure cuff or torniquet all lead to poor signals, bright fluorescent lights falsely increase the signal

-Physiologic issues include:

abnormal hemoglobin level as in carbon monoxide poisoning due to carboxyhemoglobin, unstable hemodynamics due to shock, cardiac or respiratory arrest, poor perfusion, cardiac arrhythmias, edema, peripheral vasoconstriction and Arteriovenous fistula

**Hemodynamic Monitoring**

**Pulmonary Artery Catheter/Central Venous Catheter (PAC/CVC)**

There are several factors that cause problems in hemodynamic monitoring. These include:

**Technical issues:**

-improper equipment set up such as loose connection can lead to measurement inaccuracies

-faulty device calibration and zeroing can cause inaccurate readings

-signal interference such as artifacts can disrupt the waveform

-lack of regular maintenance can cause calibration to drift overtime

**Physiological factors:**

-improper positioning such as not maintaining the transducer at the phlebostatic axis can affect the readings

-patient movement can alter waveforms

-hypovolemia or hypervolemia: any of these states can change the pressure waveform, affect temperature readings and create misinterpretations (3).

**Catheter related issues:**

-improper placement of the catheter tip or kinking of the catheter can change the waveform and the temperature readings may be inaccurate

-catheter induced clots can obstruct flow and compromise monitoring and block the thermistor function

**User error:**

-inadequate training on how the catheter is operated

-lack of knowledge in identifying abnormal readings and acting promptly

-incorrect alarm thresholds or settings (3).

**Temperature Monitoring**

**Accuracy and Reliability**

-inaccurate readings due to calibration errors, drift and electromagnetic interferences

-sensor placement: avoid heat sources and ensure proper ventilation to ensure accurate temperature readings

-wiring and connection issues: poor wiring and connection can lead voltage drops and result in inaccurate temperature sensing

**Hemodynamic Monitoring**

**Arterial Line Monitoring**

**Accuracy**

-the transducer level should be at the phlebostatic axis for accurate measurements

**-**site of arterial catheterization: arterial pressure waveforms change as the pressure wave moves from the aorta to the periphery.

-over-damping or under-damping of the pressure tracing

Over-damping: no ringing is observed after a rapid flush of an over-damped system. Common causes include air bubbles or clots in the connecting tubing, loose connections, kinks, or arterial spasm. This can cause an underestimation of systolic blood pressure and overestimation of diastolic pressure or completely obscure the dicrotic notch resulting in difficulty assessing true blood pressure

Under-damping: excess ringing is observed after a rapid flush in an under-damped system. Common causes include excessive tubing length, tubing connected with stopcocks and patient factors such as tachycardia, high cardiac output, or hypothermia. In general, most arterial pressure monitoring systems in clinical use are slightly under-damped, resulting in a falsely high systolic pressure (4).

**Holter Monitoring**/**Electrocardiogram (ECG)**

**Holter: User knowledge**

-the holter should be kept away from other electrical devices

-avoid using lotions and moisturizers as it affects lead attachments (5).

**ECG: User knowledge**

**-**requires a trained or qualified personnel to perform a 12 lead ECG, lead placement is crucial in a 15 lead ECG

-interpretation can vary based on user

-use optimal room temperatures to avoid shivering to prevent distorting the ECG tracing

-shave chest hair so there is good contact between the electrodes and the skin

-place limb leads accurately to avoid vector misinterpretation

-remove metallic objects like jewellery or a watch to prevent interference with electrical signals

-patient movement creating artifact

-loose cable connections or old and frayed cables (6)

My experience in performing an ECG on my patient became non urgent when I encountered countless problems. The patient had cardiac surgery, so his chest was already prepared. He was post operative day (POD) 2 and began experiencing a dull radiating chest pain with no other symptoms. The next step was to perform his ECG. I entered the patient’s information and then placed the electrodes on him, while he was lying in a flat but comfortable and still position. Some of the limb leads were not picking up and others that were had erratic signals. I changed all the leads to ensure the gel on them were not dried up, pressed them firmly to ensure contact with his skin. I also changed the filter setting on the monitor. The precordial leads were not an issue, but the limb leads kept giving trouble. I changed the limb lead wire set twice, then I had to change the trunk cable portion twice as well and it did not resolve the issue. I cleaned the patient’s chest, applied new electrodes and completely changed the lead wire set and the trunk cable a third time. Upon discovery, I was using the electrodes that are used in magnetic resonance imaging, and they were not picking up. I quickly changed them and finally got the ECG after missing such a simple thing

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