Describe your hospital's anesthesia gas machine (AGM) maintenance protocol and justify the process.

Anesthesia gas machine maintenance is a mandatory process in healthcare facilities to ensure patient safety, optimal equipment function and prevent any litigation. A typical maintenance protocol may include:

Perform a complete checklist at the start of each day or before the use as needed between cases

1. Daily checks: Performed before the first case of the day includes:

- visual inspection of circuits for damage, wear or leaks, record hours of use of the CO2 absorber, adjust APL, adjust all flowmeter to zero, flow sensor calibration, perform leak tests on ventilator and breathing circuit, vaporizer is filled and ports are tightly closed, checking the pressure manometer, checking that alarms are functional and audible, check the pressure on the back up oxygen cylinder mounted to AGM

2. Between-case checks: Clean and disinfect reusable components (e.g., face masks, circuits) as per infection control guidelines.

3. Weekly or monthly checks: a more thorough inspection and test of all components are performed

All the hoses, tubing and connectors are inspected for wear, cracks or disconnections.

The vaporizer levels are checked and filled as needed with the correct anesthetic agents.

The scavenging system is inspected for blockages or leaks.

The battery backup system is tested and batteries are replaced as needed.

The moving parts are cleaned and lubricated as recommended by the manufacturer.

### **Quarterly Maintenance**

A comprehensive calibration of sensors is performed (e.g., oxygen, CO2, anesthetic agents).

Inspection and replacement of filters and one-way valves as needed

A detailed inspection of the internal components is performed (e.g., valves, regulators, flowmeters) for wear and damage.

The machine is tested under simulated clinical conditions.

### **Annual Preventative Maintenance**

A certified biomedical engineer or a representative from the company will perform a complete check of the system. This includes:

Perform a comprehensive performance testing which includes:

-pressure and flow tests

-alarm test, power failure test

-mixer flow verification

-mixer outlet check valve leak test

-auxiliary and alternate O2 flowmeter test

Replacement of the backpressure valve

The breathing system modules are removed and the components are inspected. Physically damaged or worn parts are replaced

Bellows assembly disassembled, inspected, tested and worn or damaged parts replaced. After replacement bellows assembly tests are done

Replacing components that are to be discarded (e.g., CO2 absorbers, seals, and gaskets).

Anesthesia Gas Scavenging System Maintenance (AGSS)

-the condensate from the reservoir is emptied and disposed of (disposable item)

-the air brake is inspected for occlusion on the active AGSS

-the filter is inspected, cleaned or replaced as necessary on the active AGSS.

Diagnostics are performed and displayed e.g., vaporizer Test with a Test Cassette inserted

Service calibrations are performed

System checkout done

Electrical safety testing performed

**Justification:**

The purpose of having a maintenance is to prevent long-term degradation of critical systems, extend the machine's lifespan and ensure compliance with regulatory standards.

The justification for rigorous maintenance includes:

1. **Patient safety**: regular maintenance ensures reliable delivery of anesthetic agents, oxygen and ventilation, reducing the risk of hypoxia, overdose or other complications.

2. **Performance optimization**: Regular checks and software updates reduce downtime and ensure the machine is always ready for critical procedures and the machine will deliver anesthesia more accurately and efficiently.

3**. Regulatory compliance**: maintenance is completed to stay in alignment with guidelines from organizations such as the American Society of Anesthesiologists (ASA) and following manufacturer guidelines for replacing parts at recommended intervals. It is also completed in accordance with healthcare accreditation standards that require documentation that shows a tracking history of equipment maintenance.

**Cost-effectiveness**: Regular maintenance prevents costly emergency repairs and extends the lifespan of expensive equipment.

5. **Legal protection**: Documented maintenance can provide evidence of due diligence in case of litigation.

**Incident-Based Maintenance**

If the AGM fails during use or displays any unusual behavior (e.g., alarms without cause, inconsistent gas delivery) it is immediately removed from service.

A technician is called in to diagnose and repair the issue after which a complete performance check is done before returning the machine to use.

**Justification:**

This step ensures patient safety by addressing unforeseen issues promptly and maintaining trust in the reliability of the equipment.

References

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