SUS-02: Global Warming Footprint, Maintenance

SUS-02: Percentage of cases where CO_2 eq normalized by hour for cases receiving halogenated agents and or nitrous oxide is less that CO_2 eq of 2% Sevoflurane at 2L FGF = 2.83 kg CO_2/hr *or* the Total CO_2 eq is less than 2.83 kg CO_2 for the maintenance period of anesthesia.

Start: All Patients

ETT or LMA placed determined by **Anesthesia Technique: General** — No → Exclude

Yes ↓

Measure Start:
- **Intubation**. If not available, then
- **Induction End**.

Measure End
- **Extubation Time**. If not available, then
- **LMA Removal**. If not available, then
- **Surgery End**. If not available, then
- **Patient Out of Room**. If not available, then
- **Anesthesia End**.

Were halogenated hydrocarbons or nitrous oxide administered? — No → Exclude

Yes ↓

Nitric oxide use documented — Yes → Exclude

No ↓

Fresh gas flow values must be automated to be considered for this measure.

Were fresh gas flow values manually entered? — Yes → Exclude

No ↓

*Artifact values for flows and inhalational agents will be assessed and considered artifact if inside the following ranges:

Nitrous Oxide Flows	< 0.2 L/min
Nitrous Oxide Insp %	< 20%
Isoflurane Insp %	< 0.3%
Sevoflurane Insp %	< 0.4%
Desflurane Insp %	< 1.2%

Mean efficiency for case less than or equal to CO_2 eq of 2% Sevo at 2L FGF (2.83 kg CO_2/hr)
- Yes → Pass
- No → Flag

Agent	Global Warming Potential[100]	Molecular Weight (MW) (g/mol)
Isoflurane	565	184.5
Sevoflurane	144	200
Desflurane	2450	169
Nitrous Oxide	282	44

OR ↓

Total CO_2 eq less than or equal to 2.83kg CO_2 — Yes → Pass

No ↓

Flag
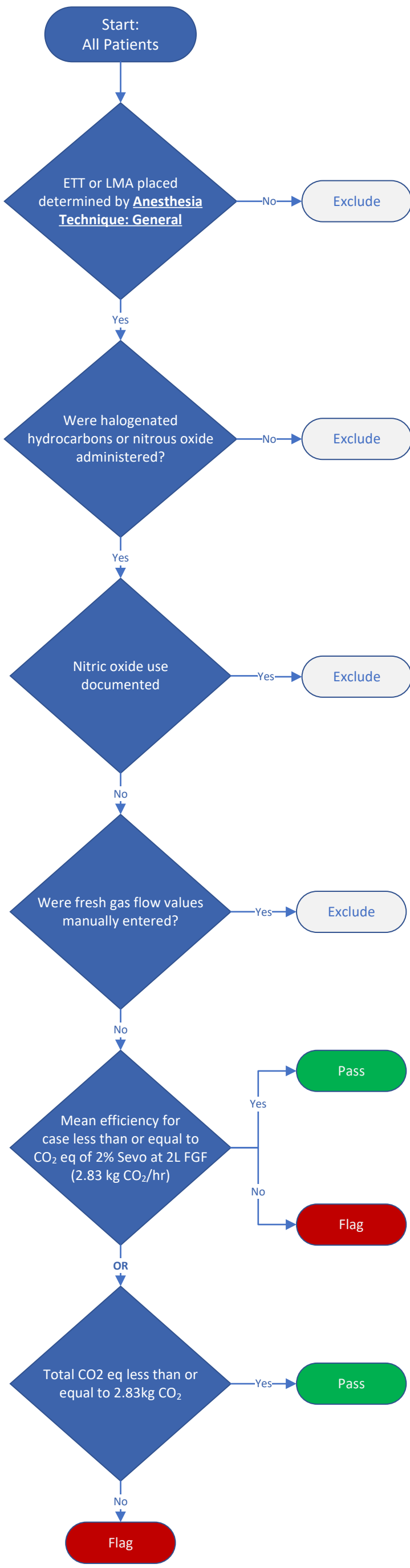
CO_2 equivalents determined by calculating the pollutant total for the time period and dividing by the total number of minutes during the maintenance period.

Pollutant total: [Inspired agent concentration (%) $\mathbf{X}$ Fresh Gas Flow(L/min) $\mathbf{X}$ GWP$_{100}$]

1. Calculate CO_2 eq for each minute of Sevoflurane %, Isoflurane % and Desflurane %*
2. Calculate CO_2 eq for each minute of Nitrous Oxide % or Nitrous Oxide flows**
3. Sum CO_2 equivalents
4. Divide by total of included minutes: Total CO2 eq / Total # of minutes
   - *Included Minute = minute within measure bounds, with both halogenated agent and flows are present*
5. Multiple Total CO_2 eq/min X 60 = Mean CO_2 per hour

*CO_2 eq for Sevoflurane, Isoflurane, Desflurane (%)	**CO_2 eq for Nitrous Oxide:
1. Convert agent % to mLs of agent/min: (FGF (L/min) X 1,000 X agent %) / 100 2. Convert mLs/min to moles: agent mL / 24,400 3. Convert moles to mass: (agent moles X MW of agent) / 1,000 4. Convert mass to CO_2 eq: agent mass X GWP of agent	For cases with documented Nitrous Oxide % but Nitrous Oxide flow **is not** reported, then use Nitrous Oxide % and FGF: • Divide Nitrous Oxide % / 100 = N • Convert N to mLs/min: (FGF(L/min) X 1,000 X N) • Convert mLs/min to moles: (N mL / 24,400) • Convert moles to mass: (N moles X MW of agent) / 100 • Convert mass to CO_2 eq: N mass X GWP of agent
To calculate Mean Fresh Gas Flow: 1. Determine which flow values to include by identifying minutes where FGF and non-artifact inhaled agent or nitrous oxide are documented 2. Add all included FGF values and divide by the total number of included minutes	For cases with both valid Nitrous Oxide % and Nitrous Oxide flows reported, only Nitrous Oxide flow values will be considered (N_2O values reported as % will be ignored) 1. Convert Nitrous Oxide (L/min) to moles/min: Nitrous Oxide / 24.4 = **Nmol** 2. Convert Nmol to N_2O mass (kg/min): (**Nmol** X 44) / 1,000 3. Convert Nmass to CO_2 eq: **Nmass** X GWP