Measure Abbreviation: **SUS 01**

Data Collection Method: This measure is calculated based on data extracted from the electronic medical record combined with administrative data sources such as professional fee and discharge diagnoses data. This measure is explicitly not based on provider self-attestation.

Description: Percentage of cases with mean fresh gas flow (FGF) equal to, or less than 3L/min, during administration of halogenated hydrocarbons and/or nitrous oxide.

Time Period: Anesthesia Start to Anesthesia End (see other measure build details)

Measure Type: Process

Measure Summary: SUS01 measures Fresh Gas Flow (FGF) during administration of halogenated hydrocarbons and/or nitrous oxide, as an indirect measure of anesthetic gas waste. For a given case, this measure will include the maintenance period of anesthesia, defined as the time between placement of an endotracheal tube or supraglottic airway and removal of the endotracheal tube or supraglottic airway. This measure will exclude pre-oxygenation (before placement of the airway device) and emergence defined as the time when the fraction of inspired halogenated hydrocarbons and nitrous oxide is 0.

Rationale: Halogenated agents and nitrous oxide leaking or vented into the atmosphere are environmental pollutants. Reducing fresh gas flows can reduce cost of anesthesia without compromising patient care.

Inclusions: Patients administered halogenated hydrocarbons and/or nitrous oxide, for greater than or equal to 30 minutes from placement of the airway device to removal of the airway device.

Exclusions:
- Cases in which halogenated hydrocarbons and nitrous oxide are NOT used
- Cases with maintenance period < 30 minutes
- Cases with >20% of Fresh Gas Flow values manually entered during the case (automated capture of FGF required)

MPOG Concept IDs Required:

<table>
<thead>
<tr>
<th>Gas Flow MPOG Concepts</th>
<th>Halogenated Agent/Nitrous Oxide MPOG Concepts</th>
</tr>
</thead>
<tbody>
<tr>
<td>3214 Fresh Gas Flow Total (L/min)</td>
<td>3275 Sevoflurane Insp %</td>
</tr>
<tr>
<td>3225 Flows Nitrous Oxide (L/min)</td>
<td>3265 Isoflurane Insp %</td>
</tr>
<tr>
<td>3220 Flows Air (L/min)</td>
<td>3285 Desflurane Insp %</td>
</tr>
<tr>
<td>Intubation MPOG Concepts</td>
<td>LMA MPOG Concepts</td>
</tr>
<tr>
<td>--------------------------</td>
<td>-------------------------------</td>
</tr>
<tr>
<td>50695 Categorized Note - Intubation</td>
<td>50209 LMA Placement Note</td>
</tr>
<tr>
<td>50117 Intubation/Airway - Approach</td>
<td>50141 Airway - LMA Type</td>
</tr>
<tr>
<td>50205 Intubation Tube Note</td>
<td>50142 Airway - LMA Size</td>
</tr>
<tr>
<td>50121 Intubation ETT Stylet Used</td>
<td>50143 Airway - LMA Placement Difficulty</td>
</tr>
<tr>
<td>50122 Intubation ETT Size</td>
<td>50144 Airway - LMA Placement Technique</td>
</tr>
<tr>
<td>50123 Intubation ETT Type</td>
<td></td>
</tr>
<tr>
<td>50124 Intubation ETT Secured Distance</td>
<td></td>
</tr>
<tr>
<td>50125 Intubation ETT Secured Reference Point</td>
<td></td>
</tr>
</tbody>
</table>

Data Diagnostics Affected:

- Percentage of Cases with Any Physiologic Observations
- Percentage of Physiologic Rows that are Machine Captured
- Percentage of Physiologic Observations with a Meaningful Type Mapping

Phenotypes Used:

- AnesthesiaEnd
- AnesthesiaStart
- ExtubationTimes
- InductionEnd
- InductionStart
- IsValidCase
- LMARemovalTimes
- PatientInRoomEnd
- PatientInRoomStart
- SurgeryEnd
- SurgeryStart

Other Measure Build Details:
If Fresh Gas Flow Total (MPOG Concept ID: 3214) is documented for the case, this concept will be used to determine success in the setting of halogenated agents or nitrous oxide use.

If Fresh Gas Flow Total (MPOG Concept ID: 3214) is not documented for the case, MPOG will calculate Fresh Gas Flow: Flows Oxygen (ID: 3215) + Flows Air (ID: 3220) + Flows Nitrous Oxide (ID: 3225)

If there are no fresh gas flows documented on the case or mapped to the appropriate MPOG concept, the case will be excluded.

There must be at least 30 minutes of Nitrous Oxide flow >0L or inspired halogenated hydrocarbons >0% during the maintenance period. Maintenance period is defined as measure start to measure end. See Appendix A for diagram.

For cases with at least 80% of the Fresh Gas Flow values machine data captured, any manually entered fresh gas flow or agent values will be included in the calculation of mean FGF.

If there is a gap in documentation for fresh gas flow values, each value is valid for up to one minute.

When calculating the mean Fresh Gas Flow, the sum of all flows will be added and divided by the total number of minutes that have a documented gas flow. If there are 30 cumulative minutes of halogenated gas documented, but only 23 minutes of fresh gas flow, the mean will be calculated using the 23 minutes of fresh gas flow. See Appendix B for diagrams depicting how fresh gas flow is calculated within the maintenance period.

If multiple flow values for oxygen (3215), air (3220), and Nitrous Oxide (3225) occur at different second intervals in the same minute, all values will be aligned to the beginning of the minute and the one documented first will be used. For example, if 1 L/min of oxygen flow was documented at 13:02:30 and 2 L/min of air flow was documented at 13:02:32, both would be assigned 13:02 as the documented time and the total FGF would equal 3 L/min for that minute.

Values for flows and gases will be assessed and considered artifact if inside the following ranges:

- Nitrous Oxide Flows: <0.2 L/min
- Isoflurane Insp %: <0.2%
- Sevoflurane Insp %: <0.5%
- Desflurane Insp %: <0.5%
- Nitrous Oxide Insp % <15%

**Measure Start:**

1. Placement of endotracheal tube, or supraglottic airway (LMA, COPA), if not available
2. Anesthesia Induction End, If not available, then
3. Anesthesia Induction Start. If not available, then
4. Procedure Start. If not available, then
5. Patient in Room. If not available, then
6. Anesthesia Start

**Measure End:**
1. Patient extubated (see Extubation Time Phenotype) or removal of supraglottic airway (see LMA Removal Time Phenotype). If not available, then
2. Procedure End. If not available
3. Patient Out of Room. If not available, then
4. Anesthesia End.

**Success:** Mean FGF equal to, or less than 3L/minute when inspired halogenated hydrocarbons is >0.2%, or nitrous oxide FGF >0.2L/min, during the maintenance period of anesthesia.

**Threshold:** 90%.

**Responsible Provider(s):** All providers signed in for at least 30 minutes during the time when halogenated agent or nitrous oxide are documented.

**Method for determining Responsible Provider:**
All providers signed in while patients are administered halogenated hydrocarbons, and/or nitrous oxide, for more than, or equal to, 30 minutes from placement of the airway device to removal of the airway device. See ‘Other Measure Build Details’ section for algorithm for determining measure start and end times.

**Risk Adjustment (for outcome measures):**
*Not applicable.*

**References:**
Appendix A: Determining 30 minutes or greater of nitrous or halogenated agents (pollutants)

Example 1: Excluded, 27 minutes of halogenated agent or nitrous oxide use

Example 2: Included, 34 minutes of halogenated agent or nitrous oxide use
Appendix B: Calculating Fresh Gas Flows during Maintenance Period

Step 0: Raw Data

Step 1: Remove Measurements Outside Measure Duration

Step 2: Remove Flow Measurements Outside Pollutant Intervals

Step 3: Average Remaining Flows