# Data Dictionary for Perioperative Variables Used in the Scorecard Model

The following is a data dictionary for the 66 variables used in the scorecard model predicting unplanned care escalations (UCE) for post-anesthesia care unit (PACU) patients during the perioperative period. Each variable includes its name, type, units (if applicable), description, possible values (for categorical variables), and any relevant notes.

# Response/Dependent variable

**Variable: escalation**

* **Type**: Boolean
* **Description**: Indicates whether the patient experienced an unexpected escalation of care within 3 midnights after PACU discharge.
* **Possible Values**:
  + True (Yes): The patient had an unexpected escalation of care.
  + False (No): The patient did not have an unexpected escalation of care.

### Definition of Escalation:

An **unexpected escalation of care** is defined as any of the following events occurring within 3 midnights after discharge from the Post-Anesthesia Care Unit (PACU):

1. **Medical Emergency Team (MET) Activation**:
   * The patient required intervention by the MET due to acute clinical deterioration.
   * **Indicator**: MET\_Team == 1
2. **Unplanned ICU Admission Without Prior Order**:
   * The patient was transferred from a general inpatient floor to an Intensive Care Unit (ICU) without a pre-existing ICU bed order before PACU discharge.
   * **Indicator**:
     + ICUafterPACU\_Days == 1 **AND**
     + ICU\_Bed\_Order == 0
3. **Admission to Step-Down Unit After General Floor**:
   * The patient was initially admitted to a general inpatient floor and then unexpectedly transferred to a step-down or intermediate care unit.
   * **Indicator**: StepDownUnitAfterGeneralCareTime\_Days is **not** missing (not NA)
4. **ICU Transfer from Step-Down Unit Without Prior Order**:
   * The patient was transferred from a step-down/intermediate care unit to an ICU without a prior ICU bed order before PACU discharge.
   * **Indicator**: ICU\_AfterStepDown\_NoOrderBeforePacuDepart\_Days == 1

### Notes:

* **Timeframe**:
  + The escalation must occur within **3 midnights** after PACU discharge.
  + The 3-midnights period is used because the risk of postoperative complications, such as major adverse cardiac events (MACE), significantly decreases after this period.
* **Unexpected Nature**:
  + Escalations are considered **unexpected** if they occur without prior planning or orders placed before the patient left the PACU.
  + Planned admissions to higher levels of care (e.g., scheduled ICU admission) are **not** counted as unexpected escalations.
* **Aggregated Variable**:
  + The escalation variable combines several indicators of patient deterioration requiring higher acuity care.
  + It captures a range of events that signify an unanticipated need for increased monitoring or interventions.
* **Clinical Relevance**:
  + Identifying unexpected escalations helps in assessing the quality of perioperative care and predicting patients at risk for deterioration.
  + Understanding factors associated with escalations can guide interventions to improve patient safety.

### Related Variables and Indicators:

* **MET\_Team**:
  + **Type**: Boolean
  + **Description**: Indicates if the MET was activated for the patient within the specified timeframe.
* **ICUafterPACU\_Days**:
  + **Type**: Boolean
  + **Description**: Indicates if the patient was admitted to the ICU after PACU discharge within 3 midnights.
* **ICU\_Bed\_Order**:
  + **Type**: Boolean
  + **Description**: Indicates if there was an ICU bed order placed before PACU discharge.
* **StepDownUnitAfterGeneralCareTime\_Days**:
  + **Type**: DateTime or Indicator
  + **Description**: Timestamp of transfer to a step-down unit after initial admission to a general floor.
* **ICU\_AfterStepDown\_NoOrderBeforePacuDepart\_Days**:
  + **Type**: Boolean
  + **Description**: Indicates if the patient was transferred from a step-down unit to ICU without a prior ICU bed order.

### Data Handling:

* **Calculation in Data Processing**:
  + The escalation variable is calculated during data preprocessing using the following logic:
  + escalation = (  
     (MET\_Team == 1) |  
     ((ICUafterPACU\_Days == 1) & (ICU\_Bed\_Order == 0)) |  
     (StepDownUnitAfterGeneralCareTime\_Days is not NA) |  
     (ICU\_AfterStepDown\_NoOrderBeforePacuDepart\_Days == 1)  
    )
* **Missing Data**:
  + Care is taken to handle missing values appropriately.
  + If certain indicators are missing, the logic ensures that only available data contribute to determining if an escalation occurred.

### Importance in the Model:

* The escalation variable serves as the **response variable** (dependent variable) in the predictive model.
* It represents the outcome that the model aims to predict based on various perioperative factors.
* Understanding and accurately defining this variable is crucial for model training, validation, and interpretation.

### Contextual Background:

* **Unplanned Care Escalations (UCE)**:
  + UCEs are significant events that can increase patient morbidity, prolong hospital stays, and escalate healthcare costs.
  + Early prediction of UCE risk allows clinicians to make informed decisions regarding patient monitoring, intervention, and resource allocation.
* **Clinical Significance**:
  + By analyzing factors associated with escalation, healthcare providers can identify at-risk patients and implement strategies to mitigate adverse events.

### Usage Considerations:

* **For Collaborators**:
  + When reproducing the model, ensure that the escalation variable is derived using the exact definitions and logic provided.
  + Consistent application of this definition is essential for the validity and comparability of the predictive model.
* **Data Integrity**:
  + Verify that all contributing indicators (MET\_Team, ICUafterPACU\_Days, etc.) are accurately recorded and timestamped.
  + Timeframes should be computed based on standardized date and time formats to ensure consistency.

# Explanatory/Independent variables

**Variable 0: Gender**

* **Type**: Categorical (String)
* **Description**: Patient’s self-reported gender at the time of surgery.
* **Possible Values**: ‘Female’, ‘Male’, ‘Undetermined’

**Variable 1: Age**

* **Type**: Numeric (Integer)
* **Units**: Years
* **Description**: Patient’s age at the time of surgery.

**Variable 2: BMI**

* **Type**: Numeric (Float)
* **Units**: kg/m²
* **Description**: Patient’s Body Mass Index (BMI).

**Variable 3: Race**

* **Type**: Categorical (String)
* **Description**: Patient’s self-reported race.
* **Possible Values**:
  + ‘American Indian or Alaska Native’
  + ‘Asian’
  + ‘African American’
  + ‘Hispanic or Latino’
  + ‘Multiple’
  + ‘Native Hawaiian/Other Pacific Islander’
  + ‘Other’
  + ‘Unknown’
  + ‘Caucasian’

**Variable 4: Ethnicity**

* **Type**: Categorical (String)
* **Description**: Patient’s self-reported ethnicity.
* **Possible Values**:
  + ‘Hispanic/Latino’
  + ‘Multiple’
  + ‘Non-Hispanic/Latino’
  + ‘Not reported’

**Variable 5: MinPACULastHour\_SpO2**

* **Type**: Numeric (Float)
* **Units**: Percentage (%)
* **Description**: Minimum oxygen saturation (SpO₂) recorded during the last hour before PACU discharge.

**Variable 6: LastPACU\_SpO2**

* **Type**: Numeric (Float)
* **Units**: Percentage (%)
* **Description**: Last oxygen saturation (SpO₂) value recorded before PACU discharge.

**Variable 7: MaxPACULastHour\_O2FlowRate**

* **Type**: Numeric (Float)
* **Units**: Liters per minute (L/min)
* **Description**: Maximum oxygen flow rate administered during the last hour before PACU discharge.

**Variable 8: LastPACU\_O2FlowRate**

* **Type**: Numeric (Float)
* **Units**: Liters per minute (L/min)
* **Description**: Oxygen flow rate administered at the time of PACU discharge.

**Variable 9: MaxPACULastHour\_HR**

* **Type**: Numeric (Float)
* **Units**: Beats per minute (bpm)
* **Description**: Maximum heart rate recorded during the last hour before PACU discharge.

**Variable 10: MinPACULastHour\_SBP**

* **Type**: Numeric (Float)
* **Units**: Millimeters of mercury (mmHg)
* **Description**: Minimum systolic blood pressure recorded during the last hour before PACU discharge.

**Variable 11: MaxPACULastHour\_SBP**

* **Type**: Numeric (Float)
* **Units**: mmHg
* **Description**: Maximum systolic blood pressure recorded during the last hour before PACU discharge.

**Variable 12: MinPACULastHour\_MAP**

* **Type**: Numeric (Float)
* **Units**: mmHg
* **Description**: Minimum mean arterial pressure recorded during the last hour before PACU discharge.

**Variable 13: MaxPACULastHour\_MAP**

* **Type**: Numeric (Float)
* **Units**: mmHg
* **Description**: Maximum mean arterial pressure recorded during the last hour before PACU discharge.

**Variable 14: LastPACU\_MAP**

* **Type**: Numeric (Float)
* **Units**: mmHg
* **Description**: Last mean arterial pressure recorded before PACU discharge.

**Variable 15: MaxPACULastHour\_RR**

* **Type**: Numeric (Float)
* **Units**: Breaths per minute
* **Description**: Maximum respiratory rate recorded during the last hour before PACU discharge.

**Variable 16: MaxPACULastHour\_PainScore**

* **Type**: Numeric (Integer)
* **Description**: Maximum pain score recorded during the last hour before PACU discharge.
* **Scale**: 0 (no pain) to 10 (worst possible pain)

**Variable 17: MinPACULastHour\_Aldrete**

* **Type**: Numeric (Integer)
* **Description**: Minimum Aldrete score recorded during the last hour before PACU discharge.
* **Scale**: 0 to 10
* **Notes**: The Aldrete score assesses patient recovery from anesthesia based on activity, respiration, circulation, consciousness, and oxygen saturation.

**Variable 18: CKD**

* **Type**: Boolean
* **Description**: Indicates if the patient had a diagnosis of Chronic Kidney Disease prior to surgery.
* **Possible Values**: True (Yes), False (No)

**Variable 19: AKI**

* **Type**: Boolean
* **Description**: Indicates if the patient had a diagnosis of Acute Kidney Injury prior to surgery.

**Variable 20: AlbuminLevel**

* **Type**: Numeric (Float)
* **Units**: Grams per deciliter (g/dL)
* **Description**: Preoperative serum albumin level.

**Variable 21: OpioidAbuseDiagnosis**

* **Type**: Boolean
* **Description**: Indicates if the patient had a diagnosis of opioid abuse.

**Variable 22: SleepApneaDiagnosis**

* **Type**: Boolean
* **Description**: Indicates if the patient had a diagnosis of sleep apnea.

**Variable 23: AlcoholUseDiagnosis**

* **Type**: Boolean
* **Description**: Indicates if the patient had a diagnosis related to alcohol use or abuse.

**Variable 24: ESRDfromProblemList**

* **Type**: Boolean
* **Description**: Indicates if End-Stage Renal Disease was listed in the patient’s problem list.

**Variable 25: COPDfromProblemList**

* **Type**: Boolean
* **Description**: Indicates if Chronic Obstructive Pulmonary Disease was listed in the patient’s problem list.

**Variable 26: AsthmafromProblemList**

* **Type**: Boolean
* **Description**: Indicates if asthma was listed in the patient’s problem list.

**Variable 27: DiabetesfromProblemList**

* **Type**: Boolean
* **Description**: Indicates if diabetes was listed in the patient’s problem list.

**Variable 28: MACE\_Score**

* **Type**: Numeric (Float)
* **Description**: Major Adverse Cardiac Events score estimating the patient’s risk for cardiac complications.
* **Notes**: Higher scores indicate greater risk.

**Variable 29: EBL**

* **Type**: Numeric (Float)
* **Units**: Milliliters (mL)
* **Description**: Estimated blood loss during the surgical procedure.

**Variable 30: SugammadexAmount**

* **Type**: Numeric (Float)
* **Units**: Milligrams (mg)
* **Description**: Total dose of Sugammadex administered during surgery.
* **Notes**: Sugammadex is a medication used to reverse neuromuscular blockade.

**Variable 31: NeostigmineAmount**

* **Type**: Numeric (Float)
* **Units**: Milligrams (mg)
* **Description**: Total dose of Neostigmine administered during surgery.
* **Notes**: Neostigmine is another medication used to reverse neuromuscular blockade.

**Variable 32: RBCs**

* **Type**: Numeric (Float)
* **Units**: Units or Milliliters (mL)
* **Description**: Amount of red blood cell transfusions administered during surgery.

**Variable 33: WholeBlood**

* **Type**: Numeric (Float)
* **Units**: Units or mL
* **Description**: Amount of whole blood transfusions administered during surgery.

**Variable 34: FFP**

* **Type**: Numeric (Float)
* **Units**: Units or mL
* **Description**: Amount of Fresh Frozen Plasma transfused during surgery.

**Variable 35: Cryo**

* **Type**: Numeric (Float)
* **Units**: Units or mL
* **Description**: Amount of Cryoprecipitate transfused during surgery.

**Variable 36: Platelets**

* **Type**: Numeric (Float)
* **Units**: Units or mL
* **Description**: Amount of platelets transfused during surgery.

**Variable 37: CellSaver**

* **Type**: Numeric (Float)
* **Units**: mL
* **Description**: Volume of autologous blood returned to the patient using cell saver technology during surgery.

**Variable 38: D5and10**

* **Type**: Numeric (Float)
* **Units**: mL
* **Description**: Volume of Dextrose 5% and Dextrose 10% intravenous fluids administered during surgery.

**Variable 39: Normosol**

* **Type**: Numeric (Float)
* **Units**: mL
* **Description**: Volume of Normosol intravenous fluids administered during surgery.
* **Notes**: Normosol is a balanced electrolyte solution.

**Variable 40: Albumin**

* **Type**: Numeric (Float)
* **Units**: mL
* **Description**: Volume of albumin solution administered during surgery.

**Variable 41: Starches**

* **Type**: Numeric (Float)
* **Units**: mL
* **Description**: Volume of starch-based colloids administered during surgery.
* **Notes**: Includes solutions like hydroxyethyl starch.

**Variable 42: Isolyte**

* **Type**: Numeric (Float)
* **Units**: mL
* **Description**: Volume of Isolyte intravenous fluids administered during surgery.
* **Notes**: Isolyte is an isotonic, balanced electrolyte solution.

**Variable 43: Dextran**

* **Type**: Numeric (Float)
* **Units**: mL
* **Description**: Volume of Dextran solution administered during surgery.

**Variable 44: Epidural**

* **Type**: Boolean
* **Description**: Indicates if an epidural procedure was performed during anesthesia care.

**Variable 45: EpinephrineInfusion**

* **Type**: Boolean
* **Description**: Indicates if an epinephrine infusion was administered during surgery.

**Variable 46: VasopressinInfusion**

* **Type**: Boolean
* **Description**: Indicates if a vasopressin infusion was administered during surgery.

**Variable 47: MilrinoneInfusion**

* **Type**: Boolean
* **Description**: Indicates if a milrinone infusion was administered during surgery.

**Variable 48: DobutamineInfusion**

* **Type**: Boolean
* **Description**: Indicates if a dobutamine infusion was administered during surgery.

**Variable 49: DopamineInfusion**

* **Type**: Boolean
* **Description**: Indicates if a dopamine infusion was administered during surgery.

**Variable 50: NorepinephrineInfusion**

* **Type**: Boolean
* **Description**: Indicates if a norepinephrine infusion was administered during surgery.

**Variable 51: PhenylephrineInfusion**

* **Type**: Boolean
* **Description**: Indicates if a phenylephrine infusion was administered during surgery.

**Variable 52: BloodProductsTotal**

* **Type**: Numeric (Float)
* **Units**: Units or mL
* **Description**: Total amount of blood products (RBCs, Whole Blood, FFP, Cryo, Platelets) administered during surgery.

**Variable 53: CrystalloidsTotal**

* **Type**: Numeric (Float)
* **Units**: mL
* **Description**: Total volume of crystalloid solutions administered during surgery.
* **Notes**: Includes solutions like Normal Saline (NaCl), Lactated Ringer’s (LR), Normosol, Isolyte, Dextrose solutions, etc.

**Variable 54: EMERGENCY**

* **Type**: Boolean
* **Description**: Indicates if the surgery was classified as an emergency case.

**Variable 55: CVL**

* **Type**: Boolean
* **Description**: Indicates if a central venous line (central line) was placed during surgery.

**Variable 56: ArtLine**

* **Type**: Boolean
* **Description**: Indicates if an arterial line was placed during surgery.

**Variable 57: PreOpBicarb**

* **Type**: Numeric (Float)
* **Units**: Milliequivalents per liter (mEq/L)
* **Description**: Preoperative bicarbonate level from labs collected before surgery.

**Variable 58: PreOpHemoglobin**

* **Type**: Numeric (Float)
* **Units**: Grams per deciliter (g/dL)
* **Description**: Preoperative hemoglobin level from labs collected before surgery.

**Variable 59: PreOpPlatelets**

* **Type**: Numeric (Float)
* **Units**: Thousands per microliter (×10³/µL)
* **Description**: Preoperative platelet count from labs collected before surgery.

**Variable 60: LastPACU\_Temp**

* **Type**: Numeric (Float)
* **Units**: Degrees Fahrenheit (°F)
* **Description**: Last recorded temperature before PACU discharge.

**Variable 61: PACU\_Urine\_mL**

* **Type**: Numeric (Float)
* **Units**: Milliliters (mL)
* **Description**: Total urine output measured during the PACU stay.

**Variable 62: Total\_NonBloodFluids**

* **Type**: Numeric (Float)
* **Units**: mL
* **Description**: Total volume of non-blood fluids administered during surgery.
* **Notes**: Includes crystalloids and colloids such as D5W, Normal Saline, Lactated Ringer’s, Albumin, etc.

**Variable 63: ASAStatus**

* **Type**: Categorical (Integer)
* **Description**: American Society of Anesthesiologists (ASA) physical status classification score assigned before surgery.
* **Possible Values**:
  + 1: Normal healthy patient
  + 2: Patient with mild systemic disease
  + 3: Patient with severe systemic disease
  + 4: Patient with severe systemic disease that is a constant threat to life
  + 5: Moribund patient who is not expected to survive without the operation
  + 6: Declared brain-dead patient whose organs are being removed for donor purposes

**Variable 64: RoomAir**

* **Type**: Boolean
* **Description**: Indicates if the patient was breathing room air (not receiving supplemental oxygen) at the time of PACU discharge.

**Variable 65: anes\_surgical\_duration\_diff**

* **Type**: Numeric (Float)
* **Units**: Minutes
* **Description**: Difference between total anesthesia time and surgical procedure time.
* **Calculation**: Anesthesia Duration - Procedure Duration
* **Notes**: Represents non-surgical anesthesia time, potentially accounting for procedures like line placements, airway management, or delays.

### General Notes:

* **Boolean Variables**: Represented as True (Yes) or False (No).
* **Numeric Variables**: Missing values may be represented as NA or might be handled specially in the analysis.
* **Units**: Units are specified where applicable. Consistent units should be used throughout the dataset.
* **Time Variables**: Durations are calculated in minutes to ensure consistency.
* **Data Sources**: Variables are derived from electronic medical records, including clinical events, labs, medications administered, and problem lists.
* **Variable Handling**: Some variables may have special considerations in data processing, such as handling missing values or combining related variables.