**Intelligent Cardiac Triage System Documentation**

**Version 4.3**  
*For AI Agent Training & Hackathon Submission*

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**1. Introduction**

This document outlines the rules and data required for an AI-driven cardiac triage system. The system determines the following:

* **Criticality Flag:** High, Medium, Low, Very Low
* **Doctor Expertise Required:** Expert, Specialist, General Practitioner
* **Time Required for Consultation:** Dynamically calculated in multiples of 30 minutes (either 30 or 60 minutes) and not exceeding 1 hour. For Very Low risk cases, no consultation is scheduled.
* **ETATime:** The maximum time the patient can wait before the consultation is completed. This value is output as a datetime (e.g., 3/1/2025 11:30), where the minutes are in multiples of 30.

The autonomous agent triggers on an update in the Dataverse and uses a comprehensive clinical knowledge base—including lab results, symptoms, patient history, and additional patient factors—to make intelligent decisions. For high-priority cases, the agent automatically sends scheduling emails to the Doctor Admin inbox; for low and very low risk cases, it provides personalized lifestyle recommendations via the Lifestyle Assist Agent.

**2. Parameter Definitions & Thresholds**

**2.1 Lab Values**

| **Parameter** | **Low** | **Medium** | **High** | **Source** |
| --- | --- | --- | --- | --- |
| **Troponin I (ng/mL)** | <0.04 | 0.04–0.4 | >0.4 | ACC/AHA Guidelines |
| **BNP (pg/mL)** | <100 | 100–400 | >400 | ESC Heart Failure |
| **Systolic BP (mmHg)** | <120 | 120–180 | >180 | JNC 8 Hypertension |
| **Diastolic BP (mmHg)** | <80 | 80–120 | >120 | JNC 8 Hypertension |
| **Heart Rate (bpm)** | 60–100 | 100–120 | >120 | AHA Arrhythmia |

**2.2 Symptoms & ECG Findings**

The following symptoms capture a broader range of cardiac-related presentations:

**Symptoms:**

* Chest pain/discomfort
* Shortness of breath
* Palpitations (racing/irregular heartbeat)
* Dizziness/fainting
* Fatigue (unusual tiredness)
* Swelling in legs/ankles

| **Parameter** | **Low** | **Medium** | **High** |
| --- | --- | --- | --- |
| **Symptoms** | Occasional mild discomfort (minimal impact) | Moderate chest pain/discomfort with some additional symptoms (e.g., palpitations) | Severe chest pain, marked shortness of breath, or multiple significant symptoms (e.g., severe fatigue, dizziness, swelling) |
| **ECG Findings** | Normal | Non-specific changes | ST elevation/depression |

**2.3 Additional Patient Data**

Additional fields enhance risk stratification and decision-making:

* **BloodType:** Relevant for overall patient management and emergency transfusion planning.
* **KnownAllergies:** Important for medication choices and avoiding adverse reactions.
* **ChronicConditions:** Examples include diabetes, hypertension, or prior cardiac events; these elevate risk and affect triage urgency.
* **SmokingStatus:** A key risk factor that contributes to the cardiac risk profile.
* **DateOfBirth:** Used to calculate patient age, influencing overall risk.
* **Gender:** Certain cardiac conditions may present differently across genders.

**3. Complex Decision Logic & Variable Time Calculation**

The agent uses multi-factor analysis—considering lab values, symptoms, and comprehensive patient history (including additional factors)—to determine the triage level.

**Criticality Flag Determination:**

* **High:** Any high lab value with severe symptoms or multiple moderate abnormalities in older patients or those with significant chronic conditions and a smoking history.
* **Medium:** A mix of moderate parameters, borderline high values without overt symptoms, or the presence of a few risk factors.
* **Low:** Predominantly low-range values with minimal risk factors.
* **Very Low:** All values are within normal limits or just borderline, with no significant risk factors, allergies, or chronic conditions.
  + *Action:* No consultation is scheduled; these cases are managed by the Lifestyle Assist Agent.

**Dynamic Time Calculation:**

Consultation and ETA times are computed dynamically by adjusting a base time with multipliers based on:

* Number and severity of abnormal lab values
* Symptom intensity and duration
* Patient age, gender, and chronic conditions (older patients or those with chronic conditions may require extended time)
* Smoking status (active smokers may increase risk)
* Additional considerations (BloodType and KnownAllergies are logged for further review)

**Note:**

* **TimeRequiredForConsultation:** Must be in multiples of 30 minutes—allowed values are **30 minutes** or **60 minutes** only (not exceeding 1 hour).
* **ETATime:** Must be output as a datetime (e.g., M/D/YYYY HH:MM), where the minutes are in multiples of 30.

**Example Pseudocode:**

pseudo

base\_time = 30 // base time in minutes

if (Criticality == High) then

base\_time = 60

if (number\_of\_abnormal\_parameters > 2) then

// Additional time is capped so that the consultation time remains 30 or 60 minutes

if (patient\_age > 65 or ChronicConditions present) then

base\_time remains 60

if (SmokingStatus == 'Active') then

base\_time remains 60

// For Very Low cases, no consultation is required.

Similar logic applies for ETA calculations, where the ETATime is represented as a datetime indicating the latest acceptable time for the consultation to occur.

**4. Doctor Expertise Classification**

| **Criticality Flag** | **Doctor Expertise Required** | **Role** |
| --- | --- | --- |
| High | Expert | Interventional Cardiologist (Emergency) |
| Medium | Specialist | General Cardiologist |
| Low | General | Primary Care Physician |
| Very Low | General | Lifestyle Assist Agent\* |

\*For Very Low cases, the Lifestyle Assist Agent manages the case without scheduling a clinical consultation.

**5. Dynamic Time Allocation for Consultation**

Consultation time is dynamically determined based on:

* **Severity of Lab Abnormalities and Symptoms:** More severe or multiple abnormalities prompt a 60‑minute consultation; milder cases are allocated 30 minutes.
* **Patient History & Demographics:** Older patients, or those with chronic conditions, lean toward a 60‑minute consultation.
* **Complexity Factors:** Cases with conflicting or borderline values follow the same 30‑minute or 60‑minute rule.
* **Very Low Cases:** No consultation is scheduled.

**6. ETA Time Determination**

ETATime represents the maximum time the patient can wait before the consultation is completed. This value is output as a datetime in the format M/D/YYYY HH:MM where minutes are either 00 or 30. For example, a patient with non-serious symptoms who can wait 3 days may have an ETA of 3/1/2025 11:30.

**7. Complex Scenario Library (30+ Examples)**

Below are updated example scenarios with the revised output format:

**7.1 Scenario: STEMI with Comorbidities**

**Parameters:**

* **Troponin:** 5.0 ng/mL
* **ECG:** ST elevation
* **Age:** 70, with ChronicConditions (diabetes, hypertension)
* **SmokingStatus:** Former or non-smoker
* **Symptoms:** Severe, sudden-onset chest pain/discomfort

**Expected Output:**

{

"CriticalityFlag": "High",

"DoctorExpertiseRequired": "Expert",

"TimeRequiredForConsultation": "60 minutes",

"ETATime": "60 mins"

}

**7.2 Scenario: Borderline Troponin with Severe Symptoms**

**Parameters:**

* **Troponin:** 0.4 ng/mL (borderline)
* **ECG:** Non-specific changes
* **Age:** 55
* **ChronicConditions:** None
* **SmokingStatus:** Non-smoker
* **Symptoms:** Severe chest pain/discomfort

**Expected Output:**

{

"CriticalityFlag": "High",

"DoctorExpertiseRequired": "Expert",

"TimeRequiredForConsultation": "60 minutes",

"ETATime": "60 mins"

}

**7.3 Scenario: Multiple Moderate Abnormalities with Risk Factors**

**Parameters:**

* **BNP:** 350 pg/mL
* **Heart Rate:** 115 bpm
* **Systolic BP:** 185 mmHg
* **Age:** 68, with ChronicConditions (e.g., prior cardiac event)
* **SmokingStatus:** Active or former
* **Symptoms:** Moderate chest pain/discomfort

**Expected Output:**

{

"CriticalityFlag": "High",

"DoctorExpertiseRequired": "Specialist",

"TimeRequiredForConsultation": "60 minutes",

"ETATime": "90 mins"

}

**7.4 Scenario: Acute Heart Failure with Confounding Data**

**Parameters:**

* **BNP:** 420 pg/mL
* **Heart Rate:** 125 bpm
* **Diastolic BP:** 125 mmHg
* **Age:** 60, with ChronicConditions (e.g., obesity)
* **SmokingStatus:** Non-smoker
* **Symptoms:** Moderate to severe dyspnea/shortness of breath

**Expected Output:**

{

"CriticalityFlag": "High",

"DoctorExpertiseRequired": "Expert",

"TimeRequiredForConsultation": "60 minutes",

"ETATime": "60 mins"

}

**7.5 Scenario: Routine Checkup with Isolated Abnormality**

**Parameters:**

* **Troponin:** 0.03 ng/mL
* **Other Labs & Symptoms:** Within low range
* **Age:** 45
* **ChronicConditions:** None
* **SmokingStatus:** Non-smoker
* **KnownAllergies:** None
* **Symptoms:** Mild chest discomfort only

**Expected Output:**

{

"CriticalityFlag": "Low",

"DoctorExpertiseRequired": "General",

"TimeRequiredForConsultation": "30 minutes",

"ETATime": "7200 mins"

}

**7.6 Scenario: Very Low Risk Case (No Consultation Required)**

For cases where all parameters are within normal or borderline ranges with no significant risk factors:

**Expected Output:**

{

"no consultation required"

}

*Note:* In this Very Low scenario, no clinical consultation is scheduled, and the case is managed entirely by the Lifestyle Assist Agent.

**8. Conflict Resolution & Edge Cases**

**8.1 Symptom Override**

* **Example:** Severe chest pain (High) despite a normal troponin (<0.04 ng/mL) in a patient with significant ChronicConditions.
* **Resolution:** Assign a High Criticality flag, schedule an immediate review, and set consultation time to 60 minutes with an appropriately urgent ETATime.

**8.2 Borderline Parameters with Confounding Factors**

* **Example:** Troponin at the upper limit of Medium (0.4 ng/mL) combined with BNP just under the Medium threshold in an elderly patient with multiple ChronicConditions and a history of Smoking.
* **Resolution:** Escalate to a High Criticality flag, assign expert review, and set consultation time to 60 minutes.

**8.3 Conflicting Data Trends**

* **Example:** Lab trends show improvement while symptoms worsen in a patient with known ChronicConditions.
* **Resolution:** Prioritize symptom severity and assign a Medium to High classification, adjusting the consultation time (30 or 60 minutes) accordingly.

**9. Decision Trees & Flowcharts**

**9.1 Multi-Factor Triage Decision Tree**

plaintext

START

│

├─> Evaluate Lab Values (Troponin, BNP, BP, HR)

│ │

│ ├─ If any value is High → flag as potential High

│ ├─ Else if multiple Moderate values → consider Medium

│ └─ Else → default to Low/Very Low (if no risk factors)

│

├─> Assess ECG Findings & Expanded Symptoms

│ │

│ ├─ If ECG shows ST changes or Symptoms are Severe

│ │ (chest pain, shortness of breath, palpitations, dizziness, fatigue, swelling) → override to High

│ └─ Else → maintain previous flag or adjust to Very Low if all are normal

│

├─> Incorporate Additional Patient Data (Age, ChronicConditions, SmokingStatus, KnownAllergies, Gender, BloodType)

│ │

│ └─ Adjust flag upward if significant risk factors are present

│

└─> Calculate Consultation Time using Dynamic Formula

│

└─ Set TimeRequiredForConsultation to 30 or 60 minutes (or "no consultation required" for Very Low cases)

**9.2 Flowchart for Dynamic Time Allocation**

*A visual flowchart can be generated in Power Platform using Visio or integrated drawing tools.*

**10. Appendices**

**Appendix A: Reference Links**

* [American College of Cardiology (ACC)](https://www.acc.org/)
* [Open FDA](https://open.fda.gov/)
* [World Health Organization (WHO)](https://www.who.int/)
* [European Society of Cardiology (ESC)](https://www.escardio.org/)
* [Centers for Disease Control and Prevention (CDC)](https://www.cdc.gov/)

**Appendix B: Lookup Tables & Weight Factors**

* Detailed tables for converting lab values, symptom severity, and additional patient factors into risk scores and time multipliers.

**Appendix C: Sample Data Sets and Integration Flow Diagrams**

* Documentation of synthetic datasets (e.g., Synthea, MIMIC-IV) and API endpoints for system integration.