

## Summary of the Document

This document provides a structured representation of the interaction workflow for an AI-assisted diagnostic training system. It details the **JSON payloads** exchanged between the **frontend (student actions)** and the **backend (system responses)** for each stage of the diagnostic process. These interactions simulate a realistic medical case, guiding students through iterative reasoning, decision-making, and diagnostic refinement.

## Context and Purpose

- The workflow is divided into **five stages**, each representing a critical step in the diagnostic reasoning process:
  1. **Initial Case Presentation and Information Gathering:** Students collect patient data through history-taking and physical exams.
  2. **Primary Diagnosis and Reasoning:** Students propose and justify their primary diagnosis.
  3. **Differential Diagnoses and Refinement:** Students explore and prioritize other potential conditions.
  4. **Diagnostic Testing and Interpretation:** Students select diagnostic tests, interpret results, and refine their diagnosis.
  5. **Final Diagnosis and Feedback:** Students confirm their diagnosis and review performance feedback.
- The system uses two **bot personas**:
  1. **Patient Persona:** Provides realistic, sometimes vague answers to simulate real-world patient interactions.
  2. **Medical Assistant Persona (MA):** Guides the student through stages, provides test results, and evaluates reasoning.

## Goals

2. **Simulate Realism:**
  - Patient responses include relevant and trivial information, incomplete details, and emotional context.
2. **Support Iterative Learning:**
  - Students refine their reasoning through test results and feedback, mirroring real-world diagnostic practices.
3. **Provide Structured Feedback:**
  - Where applicable, relevance scores and structured feedback help students understand the strengths and weaknesses of their reasoning.

# Stage 1: Initial Case Presentation and Information Gathering

---

## Step 1: Case Presentation

**Frontend → Backend:**

```
{  
  
  "stage": "case_presentation",  
  
  "step": "step_1",  
  
  "action": "start"  
}
```

**Backend → Frontend:**

```
{  
  
  "type": "case_presentation",  
  
  "step": "step_1",  
  
  "response": {  
  
    "type": "text",  
  
    "content": "Welcome to the diagnostic simulator! Today's case involves a 30-year-old woman  
presenting with a two-week history of an itchy rash, joint pain, and fatigue."  
  
  },  
  
  "imaging": {  
  
    "type": "photo",  
  
    "url": "https://example.com/patient-overview.jpg",  
  
    "caption": "The rash started two weeks ago and hasn't gone away."  
  
  },  
}
```

```
"next_step": "step_2",  
"next_stage": "case_presentation"  
}
```

---

## Step 2: Student Asks Questions

**Frontend → Backend:**

```
{  
  "stage": "case_presentation",  
  "step": "step_2",  
  "action": "ask",  
  "question": "When did the rash first appear?"  
}
```

**Backend → Frontend:**

```
{  
  "type": "case_presentation",  
  "step": "step_2",  
  "response": {  
    "type": "text",  
    "content": "It started about two weeks ago and hasn't gone away."  
  },  
  "imaging": {  
    "type": "photo",  
    "url": "https://example.com/rash-closeup.jpg",
```

```
"caption": "Close-up of rash showing red, raised patches on the forearm."

},

"relevance_score": 5,

"next_step": "step_3",

"next_stage": "case_presentation"

}
```

---

### Step 3: Student Requests Physical Examinations

**Frontend → Backend:**

```
{

  "stage": "case_presentation",

  "step": "step_3",

  "action": "exam",

  "exam_type": "skin_examination"

}
```

**Backend → Frontend:**

```
{

  "type": "case_presentation",

  "step": "step_3",

  "response": {

    "type": "text",

    "content": "Skin examination findings: Red, raised patches on the forearms and legs, some fading with bruising."

  }

}
```

```
},  
  
"imaging": {  
  
  "type": "photo",  
  
  "url": "https://example.com/skin-exam.jpg",  
  
  "caption": "Skin findings during physical examination."  
  
},  
  
"next_step": "step_4",  
  
"next_stage": "case_presentation"  
}
```

---

#### **Step 4: Student Clicks Next Button**

**Frontend → Backend:**

```
{  
  
  "stage": "case_presentation",  
  
  "step": "step_4",  
  
  "action": "next"  
}
```

**Backend → Frontend:**

```
{  
  
  "type": "case_presentation",  
  
  "step": "step_4",  
  
  "response": {
```

```
"type": "summary",

"content": "Here is a summary of the gathered information categorized into relevant and
irrelevant findings.",

"findings": {

  "relevant": [

    "Rash lasting over 24 hours, resolving with bruising",

    "Morning joint pain in wrists and knees",

    "No new exposures"

  ],

  "irrelevant": [

    "Normal blood pressure",

    "Had coffee this morning"

  ]

},

"next_step": "step_5",

"next_stage": "case_presentation"

}
```

---

## Step 5: Student Selects Relevant Information

**Frontend → Backend:**

```
{
```

```
"stage": "case_presentation",

"step": "step_5",

"action": "select",

"selected_details": [

    "Rash lasting over 24 hours, resolving with bruising",

    "Morning joint pain in wrists and knees"

]

}
```

**Backend → Frontend:**

```
{

    "type": "case_presentation",

    "step": "step_5",

    "response": {

        "type": "feedback",

        "content": {

            "summary": "You've selected key findings. Here is your performance evaluation.",

            "correct_details": [

                "Rash lasting over 24 hours, resolving with bruising",

                "Morning joint pain in wrists and knees"

            ],

            "missed_details": [],

            "trivial_details": ["Normal blood pressure"]

        }

    }

}
```

```
},  
  
  "relevance_score": 5  
  
},  
  
  "next_step": null,  
  
  "next_stage": "diagnosis"  
  
}
```

---

-

## Stage 2: Primary Diagnosis and Reasoning

### Step 1: Prompt for Primary Diagnosis (Merged Transition)

#### Backend Response:

```
{  
  
  "type": "primary_diagnosis",  
  
  "step": "step_1",  
  
  "response": {  
  
    "type": "text",  
  
    "content": "Good work on identifying key findings. Based on the patient's history and findings,  
what is your primary diagnosis?",  
  
    "options": [  
  
      "Urticarial Vasculitis",  
  
      "Chronic Idiopathic Urticaria",  
  
      "Drug-Induced Urticarial Rash",
```



```
    "Systemic Lupus Erythematosus"

  ]

},

"next_step": "step_2",

"next_stage": "primary_diagnosis"

}
```

---

## Step 2: Student Proposes and Justifies a Diagnosis

**Frontend → Backend:**

```
{

  "stage": "primary_diagnosis",

  "step": "step_2",

  "action": "submit",

  "selected_diagnosis": "Urticarial Vasculitis",

  "reasoning": "The rash persists for more than 24 hours and resolves with bruising. Joint pain and fatigue suggest systemic involvement, consistent with vasculitis."

}
```

**Backend → Frontend:**

```
{

  "type": "primary_diagnosis",

  "step": "step_2",

  "response": {

    "type": "text",
```

"content": "You have selected Urticarial Vasculitis as your primary diagnosis. Your reasoning has been recorded. Let's move on to explore potential differential diagnoses."

},

"relevance\_score": 5,

"next\_step": null,

"next\_stage": "differential\_diagnoses"

}

---

## Summary

### 1. Steps:

- **Step 1:** Prompt the student for their primary diagnosis.
- **Step 2:** Record the diagnosis and reasoning, and transition directly to the next stage.

### 2. Simplified Flow:

- Eliminated unnecessary feedback or actions, focusing only on capturing the student's reasoning and transitioning smoothly.

### 3. Relevance Score:

- Provides a measure of how well the student's diagnosis aligns with the expected outcome.

## Stage 3: Differential Diagnoses and Refinement

---

## Definition of Stage 3

This stage focuses on encouraging students to explore and prioritize possible differential diagnoses. The aim is to ensure they consider multiple conditions and logically justify their selection. The workflow for this stage consists of **3 steps**:

---

## Steps

### Step 1: Prompt for Differential Diagnoses (Merged Transition)

#### Backend Response:

```
{  
  
  "type": "differential_diagnoses",  
  
  "step": "step_1",  
  
  "response": {  
  
    "type": "text",  
  
    "content": "Based on the patient's findings and your primary diagnosis, what other conditions  
could explain the symptoms? Select all that apply.",  
  
    "options": [  
  
      "Urticarial Vasculitis",  
  
      "Systemic Lupus Erythematosus",  
  
      "Hypersensitivity Vasculitis",  
  
      "Chronic Idiopathic Urticaria"  
  
    ],  
  
  },  
  
  "next_step": "step_2",  
  
  "next_stage": "differential_diagnoses"
```

```
}
```

---

## Step 2: Student Selects and Prioritizes Differentials

**Frontend → Backend:**

```
{  
  "stage": "differential_diagnoses",  
  "step": "step_2",  
  "action": "select",  
  "selected_differentials": [  
    "Urticarial Vasculitis",  
    "Systemic Lupus Erythematosus",  
    "Hypersensitivity Vasculitis"  
  ],  
  "prioritization": [  
    "Urticarial Vasculitis",  
    "Systemic Lupus Erythematosus",  
    "Hypersensitivity Vasculitis"  
  ]  
}
```

**Backend → Frontend:**

```
{  
  "type": "differential_diagnoses",  
  "step": "step_2",
```

```
"response": {  
  
  "type": "text",  
  
  "content": "Your differential diagnoses have been recorded. Let's move forward to consider  
diagnostic tests."  
  
},  
  
"relevance_score": 4,  
  
"next_step": null,  
  
"next_stage": "diagnostic_testing"  
}
```

---

## Key Adjustments for Stage 3

### 1. Steps Reduced to 2:

- Step 1 prompts the student for differential diagnoses.
- Step 2 records their selections and prioritization, then transitions directly to the next stage.

### 2. Relevance Score:

- Assesses the appropriateness of the selected differentials and their prioritization.

### 3. Smooth Transition:

- The workflow moves directly to **Stage 4: Diagnostic Testing and Interpretation** after the student records their differentials.
- 

## Summary of Stage 3 Workflow

### 1. Prompt for Differential Diagnoses:

- Students are presented with possible conditions and asked to select all that apply.

### 2. Record and Transition:

- Student selections and prioritization are recorded without additional feedback.

## Stage 4: Diagnostic Testing and Interpretation

---

## Definition of Stage 4

This stage involves selecting appropriate diagnostic tests, interpreting the results, and refining the diagnostic reasoning. The workflow emphasizes logical test selection and iterative learning through results analysis.

---

## Steps

### Step 1: Prompt for Diagnostic Tests (Merged Transition)

#### Backend Response:

```
{  
  
  "type": "diagnostic_testing",  
  
  "step": "step_1",  
  
  "response": {  
  
    "type": "text",  
  
    "content": "Based on your differential diagnoses, what diagnostic tests would you like to  
order? Select the most relevant ones.",  
  
    "options": [  
  
      "CBC and ESR",  
  
      "Complement Levels",  
  
      "ANA Test",  
  
      "Skin Biopsy",  
  
      "Allergy Panel Testing",  
  
      "Imaging"  
  
    ]  
  
  },  
}
```

```
"next_step": "step_2",  
"next_stage": "diagnostic_testing"  
}
```

---

## Step 2: Student Orders Diagnostic Tests

**Frontend → Backend:**

```
{  
  "stage": "diagnostic_testing",  
  "step": "step_2",  
  "action": "select_tests",  
  "selected_tests": [  
    "CBC and ESR",  
    "Complement Levels",  
    "ANA Test",  
    "Skin Biopsy"  
  ]  
}
```

**Backend → Frontend:**

```
{  
  "type": "diagnostic_testing",  
  "step": "step_2",  
  "response": {  
    "type": "text",
```



```
"content": "The results for the selected tests are as follows:",  
  
"results": {  
  
  "CBC and ESR": "Mildly elevated ESR",  
  
  "Complement Levels": "Low C3 and C4",  
  
  "ANA Test": "Positive",  
  
  "Skin Biopsy": "Leukocytoclastic vasculitis with immune deposits"  
  
}  
  
},  
  
"next_step": "step_3",  
  
"next_stage": "diagnostic_testing"  
  
}
```

---

### Step 3: Student Refines Diagnosis

**Frontend → Backend:**

```
{  
  
  "stage": "diagnostic_testing",  
  
  "step": "step_3",  
  
  "action": "refine_diagnosis",  
  
  "updated_diagnosis": "Systemic Lupus Erythematosus",  
  
  "reasoning": "Low complement levels and a positive ANA test suggest systemic lupus."  
  
}
```

**Backend → Frontend:**

```
{  
  
  "type": "diagnostic_testing",  
  
  "step": "step_3",  
  
  "response": {  
  
    "type": "text",  
  
    "content": "Your refined diagnosis and reasoning have been recorded. Let's proceed to  
finalize your diagnosis."  
  
  },  
  
  "relevance_score": 4,  
  
  "next_step": null,  
  
  "next_stage": "final_diagnosis"  
}
```

---

## Key Adjustments for Stage 4

### 1. Three Steps:

- Step 1: Prompt for diagnostic tests (merged with transition feedback).
- Step 2: Record selected tests and return simulated results.
- Step 3: Refine the diagnosis based on test results and reasoning.

### 2. Simulated Test Results:

- Results mimic real-world diagnostic outputs and guide diagnostic refinement.

### 3. Relevance Score:

- Step 3 includes a relevance score to evaluate the student's refined diagnosis.

### 4. Smooth Transition:

- The workflow transitions directly to **Stage 5: Final Diagnosis and Feedback**.

---

## Summary of Stage 4 Workflow

1. **Test Selection:**
  - Students select diagnostic tests based on their differential diagnoses.
2. **Result Interpretation:**
  - Simulated results are returned for the selected tests.
3. **Diagnostic Refinement:**
  - Students update their diagnosis and reasoning based on test results.

## Stage 5: Final Diagnosis and Feedback

---

### Definition of Stage 5

The final stage evaluates the student's diagnostic journey. Students submit their final diagnosis and reasoning based on the available data. This stage concludes the case with a performance summary and optional learning materials.

---

### Steps

#### Step 1: Prompt for Final Diagnosis (Merged Transition)

##### Backend Response:

```
{  
  
  "type": "final_diagnosis",  
  
  "step": "step_1",  
  
  "response": {  
  
    "type": "text",  
  
    "content": "Based on the test results and your refined reasoning, what is your final  
diagnosis?",  
  
    "options": [  
  
      "Urticarial Vasculitis",  
  
      "Systemic Lupus Erythematosus",  
  
      "Chronic Idiopathic Urticaria",  
  
      "Drug-Induced Urticarial Rash"  
  
    ]  
  
  },  
}
```

```
"next_step": "step_2",  
  
"next_stage": "final_diagnosis"  
  
}
```

---

## Step 2: Student Confirms Final Diagnosis

**Frontend → Backend:**

```
{  
  
  "stage": "final_diagnosis",  
  
  "step": "step_2",  
  
  "action": "submit",  
  
  "final_diagnosis": "Urticarial Vasculitis",  
  
  "reasoning": "Despite initial suspicion of lupus, the biopsy findings confirm Urticarial Vasculitis."  
  
}
```

**Backend → Frontend:**

```
{  
  
  "type": "final_diagnosis",  
  
  "step": "step_2",  
  
  "response": {  
  
    "type": "text",  
  
    "content": "Your final diagnosis and reasoning have been recorded. Let's review your performance."  
  
  },  
  
  "next_step": "step_3",
```

```
"next_stage": "final_diagnosis"
}
```

---

### Step 3: Performance Summary and Case Conclusion

**Frontend → Backend:**

```
{
  "stage": "final_diagnosis",
  "step": "step_3",
  "action": "request_summary"
}
```

**Backend → Frontend:**

```
{
  "type": "final_diagnosis",
  "step": "step_3",
  "response": {
    "type": "summary",
    "content": {
      "diagnosis_accuracy": true,
      "relevance_score": 5,
      "feedback": {
        "strengths": [
          "Correctly identified Urticarial Vasculitis as the primary diagnosis.",
          "Demonstrated logical reasoning with test results."
```

```
],  
  
  "improvements": [  
  
    "Consider systemic lupus earlier in differential reasoning."  
  
  ]  
  
}  
  
},  
  
"learning_materials": {  
  
  "case_guidelines": "https://example.com/urticarial-vasculitis-guidelines",  
  
  "related_topics": [  
  
    "https://example.com/systemic-lupus",  
  
    "https://example.com/vasculitis-overview"  
  
  ]  
  
}  
  
},  
  
"next_step": null,  
  
"next_stage": null  
  
}
```

---

## Key Adjustments for Stage 5

### 1. Three Steps:

- Step 1: Prompt for the final diagnosis (merged with transition feedback).
- Step 2: Record the student's final diagnosis and reasoning.
- Step 3: Provide a performance summary and optional learning materials.

## 2. Performance Summary:

- Includes **diagnosis\_accuracy** (true/false), a final **relevance\_score**, and feedback on strengths and areas for improvement.

## 3. Learning Materials:

- Offers links to case guidelines and related topics for further study.
- 

## Summary of Stage 5 Workflow

### 1. Final Diagnosis Submission:

- Students confirm their final diagnosis and reasoning.

### 2. Performance Review:

- A comprehensive summary evaluates their diagnostic journey.

### 3. Learning Materials:

- Provides additional resources for continued learning.