

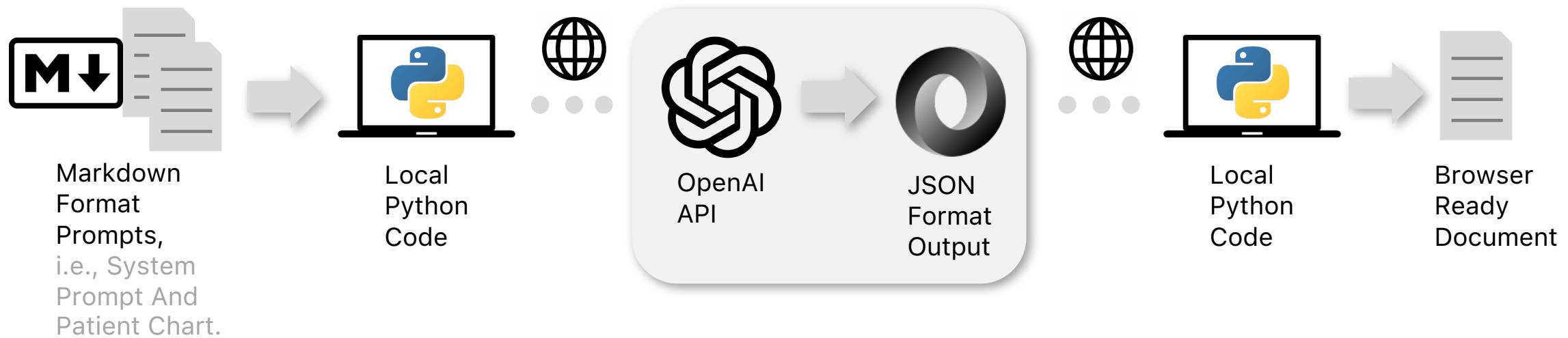
XPC Chart Review Simulator: Taking Flight

Morris Aguilar, Ph.D.

Generative AI (GenAI) Fellow at XPC

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Chart Review (CR) Prototype Road Map.



*Associated files and code are in a private GitHub project repository.

Prompt Anatomy

Prompt Engineering Strategy	Description	Advantages
Writing the System Prompt in Markdown Format	The widely adopted Markdown format provides conventions for structuring plain-text.	Enhances LM interpretability of the relationship between human written instructions.
Defining Agent Role	Defining the norm of interactions and function of the agent.	Improves performance by aligning the agent to a domain, i.e., medical chart review.
In-Context Learning (ICL)	Description of task, requirements, and goals.	LM uses internal knowledge to understand the patterns and logic to generate the desired output.
Prune-and-Search	Listing specific topics include or exclude for consideration into final output.	Controlling the information that the agent considers to synthesize its final output more accurately.
Structured Output Formatting	A JSON output template provided in the system prompt.	Improves the usability and consistency of the outputs across SLMs for downstream processing.
Chain-of-Thought	Intermediate reasoning steps.	Breaks down the complex overarching task into simplified subtasks thereby improving performance.

CR Prompting.

- **Objective** defined.
- **Instructions** provided.
- **Guidelines** listed.
- **Safety guardrails** described.
- **JSON** output format defined.

CR: Output is Standardized in JSON.

```
{  
    "Assessment": "The assessment statement constructed from the patient chart goes here.",  
    "Plan": {  
        "Problem 1": {  
            "Status": "State the status and clinical response of the problem.",  
            "Decision Making and Diagnostic Plan": "Decision and diagnostic plan constructed from the patient's chart goes here.",  
            "Treatment Plan": "Treatment plan constructed from the patient chart goes here.",  
            "Contingency Planning": "Contingency plan constructed from the patient chart goes here."  
        },  
        "Problem 2": {  
            "Status": "State the status and clinical response of the problem.",  
            "Decision Making and Diagnostic Plan": "Decision and diagnostic plan constructed from the patient's chart goes here.",  
            "Treatment Plan": "Treatment plan constructed from the patient chart goes here.",  
            "Contingency Planning": "Contingency plan constructed from the patient chart goes here."  
        },  
        "Problem N": {  
            "Status": "State the status and clinical response of the problem.",  
            "Decision Making and Diagnostic Plan": "Decision and diagnostic plan constructed from the patient's chart goes here.",  
            "Treatment Plan": "Treatment plan constructed from the patient chart goes here.",  
            "Contingency Planning": "Contingency plan constructed from the patient chart goes here."  
        },  
        "Anticipatory Preventative Care": {  
            "Item 1": "Preventative Care Item 1 constructed from the patient chart goes here.",  
            "Item 2": "Preventative Care Item 2 constructed from the patient chart goes here.",  
            "Item N": "Preventative Care Item N constructed from the patient chart goes here."  
        }  
    }  
}
```

Assessment + Plan (cont'd on next slide.)

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```
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{  
    "Assessment": "71-year-old female with newly diagnosed atrial fibrillation (AF) identified via Apple Watch notification. The patient has no symptoms and no known history of heart failure, stroke, or other major comorbidities. Blood pressure is elevated (146/82 mmHg), but the patient is not on any antihypertensive medications. Her irregularly irregular pulse and lack of symptoms suggest paroxysmal or early-onset AF. No other significant findings from her medical or family history were reported, and she has not had recent healthcare evaluations.",  
    "Plan": {  
        "Atrial Fibrillation": {  
            "Status": "Newly diagnosed atrial fibrillation without symptoms.",  
            "Decision Making and Diagnostic Plan": "Given the patient's asymptomatic presentation, an echocardiogram to assess for structural heart disease and left atrial thrombus is recommended. Anticoagulation therapy should be considered, particularly in light of her elevated blood pressure and risk of stroke. Cardiology referral for further management of AF and to discuss rate or rhythm control options is indicated. Blood pressure management will be initiated to reduce stroke risk.",  
            "Treatment Plan": "Initiate anticoagulation with either apixaban or rivaroxaban based on renal function and patient preference. Start a calcium channel blocker (e.g., diltiazem) for rate control due to the absence of symptoms. Blood pressure should be managed with an ACE inhibitor (e.g., lisinopril) or calcium channel blocker (e.g., amlodipine). Advise monitoring of INR or anti-Xa levels depending on anticoagulation choice.",  
            "Contingency Planning": "If the patient experiences symptoms like palpitations, dizziness, or chest pain, consider referral to the emergency department for treatment."  
        }  
    }  
}
```

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{  
    "Assessment": "71-year-old female with recently diagnosed asymptomatic atrial fibrillation, first noted on an Apple Watch notification two weeks ago. No history of diabetes, stroke, heart failure, thromboembolic disease, or bleeding risk factors. Not currently taking antihypertensive or anticoagulant medications. Blood pressure elevated at 146/82 mmHg, and pulse noted to be irregularly irregular at 88 bpm. The primary concerns are stroke prevention and rate versus rhythm control strategies.",  
    "Plan": {  
        "Atrial Fibrillation": {  
            "Status": "Newly diagnosed, asymptomatic, and likely persistent atrial fibrillation without prior medical evaluation.",  
            "Decision Making and Diagnostic Plan": "Obtain an ECG to confirm atrial fibrillation and consider an echocardiogram to assess structural heart disease and left atrial size. Order TSH to rule out secondary causes. Assess thromboembolic risk using the CHA2DS2-VASc score and bleeding risk using the HAS-BLED score.",  
            "Treatment Plan": "Initiate anticoagulation with apixaban or rivaroxaban for stroke prevention based on CHA2DS2-VASc score. Consider starting rate control therapy (e.g., metoprolol or diltiazem) if tachycardia is noted. Discuss options for rhythm control if indicated after further workup.",  
            "Contingency Planning": "If symptoms develop (e.g., palpitations, dizziness, shortness of breath), arrange for urgent evaluation. If anticoagulation is contraindicated or concerns arise, consider cardiology referral for alternative options such as left atrial appendage closure."  
        },  
        "Hypertension": {  
            "Status": "Elevated blood pressure (146/82 mmHg)"  
        }  
    }  
}
```

o3-mini (reasoning model)

```
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{  
    "Assessment": "71-year-old female with newly diagnosed, asymptomatic atrial fibrillation discovered incidentally via Apple Watch notification. Exam confirms an irregularly irregular rhythm without murmurs. She has untreated stage I hypertension. Likely diagnosis is nonvalvular atrial fibrillation (AF). Differential diagnoses include atrial flutter (would demonstrate sawtooth waves on ECG; absent here), frequent premature atrial contractions (would show isolated early beats rather than sustained irregularity), and sinus arrhythmia (unlikely given age and persistent irregular rhythm). CHA2DS2-VASc score is 3 (female, age 65–74, hypertension), indicating elevated thromboembolic risk; HAS-BLED risk is low.",  
    "Plan": {  
        "Atrial Fibrillation": {  
            "Status": "New diagnosis; asymptomatic; nonvalvular AF confirmed on exam.",  
            "Decision Making and Diagnostic Plan": "Obtain 12-lead ECG to confirm AF. Order transthoracic echocardiogram to assess cardiac structure/function and rule out valvular disease. Check TSH, CBC, CMP (including renal and hepatic function) to guide anticoagulant selection and exclude reversible causes.",  
            "Treatment Plan": "Initiate apixaban 5 mg PO twice daily for stroke prophylaxis. No rate-control medication needed at this time given resting HR <110 bpm and absence of symptoms.",  
            "Contingency Planning": "If bleeding develops or renal function declines (CrCl <25 mL/min), reassess anticoagulation choice/dose. If HR rises >110 bpm or patient becomes symptomatic (palpitations, dyspnea), start low-dose beta blocker (e.g., metoprolol tartrate 25 mg BID) and consider cardiology referral for rhythm control discussion. Follow-up in 4 weeks with labs and echo results."  
        }  
    }  
}
```

Preventative Care Outputs in same JSON.

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```
},  
    "Hypertension": {  
        "Status": "Uncontrolled hypertension with a BP reading of 146/82 mmHg.",  
        "Decision Making and Diagnostic Plan": "Confirm if the elevated blood pressure is consistent across multiple readings, and assess for end-organ damage. Begin antihypertensive therapy with either an ACE inhibitor or calcium channel blocker. The patient should also monitor blood pressure at home.",  
        "Treatment Plan": "Initiate antihypertensive therapy, starting with an ACE inhibitor such as lisinopril or a calcium channel blocker such as amlodipine. Counsel on lifestyle modifications such as reducing sodium intake, increasing physical activity, and weight loss. Follow-up in 1 month for blood pressure re-evaluation.",  
        "Contingency Planning": "If blood pressure remains poorly controlled, consider increasing the dose or adding a thiazide diuretic or ARB. Recheck electrolytes and renal function after initiating therapy."  
    },  
    "Preventative Care": {  
        "Vaccinations": "Recommend annual influenza vaccination and pneumococcal vaccination (if not already received). Discuss shingles vaccination if not yet completed.",  
        "Cancer Screening": "Ensure the patient has had regular screening for breast cancer (mammography) and colorectal cancer (colonoscopy), appropriate for her age. If no recent screenings, consider scheduling these.",  
        "Bone Health": "Discuss osteoporosis screening with DEXA if not previously done, given her age."  
    }  
}
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```
(e.g., palpitations, dizziness, shortness of breath), arrange for urgent evaluation. If anticoagulation is contraindicated or concerns arise, consider cardiology referral for alternative options such as left atrial appendage closure."  
},  
    "Hypertension": {  
        "Status": "Elevated blood pressure (146/82 mmHg) without current treatment.",  
        "Decision Making and Diagnostic Plan": "Confirm diagnosis with home blood pressure monitoring or ambulatory blood pressure measurement. Assess for end-organ damage (renal function, electrolytes, and ECG for LHV).",  

```

o3-mini (reasoning model)

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```
home blood pressure logs for one week to confirm diagnosis. Order basic metabolic panel to monitor electrolytes once therapy is initiated.",  
    "Treatment Plan": "Start lisinopril 10 mg PO daily. Advise DASH diet, sodium <2,300 mg/day, weight loss, and regular aerobic exercise.",  
    "Contingency Planning": "If BP remains ≥130/80 mmHg after 4 weeks, increase lisinopril to 20 mg daily or add thiazide diuretic. If cough develops, switch to losartan 50 mg daily."  
},  
    "Anticipatory Preventative Care": {  

```

Prompt Chart Review Feedback JSON.

```
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{
    "Feedback Summary": "A concise summary of the overall evaluation of the chart review output.",
    "Feedback Details": {
        "Assessment Section": "Detailed feedback on the assessment section, noting strengths and any areas for improvement regarding problem representation, synthesis of clinical issues, and inclusion of differential diagnoses.",
        "Plan Section": "Detailed feedback on the plan section, focusing on the clarity and organization of problem prioritization, explanation of decision making, treatment planning, contingency planning, and preventative care items.",
        "Overall Recommendations": "General suggestions and actionable recommendations to improve the quality and clarity of the chart review report."
    }
}
```

Feedback Workflow



Chart Review JSON Output



Feedback Agent
Feedback system prompt.
e.g.,
4o evals 4o CR,
o3-mini evals o3-mini CR.



Feedback JSON Output

Chart Review Feedback Preview

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```
● ● ●  
"Feedback Details": {  
    "Assessment Section": "The assessment section accurately reflects the patient's clinical presentation, including key details like age, atrial fibrillation diagnosis, and absence of other major comorbidities such as diabetes or stroke. The representation of the main clinical concerns—stroke prevention and rate versus rhythm control—is clearly stated. However, it could be helpful to explicitly mention the patient's CHA2DS2-VASc score, which is critical in assessing stroke risk, and how it might impact treatment decisions. Additionally, the assessment could include a brief note about the patient's medication history or any potential contraindications for anticoagulation, which would provide a more complete picture of the patient's situation."  
  
    "Plan Section": {  
        "Atrial Fibrillation": {  
            "Strengths": "The plan for atrial fibrillation is comprehensive, covering diagnostic steps, treatment options, and contingency planning. The choice of anticoagulants (apixaban or rivaroxaban) is appropriate, and the inclusion of potential rhythm control options based on further workup is clear. The contingency planning for urgent evaluation if symptoms develop is well-thought-out."  
            "Areas for Improvement": "While the diagnostic plan includes important tests (ECG, echocardiogram, TSH), it might be useful to prioritize the order or timing of these tests, especially if there is concern about the potential for a thromboembolic event. More explicit mention of how to proceed if the echocardiogram shows structural heart disease (e.g., left ventricular hypertrophy or atrial enlargement) would strengthen the plan."  
        },  
        "Hypertension": {  
            "Strengths": "The plan for managing hypertension is reasonable, with appropriate steps to confirm diagnosis,  
        }  
    }  
}
```

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```
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{  
    "Feedback Summary": "The chart review output is well-structured, clinically relevant, and includes a thorough assessment and plan. The key patient issues are accurately identified, and the management plan is comprehensive. Some areas for improvement include expanding on the rationale for anticoagulation selection, clarifying contingency plans, and ensuring a more structured approach to preventative care recommendations.",  
    "Feedback Details": {  
        "Assessment Section": {  
            "Strengths": "The assessment effectively summarizes the key clinical problem (newly diagnosed atrial fibrillation) and relevant patient history. It correctly emphasizes stroke prevention and rate vs. rhythm control as primary considerations. The problem representation is clear, concise, and clinically appropriate.",  
            "Areas for Improvement": "Consider briefly mentioning why rate vs. rhythm control is being considered (e.g., age, lack of symptoms, stroke risk factors). Explicitly stating the CHA2DS2-VASc score would strengthen the assessment by providing an immediate risk stratification for anticoagulation decisions."  
        },  
        "Plan Section": {  
            "Atrial Fibrillation": {  
                "Strengths": "The plan follows a logical approach by confirming the diagnosis with ECG, assessing structural heart disease with echocardiography, and ruling out secondary causes. Anticoagulation and rate control options are appropriately listed, along with contingency planning for worsening symptoms."  
                "Areas for Improvement": "Specify the CHA2DS2-VASc score threshold that warrants anticoagulation. If rhythm control is under consideration, mention potential candidates for antiarrhythmic therapy or procedural  
            }  
        }  
    }  
}
```

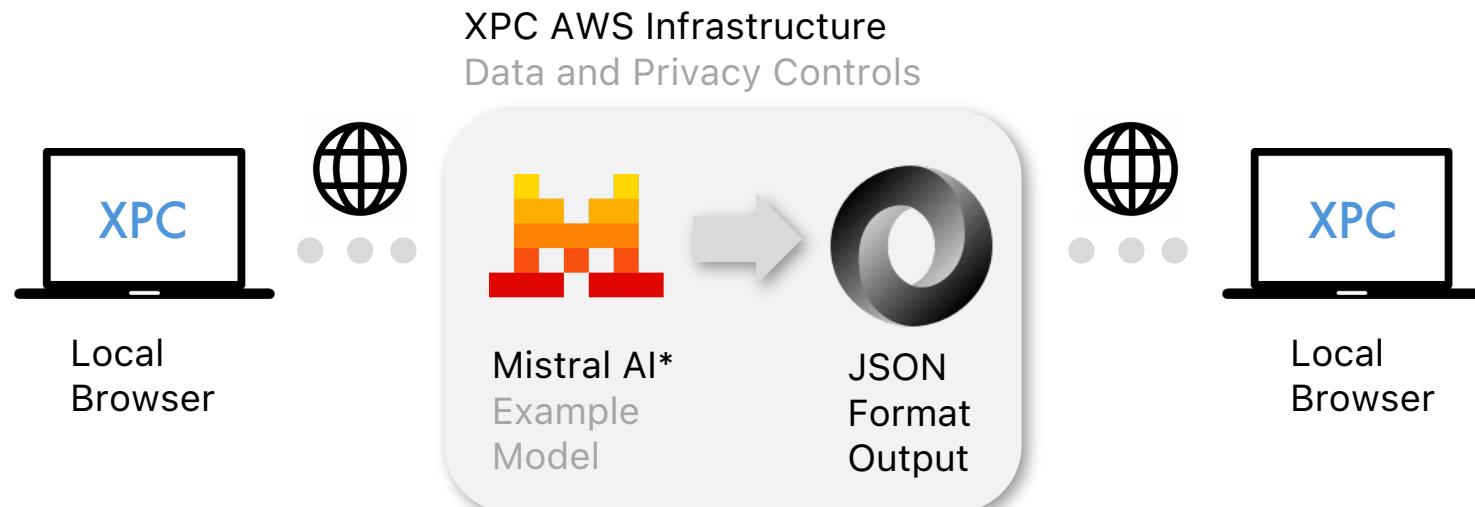
o3-mini (reasoning model)

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{  
    "Feedback Summary": "The chart review demonstrates a solid, organized approach to diagnosing and managing newly identified nonvalvular atrial fibrillation and stage I hypertension, with a comprehensive preventive care plan. The Assessment succinctly captures key clinical findings and risk stratification, while the Plan is well-structured by problem and includes clear diagnostic, treatment, and contingency steps. Opportunities exist to enhance precision in problem representation, incorporate patient-centered decision-making documentation, and specify follow-up timing and responsibilities more explicitly.",  
    "Feedback Details": {  
        "Assessment Section": {  
            "Strengths": [  
                "Concise problem representation with patient demographics, presentation, and relevant exam findings.",  
                "Appropriate differential diagnoses with rationale for exclusion.",  
                "Calculation and interpretation of CHA2DS2-VASc and HAS-BLED scores."  
            ],  
            "Areas for Improvement": [  
                "Include onset/timing of AF detection (e.g., date of Apple Watch alert) for temporal context.",  
                "Explicitly note exclusion of reversible precipitants (e.g., hyperthyroidism) beyond differential exclusion.",  
                "Refine problem statement to follow a standardized format (e.g., 'Nonvalvular atrial fibrillation, newly diagnosed, asymptomatic')."  
            ]  
        },  
        "Plan Section": {  
            "Strengths": [  
                "Logical flow from diagnosis to treatment, including anticoagulation and rate control options.  
            ]  
        }  
    }  
}
```

Ideas to Consider for the Big Picture.

- LLM Prompts as Intellectual Property.
- Anthropic's Anthology Fund
 - Focused on accelerating AI applications in areas including **education and healthcare**.
 - \$25,000 in free Anthropic API credits.
- XPC controlled LLM via AWS.

GenAI Self Sufficiency in the Near Future?



* Mistral AI is one option out of several models open-source models that can be fully controlled in AWS.

Practical Next Steps:

- Beyond OpenAI models
 - Anthropic
 - Mistral
 - LLaMA
- Possible Future Directions
 - Interfacing the computational pipeline with:
 - U.S. Prevention Task Force API.
 - Standardized medication name retrieval.
 - E.g., SciSpaCy for named entity recognition.
 - Retrieving the latest medication prices from a data base.

Clarifying Questions.

- Items missing or recommended for the final output(s)?
- Order items in the final output?
 - Social determinants of health.
 - Health maintenance items.

