- Two modes:
  - Command line: select patient ID from all_conversations.json to have clinical scenario starting point with medications current target.
    - Should have a flag for the number of weeks to converse total
    - Should ask for patient history (i.e. Type I diabetes, etc. anything relevant to any of the titration decisions)
  - Automated: Patient agent converses with heart failure agent. The patient agent uses all_conversations.json as a starting point, but does not follow the conversation given as an example.
    - Patient agents should be able to generate diverse scenarios randomly, including symptoms, medication adherence, lab results, measurements, i.e., blood pressure and heart rate.
- Main architecture
  - Define important information
    - type TitrationStrategy =
    - | "SINGLE_DRUG"
    - | "MULTIPLE_BY_ORDER"
    - | "MULTIPLE_ALTERNATING";
    -
    - interface ProtocolConfig {
    - strategy: TitrationStrategy;
    - maxWeeks: number;
    - // maybe other knobs
    - }
  - medication_protocols: this file should contain a JSON structure of all of the medications and their protocols, so the starting doses, incremental doses, max dose, contraindications, and hold criteria for all the medications within a given category. This will be accessed via tool call so that our system prompt is not too long, and we can access the top level category and the exact medication in that category and see the different criteria in there
    - ARBS = {
    - "losartan": {
    - "class": "ARB",
    - "starting_dose": {"value": 25, "unit": "mg", "frequency": "daily"},
    - "incremental_doses": [25, 50, 100],
    - "maximum_dose": {"value": 100, "unit": "mg", "frequency": "daily"},
    - "contraindications": [
    - "History of angioedema with ARB",
    - "Bilateral renal artery stenosis",
    - "Pregnancy",
    - "Concomitant use with aliskiren in patients with diabetes",
    - "Concurrent or recent (<48 hours) use of neprilysin inhibitor"
    -],
    - "hold_criteria": {

-                "potassium_high": 5.5,
-                "creatinine_increase_percent": 30,
-                "egfr_low": 30,
-                "sbp_low": 90
-            }
-         },
-       "valsartan": {
-           "class": "ARB",
-           "starting_dose": {"value": 40, "unit": "mg", "frequency": "twice daily"},
-           "incremental_doses": [40, 80, 160],
-           "maximum_dose": {"value": 160, "unit": "mg", "frequency": "twice daily"},
-           "contraindications": [
-             "History of angioedema with ARB",
-             "Bilateral renal artery stenosis",
-             "Pregnancy",
-             "Concomitant use with aliskiren in patients with diabetes",
-             "Concurrent or recent (<48 hours) use of neprilysin inhibitor"
-           ],
-           "hold_criteria": {
-             "potassium_high": 5.5,
-             "creatinine_increase_percent": 30,
-             "egfr_low": 30,
-             "sbp_low": 90
-           }
-         },
- main_hf_agent: The main agent will be responsible for conversing with the patient. Based on the indicated number of weeks, it will ask the patient relevant questions about the main things that are needed to determine the titration strategy for that week. This will include the symptoms, their medication adherence, their blood pressure, heart rate, and other related measurements, labs from the patient if they have them.
  - Based on that patient's medications, it will then use the tool calls from medication_protocols to figure out what exactly to do based on the things that it has learned about the patient for this week, and whether to hold, to continue to titrate and increase their doses, or to stop it. It should also be able to make a safety determination.
  - If the patient has warning signs such as an unduly high or low blood pressure, fainting, etc., anything that is a clinically classic warning sign, they should be instructed to go to the hospital and the conversation for that week should end. Otherwise, the conversation should not end until the LMSL LLM has collected all relevant information from the patient to make a titration decision based on the specific medication they are taking.
  - decideNextTitrations(

- patientState,
- currentMeds,
- protocolConfig
-): TitrationAction[]
- Ensure to follow labs schedule:
    - **1-2 weeks** for:
        - Aldosterone antagonists (check BMP, especially K+ and creatinine)
        - ACE-I/ARB/ARNI (check BMP, creatinine, eGFR)
        - Any combination changes with ACE-I/ARB/ARNI + aldosterone antagonist
    - **2-4 weeks** for:
        - Beta blockers (if renal or electrolyte concerns present)
        - SGLT-2 inhibitors (check BMP, creatinine, eGFR)
        - sGC stimulator (check BMP, hemoglobin)
        - Hydralazine/nitrates (generally less frequent labs needed unless concerns)
    - Need to keep track of where in the weekly cadence we are
- patient_agent: The patient agent will be responsible for representing the patient in the conversation with the patient in the conversation with the patient agent. The patient agent will also have context on its initial conversation with the patient agent will also have context on its initial medications and where it is passed from all_conversations.json.
    - We should have the ability to pass in metadata parameters that dictate the patient agent's behavior. For example, if you reference the all conversation script, you will see in the conversation that there are certain things that are defined, in addition to the dosage information, but also the round pattern, for example: clinical decline, then pause, or an expected outcome, which is, for example, the patient does not adhere very well.
    - If we pass those in, then we should see that there is a larger number of misadherence issues.
    - To steer the direction of how the patient responds, these are the things that we will define:
        - endpoint:
        - | "complete_success"
        - | "partial_success"
        - | "non_adherence_failure"
        - | "side_effect_failure"
        - | "acute_decompensation_ed"
        - | "hospitalization_pause"
        - | "patient_withdrawal"
        - | "in_progress"
        - adherence_pattern:
        - | "consistently_high"

- - | "declining"   // matches 'declining_adherence'
- - | "improving"
- - | "fluctuating"
- - | "single_drop_then_stable"
- - symptom_pattern:
- - | "steady_improvement"
- - | "mixed_response"   // some days better, some worse
- - | "plateau"   // improvement then flat
- - | "progressive_worsening"
- - | "acute_escalation_to_ed"
- - side_effect_pattern:
- - | "none"
- - | "mild_tolerable"
- - | "side_effect_escalation" // from examples
- - | "early_intolerance"
- - vitals_pattern:
- - | "stable_in_goal_range"
- - | "bp_trending_low"
- - | "bp_trending_high"
- - | "weight_gain_fluid_overload"
- - | "oscillating"
- - lab_pattern:
- - | "labs_normal"
- - | "mild_renal_drift"
- - | "progressive_renal_impairment"
- - | "electrolyte_instability"
- - | "labs_missing_or_delayed"
- endpoint: We see in our document that there are multiple possible endpoints: complete success, partial success, non-adherence failure, side effect failure, acute decompensation ED, hospitalization pause, patient withdrawal, and in progress. We should be able to determine, based on the course of their interactions with the agent, which of these endpoints we have ended up at, and the outcome should be classified as such.
  - Evaluation on a week-to-week basis that is rules-based to ensure that the agent did not violate any criteria.
  - LLM as a judge approach where we are evaluating the holistic titration decisions that were made based on the information that the patient is giving us on a week-to-week basis.
    - Do this once at the end