

Pharmacy Refill & Escalation — PA requests a refill, with escalation if approval needed

Functional Requirements and Assumptions

Design Principles

- Safety-First: All automation must include human-in-the-loop failsafes
- Transparency: Audit trail for every decision and escalation
- Compliance: HIPAA, DEA Schedule II-V handling, state pharmacy laws

Patient Optimization Suite (PAT) Integration

- Position: Medication management module within broader perioperative workflow
- Upstream Dependencies: Patient scheduling, preoperative assessments
- Downstream Dependencies: Pharmacy fulfillment, patient notification systems
- Shared Services: EHR access layer, audit logging, identity management

Agent Architecture

(Multi-Agent System Components)

Central Intelligence Agent (ReAct Orchestrator) Workflow coordination, intent classification, routing decisions

- Parse user input (PA/RN natural language requests)
- Classify intent (refill request, cancellation, status inquiry)
- Route to appropriate specialist agents
- Manage conversation state and multi-turn clarifications
- Trigger escalation workflows
- Aggregate results and formulate user responses

Interfaces:

- Input: User messages (text/voice transcription)
- Output: Routed tasks to specialist agents, user-facing responses
- State Management: LangGraph state machine coordination

Pharmacy Agent Medication safety validation and policy enforcement

Drug-Drug Interaction (DDI) Checking

1. Cross-reference requested medication against active prescriptions
2. Check for contraindications based on severity level (major/moderate/minor)
 - Validate dosage appropriateness for patient demographics (age, weight, renal function)
3. Allergy & Intolerance Screening
 - Match drug ingredients against patient allergy list
 - Check for cross-sensitivities (e.g., penicillin family)
 - Validate excipient intolerances (peanut oil, gluten, lactose, dyes)
4. Dosage & Dispensation Validation
 - Verify dose falls within formulary guidelines
 - Check quantity against days supply calculations
 - Validate route of administration (PO, IV, topical, etc.)
 - Flag excessive quantities or early refill requests
5. Controlled Substance Policy
 - Identify DEA Schedule II-V medications
 - Enforce co-signature requirements for Schedule II-III
 - Verify prescriber DEA license validity
 - Apply state-specific PDMP (Prescription Drug Monitoring Program) rules
6. Escalation Path Management
 - Trigger physician review for policy violations
 - Package clinical context for escalation (labs, allergies, DDI report)
 - Track escalation status and responses

Interfaces:

- Input: Medication request (drug name, dose, quantity, patient ID)
- Output: Safety validation result, escalation flag, dispensation approval
- Tools: FHIR MCP server (medication history), RAG vector store (formulary/policy docs)

EHR Agent

Role: Patient data retrieval and contextualization

1. Patient Identity Verification
 - Confirm MRN (Medical Record Number) against demographics
 - Retrieve patient context (age, sex, active diagnoses)
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2. Clinical Data Aggregation

- Fetch active medication list (via FHIR MedicationStatement)
- Retrieve allergy/intolerance list (via FHIR AllergyIntolerance)
- Pull relevant lab results (renal function, liver function, drug levels)
- Access vital signs (weight for dosage calculation)

3. Risk Factor Identification

- Flag patient-specific contraindications (pregnancy, renal impairment)
- Identify comorbidities affecting medication choice (diabetes, heart failure)
- Surface historical adverse drug reactions

4. Conversational History Mining (Future Enhancement)

- Access ambient intelligence transcripts (clinic visit notes)
- Identify patient-reported symptoms or concerns
- Correlate with medication changes

Interfaces:

- Input: Patient identifier (MRN), data query type
- Output: Structured clinical data (FHIR resources)
- Tools: FHIR MCP server (read access to Patient, Medication, Observation, Condition resources)

Dispensation Connector Agent. Interface with automated medication dispensing systems

- Translate approved refill into Pixsys/Omnicell format
- Submit dispensation order
- Retrieve confirmation/status
- Handle error states (out of stock, device offline)

Interfaces:

- Input: Approved refill order (structured data)
- Output: Dispensation confirmation, order tracking ID
- Integration: Pixsys/Omnicell APIs (simulated in prototype)