

AI-Powered Hospital Management System

1. Problem Statement & Proposed Solution

1.1 Problem Statement

Hospitals and clinics face multiple operational challenges in patient handling, especially on chat-based platforms:

- Manual patient registration is slow and error-prone
- Staff repeatedly ask the same questions
- Difficulty in identifying registered vs new patients
- Slow Medical Record Number (MRN) verification
- Poor WhatsApp/chat user experience
- Increased operational cost due to human dependency

These issues lead to longer waiting times, frustrated patients, and inefficient front-desk operations.

1.2 Proposed Solution

We provide an **AI-Powered Patient Registration & Appointment Management System** built on n8n automation and AI agents.

The system:

- Automatically identifies whether a patient is **Registered** or **Not Registered**
- Verifies MRN from an existing database
- Registers new patients step-by-step
- Maintains conversation state (no repetition)
- Operates 24/7 on chat platforms (e.g., WhatsApp)
- Reduces staff workload and operational costs

The solution ensures:

- One question at a time
- Zero confusion for patients
- Faster registration and lookup
- Seamless appointment handling

2. Tools & Technologies Used

2.1 Workflow Automation

- **n8n (v1.42.0 or later)** – Core workflow automation platform

2.2 AI & Language Models

- **AI Agent Nodes (LangChain-based)**
- **Groq LLM (OpenAI-compatible)** for fast and accurate responses

2.3 Memory & State Management

- **Simple Memory (Session-based)**
 - Preserves conversation context
 - Prevents repeated questions
 - Ensures step-by-step flow

2.4 Data Storage & Retrieval

- **Registration Sheet / Database**

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2.4 Data Storage & Retrieval

- **Registration Sheet / Database**
 - MRN lookup for existing patients
- **Client Registration Tool**

- Stores new patient details securely

2.5 Communication

- **Chat Trigger (n8n)**
- **Respond to Chat Node**
- - MRN lookup for existing patients
- **Client Registration Tool**
 - Stores new patient details securely
- - MRN lookup for existing patients
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3. System Workflow Overview

Phase 1: Greeting & Triage

1. User sends any message
2. System greets the user
3. Asks:

“Are you already registered with us?”

Phase 2A: Registered Patient Flow

1. Ask for Medical Record Number (MRN)
2. Lookup MRN in Registration Sheet
3. If MRN found:
 - Confirm registration
 - Display patient details
4. If MRN not found:
 - Treat user as new patient
 - Move to registration flow

Phase 2B: New Patient Registration Flow

Details are collected **one by one**:

1. Full Name
2. Contact Number
3. Address

After collection:

- Data is saved
- Confirmation message is sent

Phase 3: Appointment Handling

- Appointment type selection (Physical / Online)
- Token generation
- Date and time assignment
- Final confirmation

4. System Setup & Configuration Guide

4.1 Required Software & Versions

- **n8n Version:** v1.42.0 or later
- **Node.js:** v18.x (LTS recommended)
- **OS:** Windows / macOS / Linux

Older n8n versions may break AI Agent and Memory nodes.

4.2 Installing n8n

Option A – npm (Local Setup)

```
npm install n8n -g  
n8n
```

Access:

```
http://localhost:5678
```

Option B – Docker (Production)

```
docker run -it --rm -p 5678:5678 n8nio/n8n
```

4.3 Importing Workflow JSON

1. Open n8n Dashboard
2. Click **Workflows → Import**
3. Upload the provided **workflow JSON file**
4. Save and open the workflow

All nodes, agents, and logic will be created automatically.

4.4 Credential Configuration (APIs Hidden)

Groq API

- Create Groq credential in n8n
- Assign it to all AI Model nodes
- Keep API keys hidden

Database / Google Sheets

- Configure credentials for:
 - Registration lookup
 - Client registration
- Ensure MRN search and record creation are enabled

4.5 Memory Configuration (Important)

For every **Simple Memory** node:

Session Key Expression:

```
{ { $json.sessionId || $json.chatInput || $json.workflowId } }
```

This ensures:

- No repeated questions
- Proper conversation continuation

4.6 Activating the Workflow

1. Ensure all nodes show green checkmarks
2. Click **Save**
3. Click **Activate Workflow**
4. Test with sample messages

5. Deployment Options

Option 1: n8n Cloud

- Upload workflow
- Activate
- Connect to chat platform

Option 2: Self-Hosted

- Deploy on VPS / Docker
- Secure endpoints
- Monitor logs

6. Cost Estimation (Monthly Approx.)

Component	Estimated Cost
n8n Cloud	\$20 – \$50
Groq API	\$5 – \$60
Server (Self-Hosted)	\$10 – \$30
Total	\$30 – \$100+

Costs scale based on usage volume.

7. Benefits Summary

- 24/7 automated patient handling
- Faster registration & appointments
- No repetitive questioning
- Reduced staff workload
- Improved patient experience
- Scalable & cost-efficient

8. Conclusion

This AI-Powered Patient Registration & Appointment Management System provides a reliable, scalable, and efficient solution for modern healthcare facilities. By automating front-desk workflows using AI and n8n, hospitals can significantly improve service quality while reducing operational costs.