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Small Clinic Management System

Report:

Object-Oriented Analysis (OOA)

1. Identify Objects (Nouns)

- **Patient**
- **ChronicPatient** (special type of Patient)
- **Doctor**
- **Appointment**
- **Prescription**

2. Identify Attributes (Descriptive Nouns)

- **Patient**: name, id, age, history, appointments
- **ChronicPatient**: condition, lastCheckup (inherits Patient's attributes)
- **Doctor**: name, id, specialty
- **Appointment**: id, date, time, reason, status, patientName, doctorName
- **Prescription:** medicine, dosage, duration

3. Identify Methods (Verbs)

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- **Patient:**
  - addHistory()
  - scheduleAppointment()
  - addPrescriptionToAppointment()
  - printAppointments()
  - printInfo()

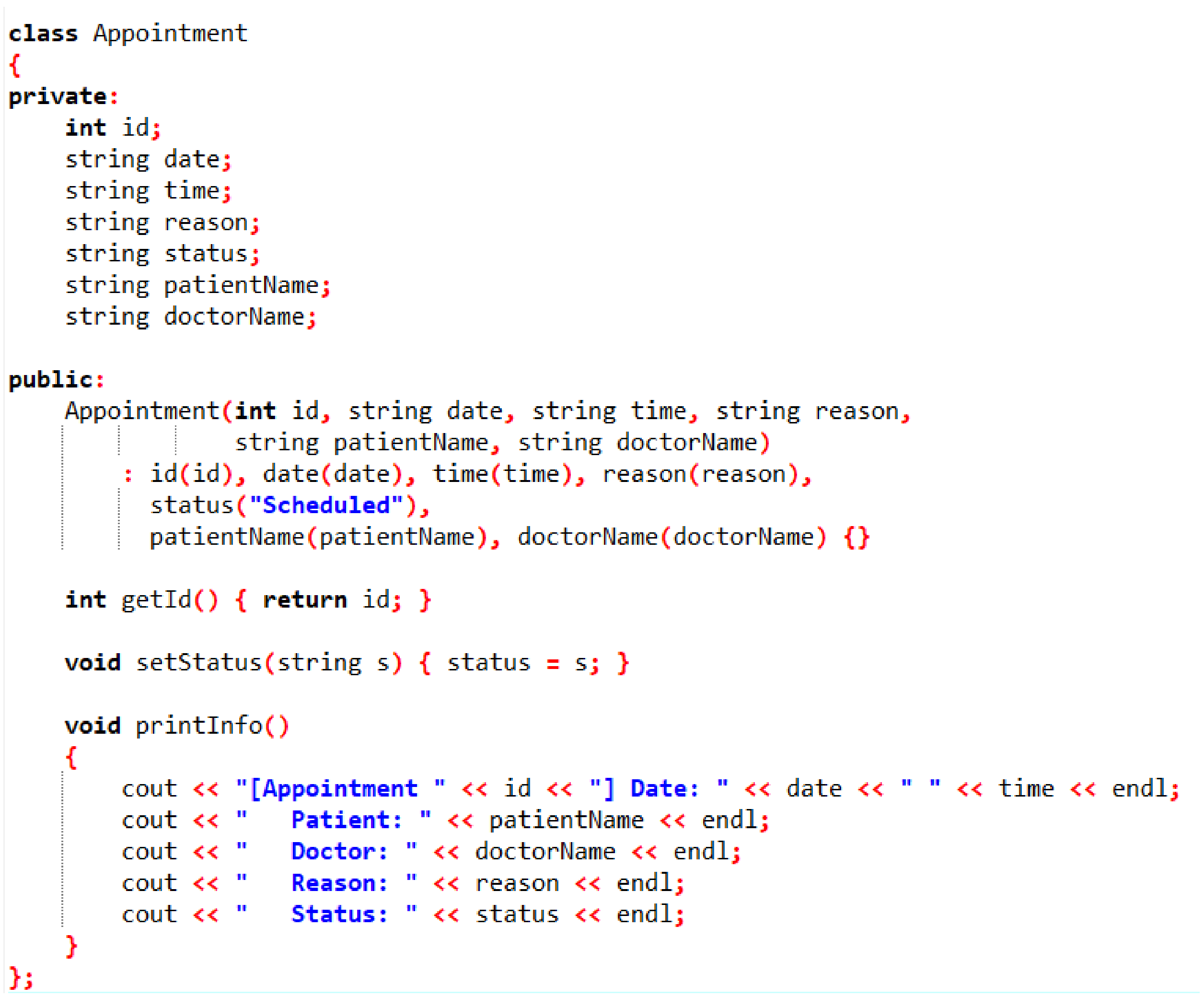
- **ChronicPatient:**
    - scheduleAppointment() (overridden for condition-specific reminders)
    - printInfo() (adds condition + last checkup)
- **Doctor:**
    - assignAppointment()
    - updateAppointmentStatus()
    - printAppointments()
    - printInfo()
- **Appointment:**
    - getId(), getDoctorName(), getPatientName()
    - setStatus()
    - addPrescription()
    - printInfo()
- **Prescription:**
    - printInfo()

4. Inheritance Relationships

- **ChronicPatient** inherits from **Patient** (class ChronicPatient : public Patient).
- Both **Patient** and **Doctor** use **Appointment** objects but do not inherit from it.

Explanation of Class Design

Appointment – the scheduled meeting between a patient and a doctor.



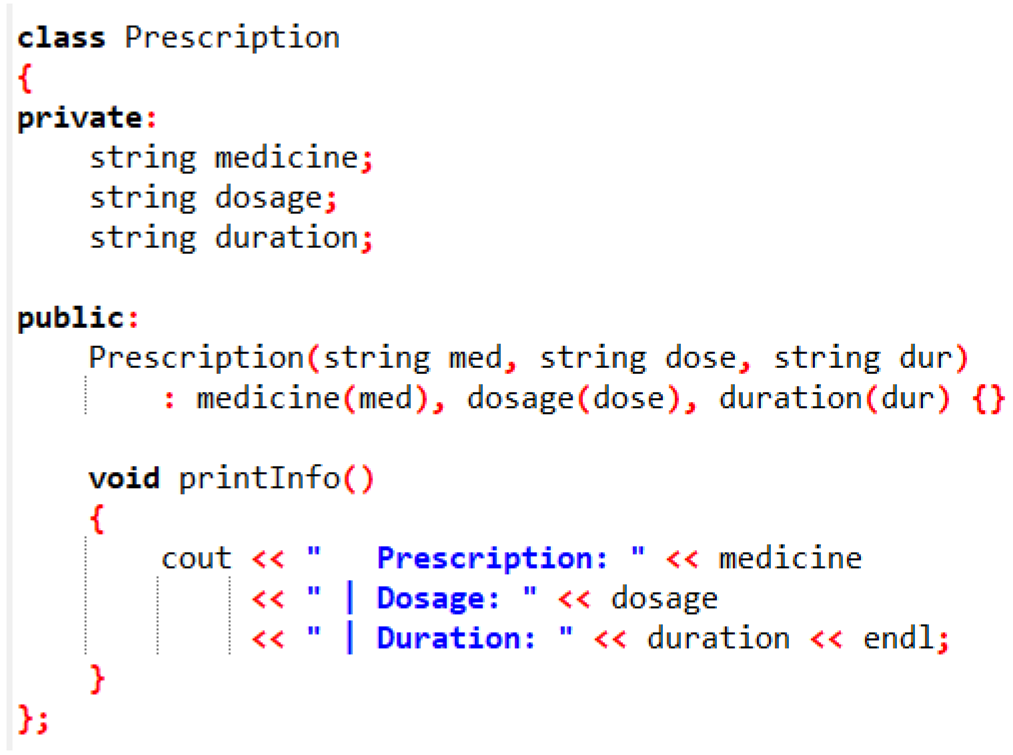
```cpp
class Appointment
{
private:
    int id;
    string date;
    string time;
    string reason;
    string status;
    string patientName;
    string doctorName;

public:
    Appointment(int id, string date, string time, string reason,
                string patientName, string doctorName)
        : id(id), date(date), time(time), reason(reason),
        status("Scheduled"),
        patientName(patientName), doctorName(doctorName) {}

    int getId() { return id; }

    void setStatus(string s) { status = s; }

    void printInfo()
    {
        cout << "[Appointment " << id << "] Date: " << date << " " << time << endl;
        cout << "   Patient: " << patientName << endl;
        cout << "   Doctor: " << doctorName << endl;
        cout << "   Reason: " << reason << endl;
        cout << "   Status: " << status << endl;
    }
};
```

Attributes: id, date, time, reason, status, patientName, doctorName.

Methods: printInfo(), setStatus(), getId().

Allows displaying appointment or updating it.

Prescription – medication instructions



```cpp
class Prescription
{
private:
    string medicine;
    string dosage;
    string duration;

public:
    Prescription(string med, string dose, string dur)
        : medicine(med), dosage(dose), duration(dur) {}

    void printInfo()
    {
        cout << "   Prescription: " << medicine
             << " | Dosage: " << dosage
             << " | Duration: " << duration << endl;
    }
};
```

Attributes: medicine, dosage, duration.

Methods: printInfo().

Represents prescriptions given during an appointment.

Patient – the clinic patient.

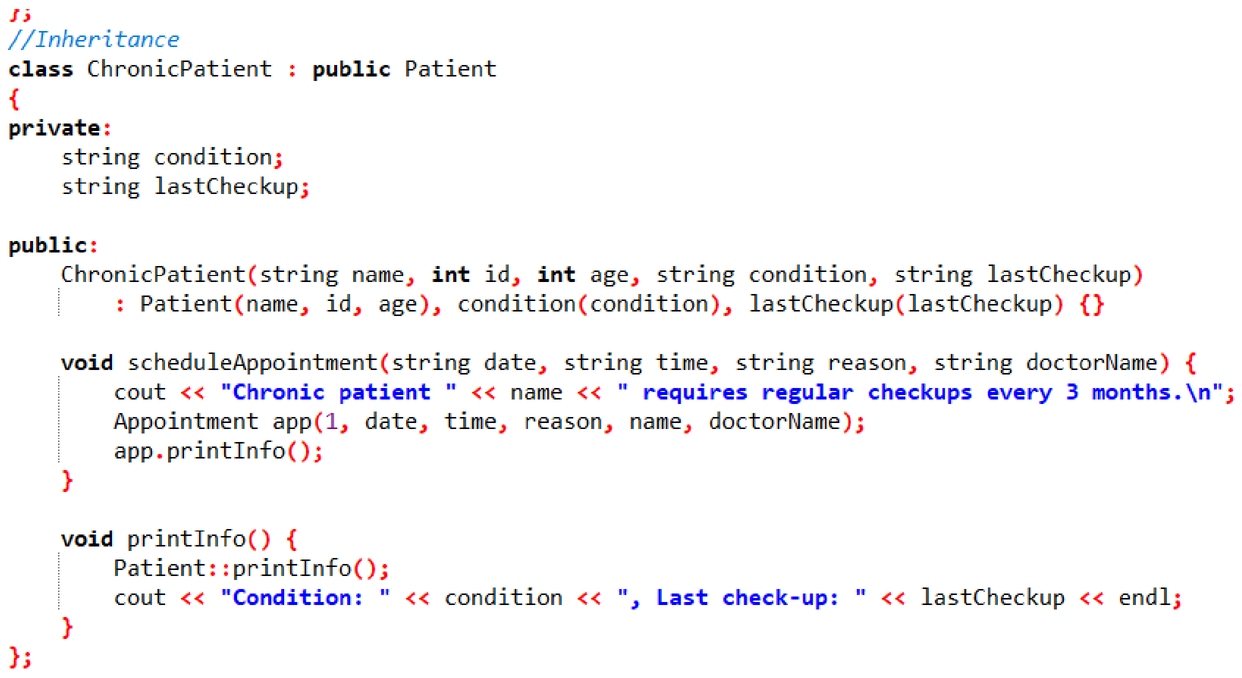
```cpp
class Patient
{
protected:
    string name;
    int id;
    int age;
    string history;
    vector<Appointment> appointments;

public:
    Patient(string name, int id, int age)
        : name(name), id(id), age(age), history("") {}

    void addHistory(string record)
    {
        history += record + "\n";
    }

    void scheduleAppointment(string date, string time, string reason, string doctorName)
    {
        Appointment app(1, date, time, reason, name, doctorName);
        cout << "Appointment scheduled for " << name << endl;
        app.printInfo();
    }
    void printAppointments()
    {
        cout << "Appointments for " << name << ":\n";
        for (int i = 0; i < appointments.size(); i++) {
            appointments[i].printInfo();
        }
    }
    void printInfo()
    {
        cout << "[Patient] " << name << " (ID: " << id << ", Age: " << age << ")" << endl;
        cout << "History:\n" << history << endl;
        printAppointments();
    }
```

Attributes: name, id, age, history, appointments.

Methods: addHistory(), scheduleAppointment(), printInfo(), printAppointments().

Manages basic patient information, medical history, and appointments.

ChronicPatient (inherits from Patient) – the patient with long-term conditions.



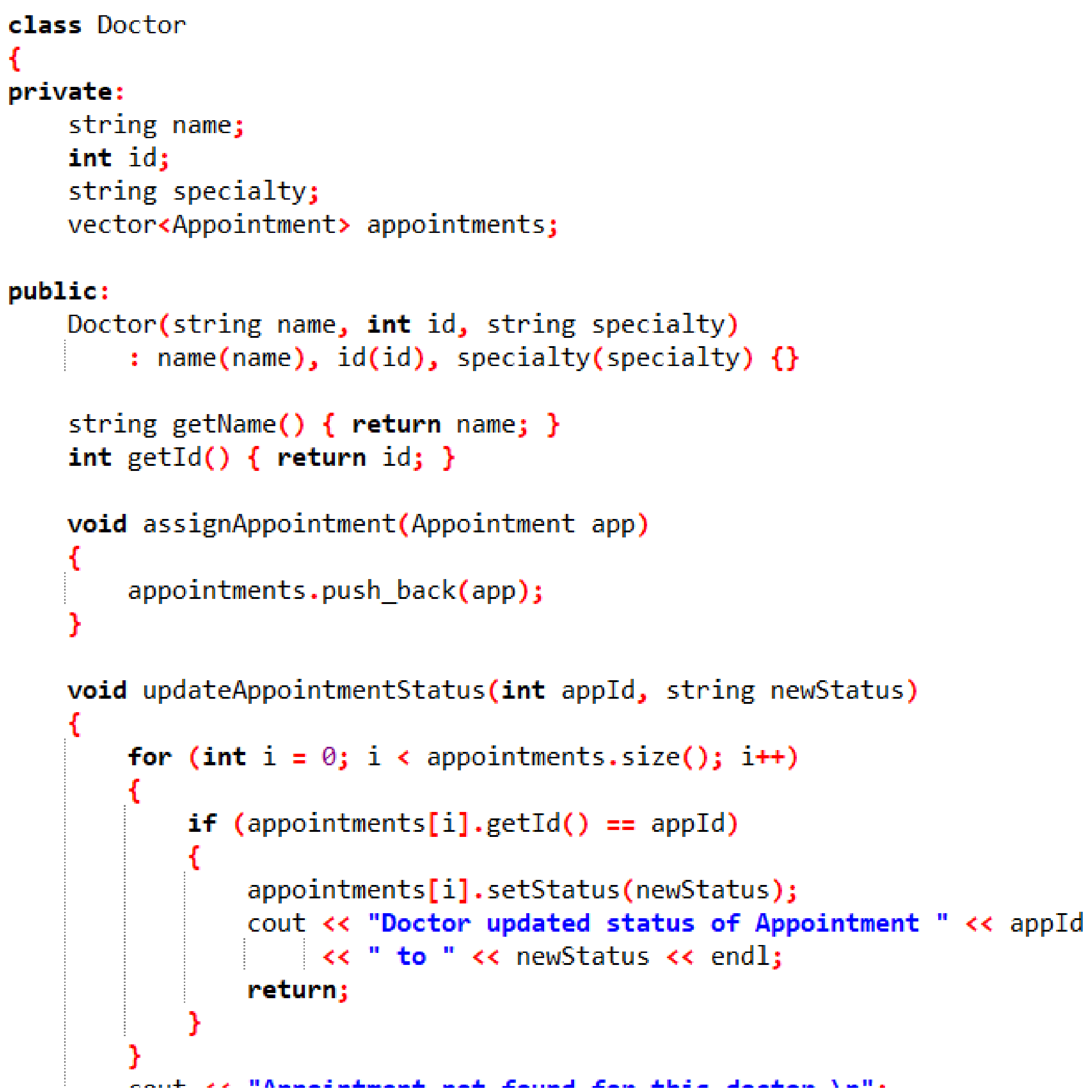
```cpp
};
//Inheritance
class ChronicPatient : public Patient
{
private:
    string condition;
    string lastCheckup;

public:
    ChronicPatient(string name, int id, int age, string condition, string lastCheckup)
        : Patient(name, id, age), condition(condition), lastCheckup(lastCheckup) {}

    void scheduleAppointment(string date, string time, string reason, string doctorName) {
        cout << "Chronic patient " << name << " requires regular checkups every 3 months.\n";
        Appointment app(1, date, time, reason, name, doctorName);
        app.printInfo();
    }

    void printInfo() {
        Patient::printInfo();
        cout << "Condition: " << condition << ", Last check-up: " << lastCheckup << endl;
    }
};
```

Extra Attributes: condition, lastCheckup.

Overridden Method: scheduleAppointment() – prints an additional reminder that chronic patients require regular checkups every 3 months.

Using inheritance and method overriding, extending patient functionality without duplicating code.

Doctor – the clinic doctor.



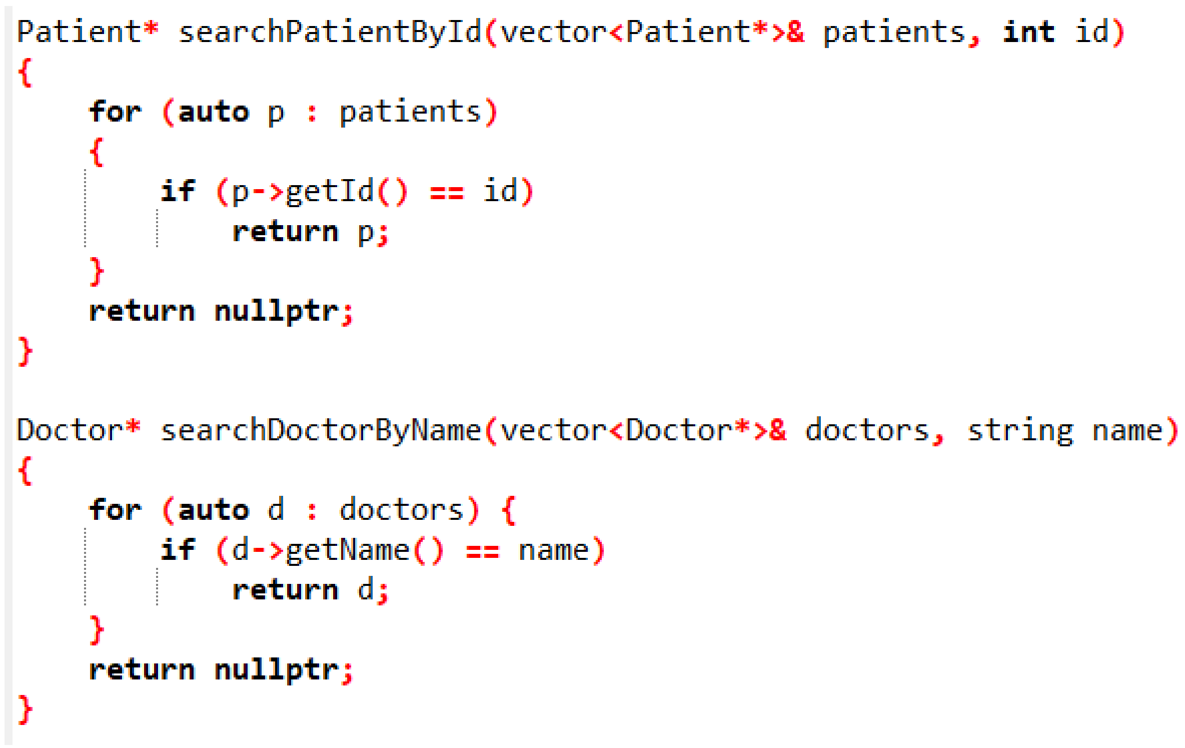
```
class Doctor
{
private:
    string name;
    int id;
    string specialty;
    vector<Appointment> appointments;

public:
    Doctor(string name, int id, string specialty)
        : name(name), id(id), specialty(specialty) {}

    string getName() { return name; }
    int getId() { return id; }

    void assignAppointment(Appointment app)
    {
        appointments.push_back(app);
    }

    void updateAppointmentStatus(int appId, string newStatus)
    {
        for (int i = 0; i < appointments.size(); i++)
        {
            if (appointments[i].getId() == appId)
            {
                appointments[i].setStatus(newStatus);
                cout << "Doctor updated status of Appointment " << appId
                    << " to " << newStatus << endl;
                return;
            }
        }
        cout << "Appointment not found for this doctor.\n";
```

Attributes: name, id, specialty.

Methods: printInfo().

Manages doctor information and links them with appointments.

Search Functions



```
Patient* searchPatientById(vector<Patient*>& patients, int id)
{
    for (auto p : patients)
    {
        if (p->getId() == id)
            return p;
    }
    return nullptr;
}

Doctor* searchDoctorByName(vector<Doctor*>& doctors, string name)
{
    for (auto d : doctors) {
        if (d->getName() == name)
            return d;
    }
    return nullptr;
}
```

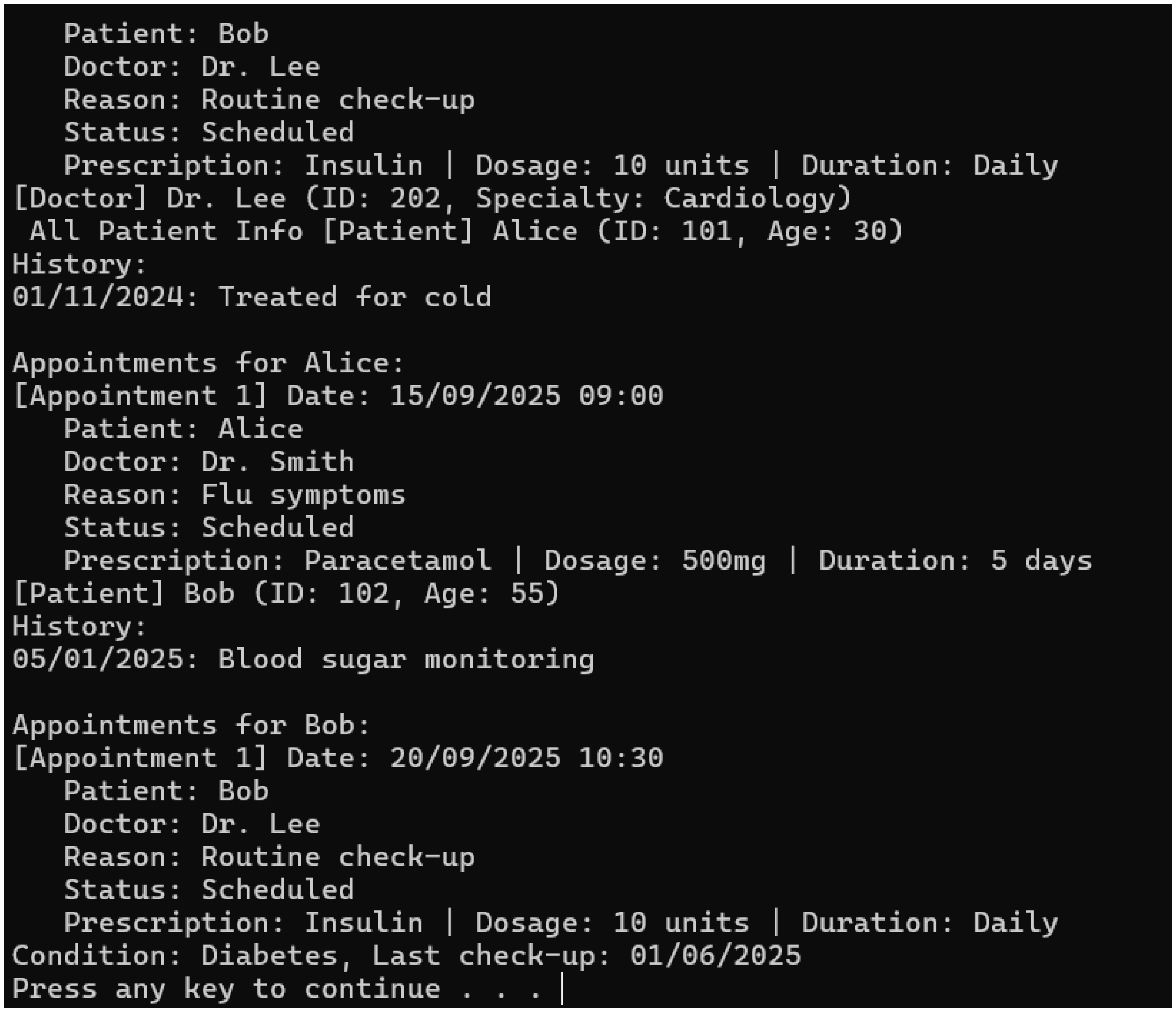
searchPatientById() → Finds a patient in the system by ID.

searchDoctorByName() → Finds a doctor by name.

Inheritance was applied between Patient and ChronicPatient because both share common information (name, ID, age, history, appointments). Instead of duplicating this logic, the ChronicPatient class reuses Patient's structure avoid rewriting when add more ChronicPatient.

The overall idea and flow of logic is my own ideas with some help of ChatGPT like appointments linked to patients and doctors, histories stored as text and suggesting minor improvement like help me add history record,…Also LLM has helped me with new class like Search and Prescription.

Test result:



```
   Patient: Bob
   Doctor: Dr. Lee
   Reason: Routine check-up
   Status: Scheduled
   Prescription: Insulin | Dosage: 10 units | Duration: Daily
[Doctor] Dr. Lee (ID: 202, Specialty: Cardiology)
 All Patient Info [Patient] Alice (ID: 101, Age: 30)
History:
01/11/2024: Treated for cold

Appointments for Alice:
[Appointment 1] Date: 15/09/2025 09:00
   Patient: Alice
   Doctor: Dr. Smith
   Reason: Flu symptoms
   Status: Scheduled
   Prescription: Paracetamol | Dosage: 500mg | Duration: 5 days
[Patient] Bob (ID: 102, Age: 55)
History:
05/01/2025: Blood sugar monitoring

Appointments for Bob:
[Appointment 1] Date: 20/09/2025 10:30
   Patient: Bob
   Doctor: Dr. Lee
   Reason: Routine check-up
   Status: Scheduled
   Prescription: Insulin | Dosage: 10 units | Duration: Daily
Condition: Diabetes, Last check-up: 01/06/2025
Press any key to continue . . .
```