University
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Deliverable #: MNHS database conceptual design

Data Management Course

UM6P College of Computing

Professor: Karima Echihabi **Program:** Computer Engineering
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Team Information

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Repository Link	`https://github.com/beaNoBeebea`

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1 Introduction

The MNHS needs a database to manage its different entities(patients, staff, hospitals, departments, appointments, prescriptions, medications, insurance, billing, emergencies etc.) and the different interactions between them. Our work consists of making a coherant conceptual design by analyzing the different requirements and translating them into an ER model.

2 Requirements

The database must manage patients, staff, hospitals, departments, appointments, prescriptions, medications, insurance, billing, emergencies, and pharmacy inventory.

Patients: Identified by internal ID and CIN; attributes include demographics and multiple contact locations.

Staff: Assigned to departments; categorized as practitioners (license, specialty), caregiving staff (grade, ward), or technical staff (equipment, certifications).

Hospitals and Departments: Hospitals defined by name, city, region; departments belong to hospitals and host staff.

Appointments: Link one patient, one staff, and one department; track date, time, reason, and status.

Prescriptions and Medications: A prescription is issued by staff to a patient, may include multiple medications with dosage/duration; medications have detailed attributes.

Insurance and Billing: Patients may hold multiple insurances; each bill relates to a single clinical activity and one insurance.

Emergencies: Record patient admission, triage level, outcome, and optionally attending staff.

Pharmacy Inventory: Track per hospital the stock level, reorder thresholds, restock date, and unit price of medications.

3 Methodology

- Starting off with the clinical activities that is linked with almost every entity in the diagram, "Staff work in departments and interact with patients via clinical activities" and "A prescription is issued for a patient by a staff member on a given date.","An appointment links exactly one patient and one staff member and occurs in one department." signaled that "appointments" and "prescriptions" were sub-entites of "clinical-activities" as the had common relationships with other entities as well as different ones.
- "Staff" was modeled by hierarchy as well because of the different roles of staff stated in the requirements that each had its own attributes.
- The contact locations was modeled as an entity due to the different addresses used by one patient and the ones shared by many patients.
- "Patients" have one or more insurances as the ones that don't have one are still given a "None" type insurance.
- The team tried to minimize the number of relationships by using hierarchy. Meanwhile, we didn't rely much on ternary relationships because of the participation and cardinality constraints. Aggregation was also dropped because of the particularity of behavior (relationships) between every entity.

4 Implementation & Results

The final model is available on our github repository : `https://github.com/beaNoBeebea`

5 Discussion

The main challenge was the representation of "Clinical Activities" and its relationships with the other entities; We began by exploring ternary relationships; however, the complexity introduced by the cardinality and participation constraints prevented us from fully addressing the problem. We then turned to aggregation, but the particular behavior of the different entities and their interactions limited the effectiveness of this approach. We learned how hard is conceptual design. Because a tiny fraction of our work was actually drawing the ER diagram. Most of it was arguing over different interpretations and heated discussions over Zoom calls as we were all in different locations, but this fostered an upgrade in our team spirit and collaboration skills.

6 Conclusion

The conceptual design highlights the complexity of managing multiple interconnected entities. By carefully analyzing the requirements and exploring different modeling techniques, we identified the challenges posed by relationship constraints and entity interactions to bring about an effective and coherant ER model.