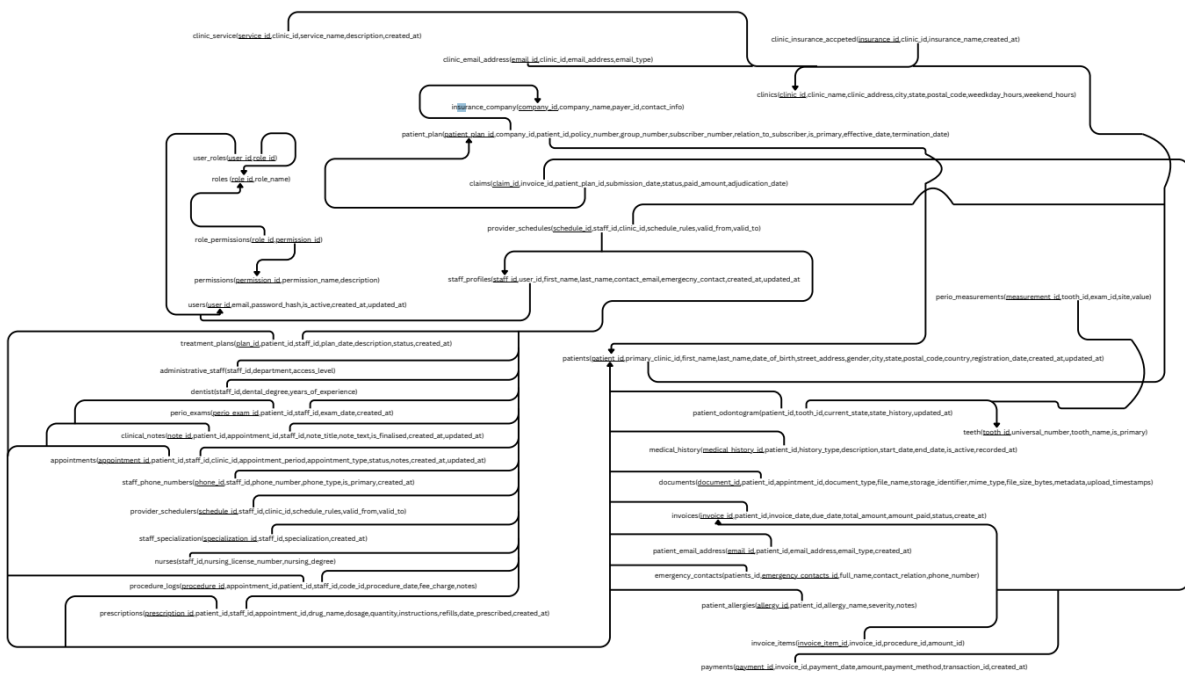


# DBMS PROJECT PHASE - 3

## NORMALIZATION

### PATIENT MANAGEMENT SYSTEM FOR DENTAL HOSPITALS

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### ASSIGNMENT-3

Potential Primary Keys :-

[ appointment\_id, clinic\_id, code\_id, company\_id, exam\_id, invoice\_id, patient\_id, patient-plan\_id, payer\_id, permission\_id, plan\_id, policy-number, primary-clinic\_id, procedure\_id, ref\_id, role\_id, staff\_id, storage-identifier, subscriber\_id, tooth\_id, transaction\_id, user\_id ]

Non-primary Keys :-

[ access-level, address, amount, adjudication-date, amount-paid, city, contact-email, contact-info, country, current-state, date, date-of-birth, date-prescribed, degree, dental-degree, department, description, dosage, drug-name, due-date, effective-date, email, emergency-contact, end-date, exam-date, fee-charged, fee-quoted, file-name, file-size-bytes, first-name, full-name, gender, group-number, instructions, is-active, is-finalized, is-primary, last-name, licence-number, meta-data, method, mime-type, name, note, number, paid-amount, password-hash, period, phone-number, postal-code, proficiency-level, quantity, recorded-at, referral-network, refills, registration-date, relationship, relationship-to-subscriber, rules, severity, site, speciality-area, standard-fee, start-date, state, state-history, status, street-address, submission-date, system, termination-date, text, title, total-amount, type, upload-timestamps, valid-from, valid-to, value, weekend-hours, weekday-hours, years-experience ]

## FD

### 1) Patient - Related Fields

patient-id : [ first-name, last-name, full-name, date-of-birth,  
(primary key) gender, email, phone-number, emergency-contact,  
relationship, street-address, city, state, country,  
postal-code, registration-date ]

### 2) Staff, Clinic and Role fields :

• staff-id : [ first-name, last-name, email, phone-number, degree,  
(primary key) licence-number, dental-degree, speciality-area,  
years-experience, proficiency-level, is-active,  
role-id (FK), primary-clinic-id (FK) ]

• clinic-id : [ name, street-address, phone-number, contact\_email,  
(PK) weekday-hours, weekend-hours, site, referral-network ]

• role-id : [ name, description, access-level, rules ]  
(PK)

### 3) Appointment & Record Fields

• appointment-id : [ date, start-date, end-date, status, notes, type,  
(PK) patient-id (FK), staff-id (FK), clinic-id (FK) ]

• exam-id : [ exam-date, notes, description, severity,  
(PK) patient-id (FK), staff-id (FK), procedure-id (FK) ]

• procedure-id : [ name, description, standard-fee ]  
(PK)

• prescription-id : [ date-prescribed, drug-name, dosage, quantity,  
(PK) refills, instructions, patient-id (FK), staff-id (FK) ]

• tooth-id : [ universal-number, name, description ]  
(PK)

#### 4) Billing & Insurance Fields

- invoice\_id : [ date, due\_date, total\_amount, paid\_amount, status, (PK) submission\_date, fee\_charged, fee\_quoted, patient\_id (FK), appointment\_id (FK) ]
- transaction\_id : [ date, amount, amount\_paid, method, type, (PK) invoice\_id, (FK) ]
- plan\_id : [ name, payer\_id, group\_number, company\_id (FK) (PK) ]
- company\_id : [ name, address, phone\_number, contact\_info ] (PK)
- (patient\_id, plan\_id) : [ subscriber\_id, policy\_number, is\_primary, (Composite key) subscriber\_relation, effective\_date, termination date ]

#### 5) System User & File Fields

- user\_id : [ email, password\_hash, is\_active, staff\_id (FK), (PK) patient\_id (FK) ]
- storage\_identifier : [ file\_name, mime\_type, file\_size\_bytes, (PK) upload\_timestamps, metadata, user\_id (FK), patient\_id (FK) ]
- permission\_id : [ name, description ] (PK)
- (role\_id, permission\_id) : [ rules ] (Composite PK)

## 1-NF

- There are no composite attributes present.
- For multivalued attributes:
  - In case of phone numbers we create a new one to many relation to 'Entity-phone' and for emails 'Entity-emails', and for (degree, dental-degree, speciality-area) we use 'Staff Degree'.
  - For state-history we use 'EntityStateHistory'.

## 2-NF

- For patient Insurance, it uses composite key (patient-id, plan-id).
- ~~It~~ patient-id is being partially dependent on by patient-name and similarly plan-name partially depends on plan-id.
- Policy-number full dependence on (plan-id, patient-id)

- Patients:
  - PK → patient-id
  - Attributes :- ~~plan~~ patient-name, date-of-birth, gender etc.
- Insurance Plans:
  - PK → plan-id
  - Attributes :- plan-name, payer-id, group-number etc..
- Patient Plans
  - PK → (patient-id, plan-id)
  - Attributes → policy-number, subscriber-id etc..



2NF  $\rightarrow$  3NF:

- Remove transitive dependencies
- Each non-key attribute must depend only on the key, not on another non key field.

Find 3NF Relations:

Patients [ patient-id (PK), first-name, last-name, date-of-birth, gender, registration-date, street-address, postal-code (FK) ]

PostalCodes [ postal-code (PK), city, state, country ]

Staff [ staff-id (PK), first-name, last-name, license-number, years-experience, proficiency-level, department, role-id (FK), primary-clinic-id (FK) ]

Roles [ role-id, name, access-level ]

Clinics [ clinic-id, name, street-address, weekday-hours, weekend-hours, site, referral-network, postal-code (FK) ]

Appointments [ appointment-id<sup>(PK)</sup>, date, start-date, end-date, status, notes, type, patient-id (FK), staff-id (FK), clinic-id (FK) ]

Procedures [ procedure-id (PK), name, standard-fee, code-id (FK) ]

BillingCodes [ code-id (PK), description, type ]

Exams [ exam-id, exam-date, notes, severity, patient-id (FK), staff-id (FK) ]

ExamProcedures [ (exam-id, procedure-id) PK, fee-charged, fee-quoted, status, tooth-id (FK) ]

Teeth [ teeth-id (PK), universal-number, name ]

• Prescription [ prescription-id (PK), drug-name, dosage, quantity, refills, instructions, date-prescribed, patient-id (FK), staff-id (FK) ]

~~Bi~~ Invoices [ invoice-id (PK), date, due-date, total-amount, amount-paid, status, submission-date, adjudication-date, patient-id (FK), appointment-id (FK) ]

Transactions [ transaction-id (PK), date, amount, method, type, invoice-id (FK) ]

InsuranceCompany [ <sup>(PK)</sup>company-id, name, payer-id ]

InsurancePlan [ plan-id (PK), name, group-number, valid-from, valid-to, company-id (FK) ]

PatientPlans [ patient-plan-id (PK), policy-number, subscriber-id, relation-to-subscriber, is-primary, effective-date, termination-date, patient-id (FK), plan-id (FK) ]

Users [ user-id (PK), email, password-hash, is-active, email, staff-id (FK), patient-id (FK) ]

Files [ ~~file-id (PK)~~ storage-identifier (PK), file-name, mime-type, file-size-bytes, user-id (FK) ]

Permissions [ permission-id (PK), name, description ]

Role-permission [ (role-id, permission-id) (PK) ]