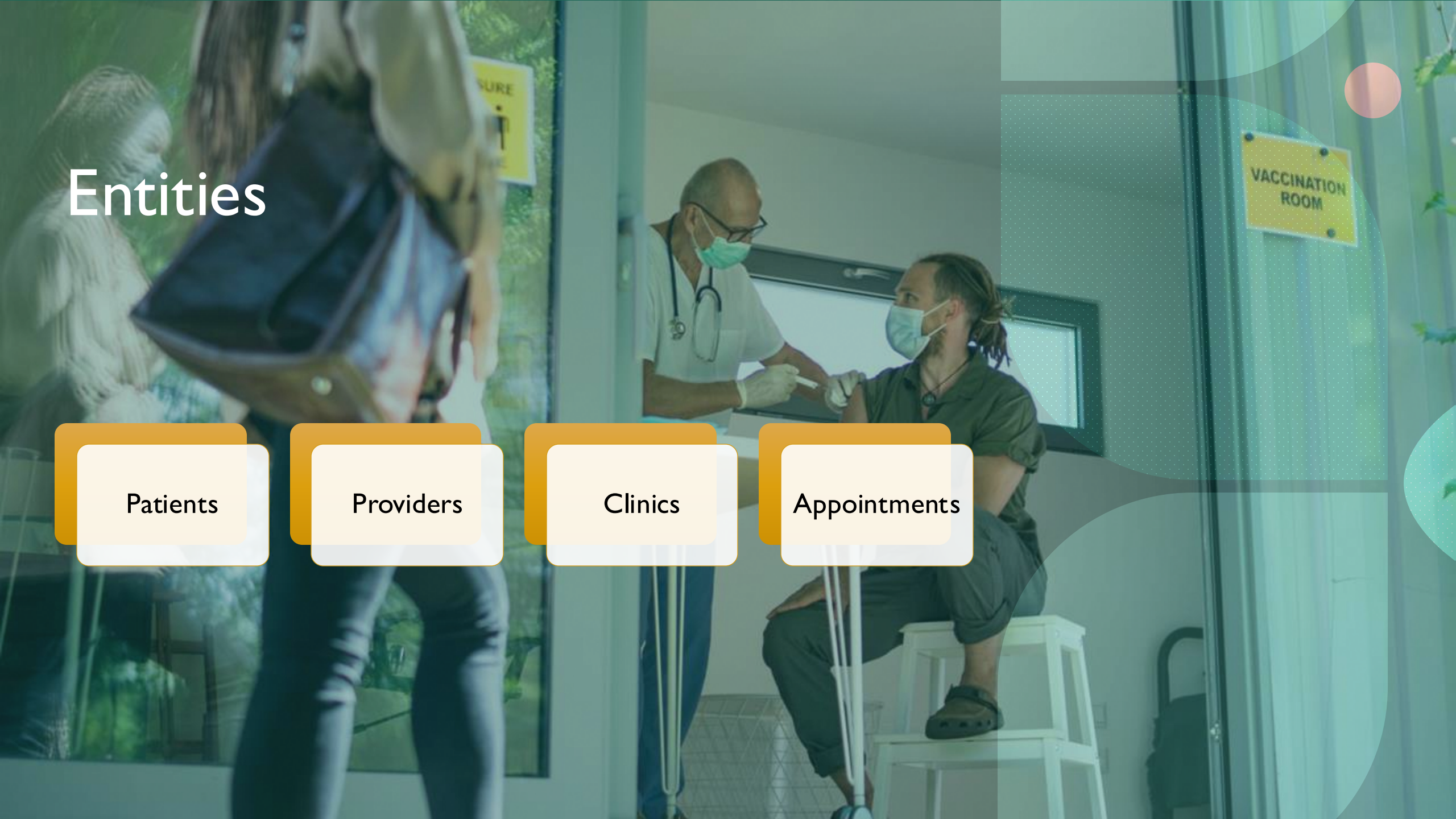
Relational Database Design Final Project

Business: A healthcare company called “Primary Care CA.”

Business Background

- Healthcare Company
- "Primary Care CA"
- Serving San Diego, CA since 2009
- 20 Primary Care Clinics
- Rapidly Expanding
- Seeking to improve outdated database system

Entities



- Patients
- Providers
- Clinics
- Appointments

ER Model: Summary of Entities

- Patients: MedicalRecord#, FirstName, LastName, DoB, Age, Address, Phone#, Sex, InsurancePolicy#, InsuranceName
    - MedicalRecord# is the identifier
- Providers: ProviderNPI, FirstName, LastName, ProviderType
    - ProviderNPI is the identifier
- Clinics: ClinicID, ClinicName, Street Address, City, State, ZipCode, Phone#
    - ClinicID is the identifier.
- Appointments: Appointment#, AppointmentDate, AppointmentTime, MedicalRecord#, ProviderNPI, ClinicID, Status
    - Appointment# is the identifier.

Entity Relationship Model: Relationships

A patient may have one or more (zero or more) appointments; and each appointment must belong to one and only one patient.

A provider may treat one or more patients (zero or more); and a patient may be treated by one or more (zero or more) providers.

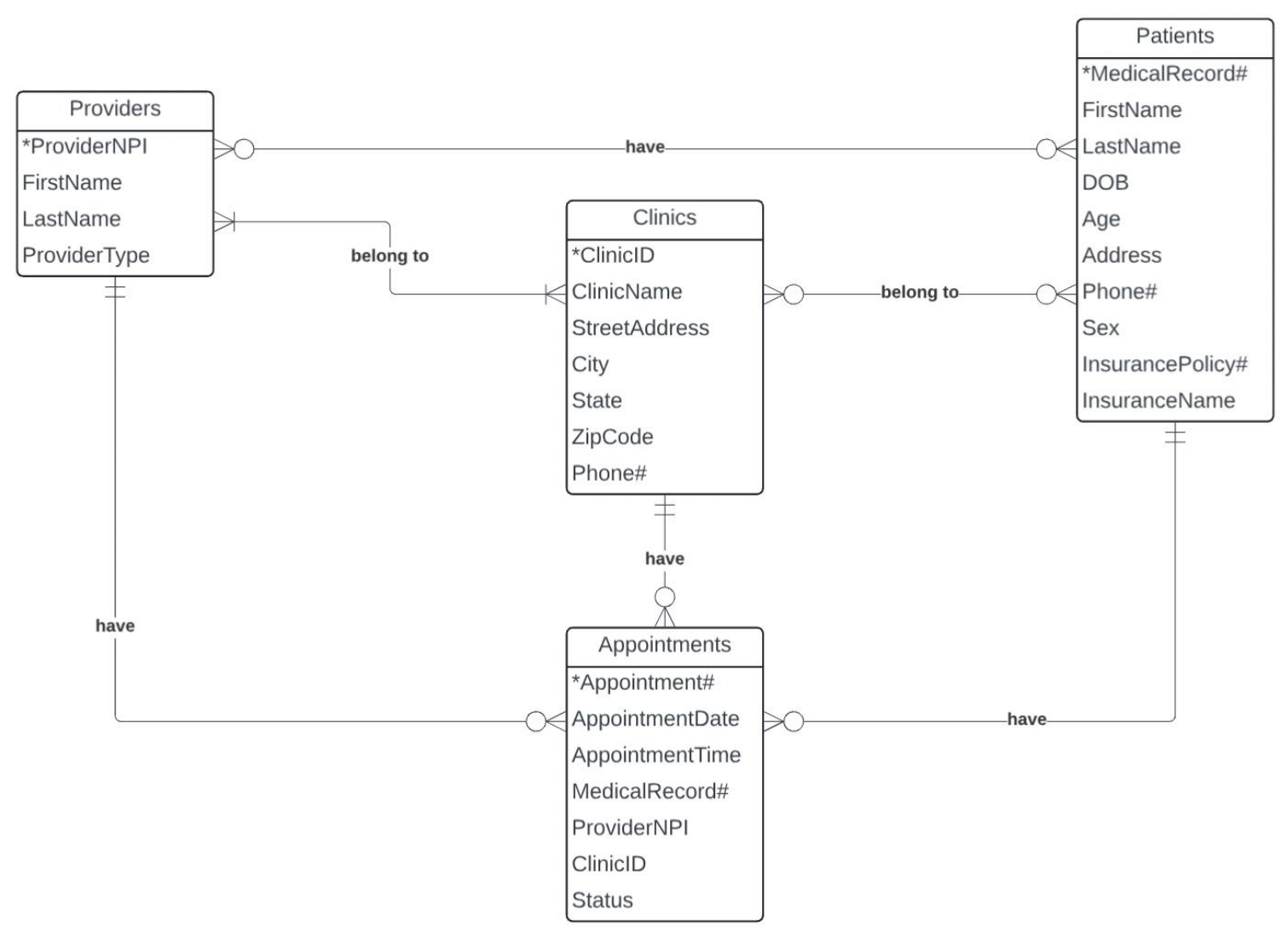
A provider must belong to one or more clinics; and a clinic must have one or more providers.

A patient may belong to one or more clinics; and a clinic may see one or more patients.

A provider may have one or more appointments; and an appointment must belong to one and only one provider.

A clinic may have one or more appointments; and an appointment must belong to one and only one clinic.

Entity Relationship Diagram



ERD To Relational Model

- Patients(MedicalRecord#, FirstName, LastName, DoB, Age, Address, Phone#, Sex, InsuranceName, InsurancePolicy#)
  - FD1: MedicalRecord# → FirstName, LastName, DoB, Age, Address, Phone#, Sex, InsurancePolicy#, InsuranceName
    ***fully FD on primary key**
  - FD2: InsurancePolicy# → InsuranceName
    ***this is a transitive functional dependency**
  - FD3: DoB → Age
    ***this is transitive FD**

- Providers(ProviderNPI, FirstName, LastName, ProviderType)
  - FD1: ProviderNPI → FirstName, LastName, ProviderType
    ***fully FD on primary key**

- Providers_Clinics(ProviderNPI(fk),ClinicID(fk)) ***Created new relation**

ERD to Relational Model

- Clinics(ClinicID, ClinicName, Street Address, City, State, ZipCode, Phone#)
  - FD1: ClinicID → ClinicName, Street Address, City, State, ZipCode, Phone#) ***fully FD on primary key**
  - FD2: Zip Code → City, State ***this is transitive FD**
- Clinics_Patients(ClinicID(fk), MedicalRecord#(fk)) ***Created new relation**
- Appointments(Appointment#, AppointmentDate, AppointmentTime, MedicalRecord#(fk), ProviderNPI(fk), ClinicID(fk), Status)
  - FD1: Appointment# → AppointmentDate, AppointmentTime, MedicalRecord#(fk), ProviderNPI(fk), ClinicID(fk), Status
    ***fully FD on primary key**
- Providers_Patients(ProviderNPI(fk), MedicalRecord#(fk))

  ***Created new relation**

Normalize the Relational Model

- Patients(MedicalRecord#, FirstName, LastName, DoB(fk), Address, Phone#, Sex, InsurancePolicy#(fk))
  - FD1: MedicalRecord# → FirstName, LastName, DoB, Address, Phone#, Sex, InsurancePolicy#
    ***fully FD on primary key**

- Insurance(InsurancePolicy#, InsuranceName) ***created new relation here to remove transitive FD**
  - FD1: InsurancePolicy# → InsuranceName
    ***fully FD on primary key**

- PatientAge(DoB, Age) ***created new relation here to remove transitive FD**
  - FD1: DoB → Age ***fully FD on primary key**

Normalize the Relational Model

- Providers(ProviderNPI, FirstName, LastName, ProviderType)
  - FD1: ProviderNPI → FirstName, LastName, ProviderType

  ***fully FD on primary key**
- Providers_Clinics(ProviderNPI(fk),ClinicID(fk)) ***already in 3NF since no transitive or partial FDs**
- Clinics(ClinicID, ClinicName, Street Address, ZipCode(fk), Phone#)
  - FD1: ClinicID → ClinicName, Street Address, ZipCode, Phone#
- ClinicZip(ZipCode, City, State) ***created new relation here to remove transitive FD**
  - FD1: ZipCode → City, State ***fully FD on primary key**
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Normalize the Relational Model

- Clinics_Patients(ClinicID(fk), MedicalRecord#(fk)) ***already in 3NF since no transitive or partial FDs**

- Appointments(Appointment#, AppointmentDate, AppointmentTime, MedicalRecord#(fk), ProviderNPI(fk), ClinicID(fk), Status)
  - FD1: Appointment# → AppointmentDate, AppointmentTime, MedicalRecord#, ProviderNPI, ClinicID, Status
    ***fully FD on primary key**

- Providers_Patients(ProviderNPI(fk), MedicalRecord#(fk))
  ***already in 3NF since no transitive or partial FDs**

Final Relational Model in 3NF

- Patients(MedicalRecord#, FirstName, LastName, DoB(fk), Address, Phone#, Sex, InsurancePolicy#(fk))
  - FD1: MedicalRecord# → FirstName, LastName, DoB, Address, Phone#, Sex, InsurancePolicy#
- Insurance(InsurancePolicy#, InsuranceName)
  - FD1: InsurancePolicy# → InsuranceName
- PatientAge(DoB, Age)
  - FD1: DoB → Age
- Providers(ProviderNPI, FirstName, LastName, ProviderType)
  - FD1: ProviderNPI → FirstName, LastName, ProviderType

Final Relational Model in 3NF

- Clinics(ClinicID, ClinicName, Street Address, ZipCode, Phone#)
  - FD1: ClinicID → ClinicName, Street Address, ZipCode(fk), Phone#)
- ClinicZip(ZipCode, City, State)
  - FD1: ZipCode → City, State
- Appointments(Appointment#, AppointmentDate, AppointmentTime, MedicalRecord#(fk), ProviderNPI(fk), ClinicID(fk), Status)
  - FD1: Appointment# → AppointmentDate, AppointmentTime, MedicalRecord#, ProviderNPI, ClinicID, Status
- Clinics_Patients(ClinicID(fk), MedicalRecord#(fk))
- Providers_Patients(ProviderNPI(fk), MedicalRecord#(fk))
- Providers_Clinics(ProviderNPI(fk),ClinicID(fk))

Summary

-Created a relational model
-Normalized to 3NF
-Primary Care CA has a new relational model to organize data of their growing healthcare business