

Online Appointment Database Management System

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Milestone/Version	Date
M1V1	03/15/2020

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Section I. Project Description

The objective of this project is to build an appointment management system that will handle all the intricacies of making an appointment for a doctors office. The goal is to create an efficient system that will allow any individual the ability to make appointments as well as store information of the patients in a concise manner. Making the experience easy and pain free for the patient will prevent miscommunication and promote patient satisfaction that will lead to more consistent and reliable business practices. Healthcare can be a very intimidating thing for many, and putting focus on their experience being streamlined and easy will benefit both them and the success of the business.

Furthermore, the database will contain any information needed for both the doctors and patients. Patient information will be organized and kept on file for both their own and the doctors reference. This means that patients will be able to easily keep track of their health plan as well as make it easy for doctors to get them the proper help that they need in a painless manner. When making an appointment important information such as chronic conditions and current medications will be taken and stored in order to make the appointment as efficient as possible. Patients will have the option to make an account or not; accounts will grant them access to a type of patient portal, but it is not necessary to make an appointment, which makes the clinic more accessible. Appointments will be easy to cancel and reschedule and patients will have many options with doctors and treatments.

Patient satisfaction will also be considered in this project. After seeing a doctor patients will have the ability to review the doctor based on their appointment in order to maintain communication and encourage patients to make future or new appointments with a physician that will work for them. Patients will have control over the doctors they can see per appointment and will be educated on any specialties in order to make an informed decision. This project strives to improve the experience of making appointments to and integrating a clinic into your life for a pleasant healthcare experience and a profitable and stable business.

Section II: Use Cases

Title	Making an Appointment
Actors	Patient, Clinic, Schedule, Appointments, Payment
Description	<p>Rachel is looking at a doctor's office website to try to make an appointment to get a general check up. She first has to choose a time frame in which she would like to make her visit. If no appointments are available, she can look further in advance, or even has the option of choosing a different location. For every month the calendar shows days that have available appointments that will be validated. Once a day is clicked, the available appointments will be retrieved and displayed for her. She is prompted to choose from a list of available times at a specific location. Once chosen, a form appears for her to write down her information, including email, payment, gender, phone, etc. Once this is filled and submitted, she is given a confirmation number via phone and/or email.</p>

Title	Cancelling and Rescheduling Error
Actors	Patient, Schedule, Appointment
Description	<p>Steve had previously made an appointment on his account to see a general practitioner about chronic migraines that he has been experiencing the last</p>

	<p>few months. However, he accidentally double books his day and cannot make it to the appointment. When he goes to cancel his appointment, he also wants to reschedule it as well. However, when he goes to the cancellation page, there is no option to request a new appointment. He ends up having to cancel his appointment and manually go back to the original booking page to make a new one.</p>
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Title	Rescheduling Successfully
Actors	Patient, Schedule, Appointment, Clinic
Description	<p>John realizes that he has overbooked and cannot make his doctor appointment that he had previously scheduled. However, he still needs to see his doctor. In the confirmation email he was provided there is a link to reschedule the appointment. Once he clicks on this link, he is prompted to enter either his confirmation number and/or his personal information that can retrieve his appointment date. He is then prompted to choose from a list of available appointments that meet his criteria. He simply has to select the next date and submit and his previous appointment is cancelled and his new date is saved with his previous information.</p>

Title	Retrieving an Appointment
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Actors	Patient, Schedule, Appointment, Clinic
Description	<p>Alice had previously made an appointment with a clinic but realizes that the pain she was experiencing has settled and she wants to cancel her appointment. On the website there is a url for her to cancel or reschedule her appointment. Once she has gotten to the page, she is prompted to enter in her confirmation number or personal information. She has lost her confirmation number so she enters her first name, last name, and date of birth instead. Once her appointment is retrieved it is displayed. She clicks the provided button to cancel and it displays a message asking her if she is sure, because the appointment will be made available to other patients. Once she confirms, her appointment is cleared and released.</p>

Title	Unclear Service Error
Actors	Patient, Services, Appointment, Schedule
Description	<p>Rebecca is looking to make an appointment at the nearest clinic to her over multiple health concerns she had been experiencing recently. However, as she enters her information, she realizes that the appointments do not have any options to select for her services. She still goes ahead with booking the appointment. When she goes to her appointment she realizes that not enough time was booked in order for her requests.</p>

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Title	Forgotten Appointment
Actors	Patient, Appointment, Schedule, Receptionist, Clinic
Description	<p>Evie makes an appointment to get her eyes check at her local clinic as she has some difficulty seeing. She chooses the services and checks over her payment and the amount she will owe. She reads the terms and sees that the clinic has a fee for last minute cancellations or no shows. She brushes it off. However, she unfortunately forgets and misses her appointment. Her method of payment is charged a \$50 fee for missing her appointment and she is notified.</p>

Title	A Need for Feedback
Actors	Patient, Doctor, Payment, Appointment, Schedule, Review
Description	<p>Peter recently had an appointment with a clinic where he discussed with a physician named Robert L. About migraines that he had been experiencing</p>

	<p>recently. While making his appointment he realizes that his insurance is not listed as an accepted provider, but feeling in a rush, he makes an appointment using his credit card instead. After his appointment, he left the clinic feeling confused and dejected. He felt like he wanted to vent his experiences so others would know what to look for when making an appointment but found when he looked on the website that there was no way to do so.</p>
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Title	Helpful Reminders
Actors	Patient, Doctor, Schedule, Appointment, Notifications, Clinic, Fees
Description	<p>Sarah made an appointment to see a doctor about issues regarding pain management and overall health concerns. Sarah however has a difficult time keeping track of her schedule and loses her confirmation email regarding her appointment and forgets to put it in her calendar. Thankfully, Prime Health Clinic had notifications set up regarding her appointment that warned her two days in advance. Because of this, Sarah was able to make her appointment on time and was not charged any late or missed fees.</p>

Title	Updating Payment Information
Actors	Patient, Clinic, Account, Prescriptions, Insurance, Insurance Provider
Description	Phil has had appointments with Prime Health Clinic in the past. Because he has had regular visits, he chose to make an account so he could view his medical information and keep track of his prescriptions. He recently had to change insurances, which he used as a primary payment for his appointments. So going into his account, he goes to update his provider information, entering his new provider name, member id and group number. Thankfully the provider was one taken by the clinic so he was all set for future visits.

Title	Accessing Patient Records
Actors	Employee, Doctor, Patient, Clinic, Medical Record, Prescriptions
Description	April is a practicing physician at the Hope Clinic and has recently had a patient switch to her care from another doctor at the clinic. She has not met the patient yet, but wants to be able to have an idea of what is going on with their health plan. She searches the patient name to find their medical record in their system. She is then able to check out the prescriptions filed under their name and previous details of past appointments so she is able to help the patient to the full extent of her ability.

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Title	Scheduling Followups
Actors	Patient, Doctor, Nurse, Account, Appointment, Service
Description	<p>Joseph A. books an appointment online for a dental procedure. After filling out the form for his service inquiries for fillings, he chose a doctor Jones to do the procedure. When at the office, he is informed he will be accompanied by a nurse who will be assisting the process. During the appointment they discover he has more cavities than previously seen in another consultation. Joseph is able to book a new appointment for a filling online through his account as a reaccuring patient. He double checks his previous medical information to be sure that he has paid for his past procedures and checks the given price when scheduling the appointment and is all set.</p>

Section III: Database Requirements

1. Patient

A patient shall have at most one account associated with their information.

A patient shall have their last and first name provided.

A patient shall have an email and/or phone provided to contact.

A patient shall have a gender identity provided.

A patient shall have a valid address.

A patient shall be able to make many appointments at once.

A patient shall have medical records that track their medications and appointments.

A patient shall be able to make reviews for doctors.

2. Employee

Employees shall be doctors and receptionists.

Employees shall have permissions based on their type.

Employees shall be supervised by another employee as office supervisor.

3. Doctor

Doctors shall have many individual appointments scheduled in their name.

Doctors shall have the ability to have many specialties.

Doctors shall have at least one language.

Doctors shall have an available schedule that dictates when they are free or not.

Doctors shall have profiles that include their information such as name, gender, and specialties.

Doctors shall have reviews in their name.

Doctors shall have at least one service they can provide.

4. Nurse

A nurse shall have at least one service they can provide.

A nurse shall assist doctors but cannot make independent appointments.

5. Receptionist

A receptionist shall have permissions to make and cancel appointments.

6. Clinics

Clinics shall all have a physical address.

Clinics shall offer a variety of insurance providers that are stated to the patient upon appointment creation.

Clinics shall have at least one doctor.

Clinics shall have many different services with associated prices.

7. Appointment

An appointment shall have a unique confirmation number associated with it that can be made up of letters and numbers.

An appointment shall have a pre-assigned purpose. (Check up, blood test, etc)

An appointment shall have a specific location.

An appointment shall have the ability to be cancelled.

An appointment shall have prices associated with them if applicable.

An appointment shall be made for only one patient.

An appointment shall be made with only one doctor at a time.

An appointment shall be made for one or more reasons.

An appointment will be made for a specific date.

An appointment will have a predefined time slot.

An appointment shall have extra fees for things such as cancellations or late shows.

8. Payment

Payment shall be made with credit, debit, or insurance.

Payment method shall be entered at time of making the appointment.

9. Card Payment

Card payment shall have a patient associated with it.

Card payment shall have a valid card number.

Card payment shall have an expiration date.

Card payment shall have a CVV.

10. Insurance Payment

Insurance information shall have a valid provider taken by the clinic.

Insurance information shall have a valid member id.

Insurance shall have a valid group/policy number.

Insurance shall have a plan name.

11. Services

Services shall include physicals, vaccinations, medical screening, and general checkups.

A service shall be provided by at least one doctor.

A service shall be provided by a nurse in conjunction with a doctor.

12. Schedule

Schedules shall have available and unavailable appointments marked.

Schedules shall have associated doctors with each time.

Schedules shall be separate for each location.

13. Specialties

Specialties shall be applicable to any doctor.

Specialties shall have a type and description.

14. Account

Accounts for patients shall be optional but not necessary.

Accounts will include all the patient's history that they can view on their own.

Accounts will include accessible medical history.

15. Medical Record

Medical records shall include previous appointments made by patients.

Medical records shall have associated treatment plans.

Medical records shall track individual patient prescriptions.

16. Prescriptions

A prescription shall be made for one medication.

A prescription shall be contained on file and accessible to doctors.

A prescription shall include a date they were last prescribed.

A prescription shall have the status on refills.

17. Insurance Providers

Insurance providers shall have a unique id.

Insurance providers shall have a name.

Insurance providers shall have an address.

Insurance providers shall have a phone number.

18. Fees

Fees shall be charged on top of regular service costs.

Fees shall have a description of what they detail.

Fees of different types will all each have their own price.

19. Permissions

Permissions shall be given to many employees.

Permissions shall have a description detailing what they entail.

20. Doctor Languages

A language shall be used by many doctors.

21. Reviews

A review shall include a rating out of five stars.

A review shall include the doctor in which the appointment was made with.

A review shall be associated with only one patient.

A review shall contain a description.

22. Notifications

Notifications shall be available for all clients.

Notifications shall be sent through email or phone number.

Notifications shall have a set timeframe to remind clients of their appointment.

Section IV: Detailed List of Main Entities, Attributes and Keys

1. Patient (Strong)

- * patient_id: key, numeric
- * name: composite, alphanumeric
- * dob: date
- * gender: alphanumeric
- * email: alphanumeric, multi-value
- * phone: numeric, multi-value, composite
- * address: alphanumeric, multi-value, composite

2. Employee (Strong)

- * employee_id: key, numeric
- * permission_id: fkey, numeric
- * name: composite, alphanumeric
- * dob: date
- * gender: alphanumeric
- * clinic: fkey, numeric

3. Doctor (Weak)

- * doctor_id: key, numeric
- * permission_id: fkey, numeric
- * name: alphanumeric, composite
- * dob: date
- * gender: alphanumeric
- * clinic: fkey, numeric
- * languages: fkey, numeric

- * specialties: fkey, numeric

- * services: fkey, numeric

4. Nurse (Weak)

- * employee_id: key, numeric

- * permission_id: fkey, numeric

- * name: alphanumeric, composite

- * dob: date

- * gender: alphanumeric

- * clinic: fkey, numeric

- * services: fkey, numeric

5. Receptionist (Weak)

- * employee_id: key, numeric

- * permission_id: fkey, numeric

- * name: composite, alphanumeric

- * dob: date

- * gender: alphanumeric

- * clinic: fkey, numeric

6. Clinic (Strong)

- * clinic_id: key, numeric

- * address: alphanumeric, multi-value, composite

- * phone: numeric, multi-value, composite

7. Appointment (Strong)

- * appointment_id: key, numeric

- * patient: fkey, numeric

- * doctor: fkey, numeric

- * confirmation: alphanumeric
- * type: alphanumeric, composite
- * location: fkey, numeric
- * cancelled: Boolean
- * date: date
- * time: alphanumeric
- * service: fk, numeric
- * fee: fkey, numeric

8. Payment (Strong)

- * patient: fkey, numeric
- * card: fkey, numeric
- * insurance_id: fkey, numeric

9. Card (Weak)

- * patient: fkey, numeric
- * card_no: alphanumeric
- * expiration: alphanumeric, multivalue
- * cvv: alphanumeric

10. Insurance (Weak)

- * patient: key, numeric
- * provider: key, numeric
- * member_id: alphanumeric
- * group_no: alphanumeric

11. Services (Strong)

- * service_id: key, numeric
- * type: alphanumeric, composite

- * price: alphanumeric

12. Schedule (Strong)

- * schedule_id: key, numeric
- * date: date
- * doctor: fkey, numeric
- * status: boolean
- * clinic: fkey, numeric

13. Specialties (Strong)

- * doctor: key, numeric
- * type: alphanumeric, composite

14. Account (Weak)

- * patient: fkey, numeric
- * password: alphanumeric

15. Medical Records (Strong)

- * patient: key, numeric
- * prescriptions: fkey, numeric
- * appointments: fkey, numeric

16. Prescriptions (Strong)

- * prescription_id: key, numeric
- * patient: fkey, numeric
- * doctor: fkey, numeric
- * date_prescribed: date
- * refills: numeric

17. Insurance Providers (Strong)

- * provider_id: key, numeric
- * name: alphanumeric, composite
- * address: alphanumeric, composite, multi-value

18. Fees (Strong)

- * fee_id: key, numeric
- * description: alphanumeric, composite
- * price: alphanumeric

19. Permissions (Strong)

- * permission_id: key, numeric
- * description: alphanumeric, multi-value

20. Languages (Strong)

- * doctor: key, numeric
- * name: multivalue, alphanumeric

21. Reviews (Strong)

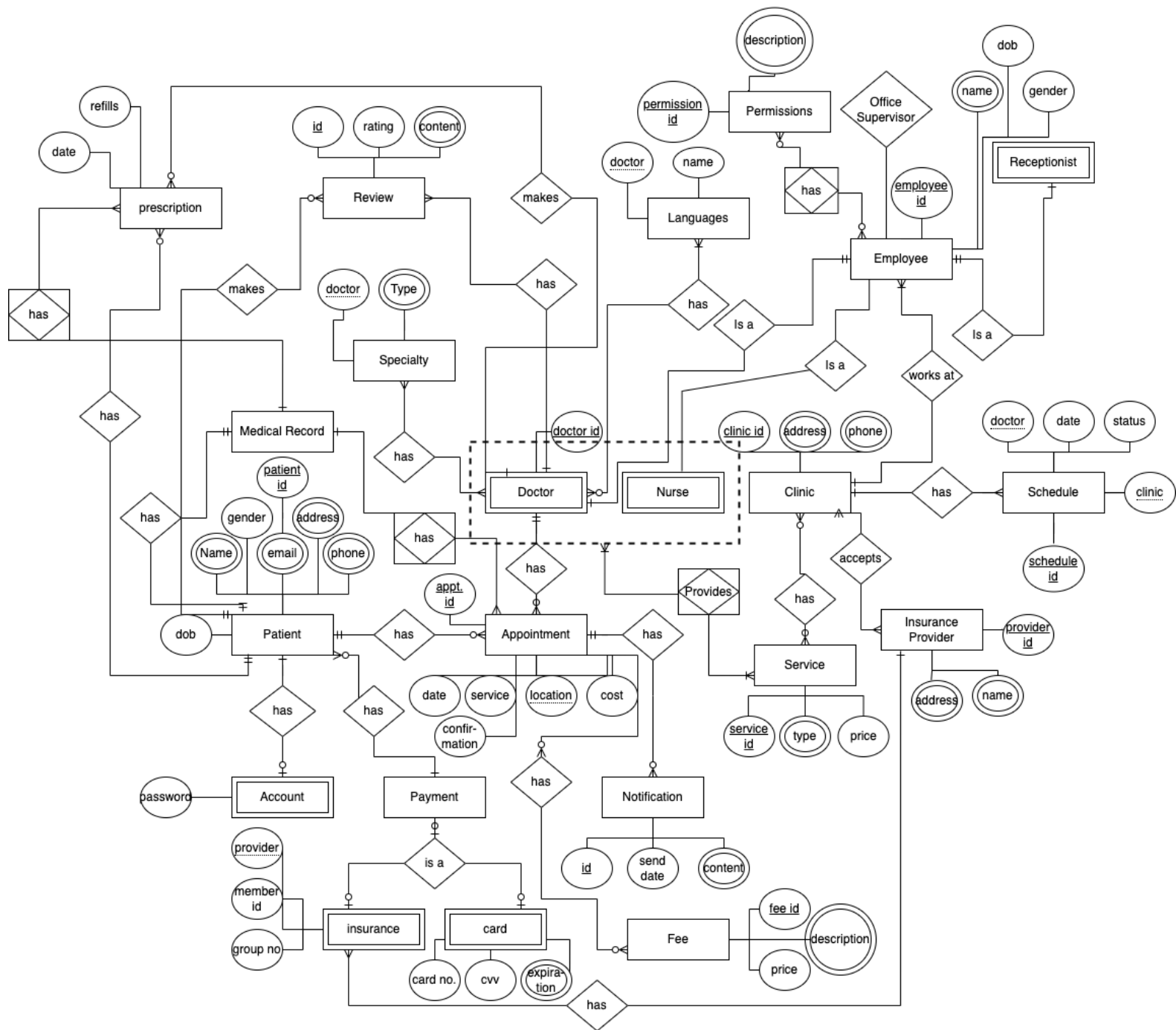
- * review_id: key, numeric
- * patient: key, numeric
- * doctor: key, numeric
- * content: alphanumeric, composite

22. Notifications (Strong)

- * notification_id: key, numeric
- * appointment: key, numeric
- * patient: key, numeric
- * send_date: date

* content: alphanumeric, composite

Section V: Entity Relationship Diagram



Section VI: Testing Table

Rule	Entity A	Relation	Entity B	Cardinality	Pass/ Fail	Description
1	Patient	Has a	Account	Zero or one to 1	Fail	An account should actually have one and one only patient. Accounts cannot be changed to another name.
2	Patient	Has	Appointment	Zero or many to one and only one	Pass	None
3	Appointment	Has	Doctor	one and only one to zero or many	Pass	None
4	Employee	Works at	Clinic	One to one or many	Pass	None
5	Patient	Has	Payment	One to zero or many	Fail	Payment must be connected to at least one account.
6	Payment	Is a	Insurance	Zero or one to zero or one	Pass	None
7	Payment	is a	Card	Zero or one to zero or one	Pass	None
8	Clinic	Has	Service	Zero or many to zero or many	Fail	A clinic cannot have zero services. It must provide many services.
9	Doctor	Has	Specialty	Many to many	Pass	None
10	Clinic	Has	Schedule	Many to one	Fail	The clinic will have many scheduled days and therefore cannot have one single schedule per clinic. As well, a schedule can only belong to one clinic as they have different times.
11	Appointment	Has	Notifications	Zero or many to one and only one	Pass	None
12	Clinic	Has	Schedule	One to many	Pass	None
13	Clinic	Accepts	Insurance Provider	Many to many	Pass	None

14	Patient	Has	Medical record	One to one	Fail	A medical record can only ever belong to one patient. It can never be changed to another patient. Therefore it can only ever have one and only one. Same goes for the other way.
15	Patient	Makes	Review	Zero or many to one	Fail	While it is true that a patient can make no or many reviews, an instance of a review can only be made by one and only one patient and cannot be changed.
16	Doctor	Has	Review	Zero or many to one	Fail	Similar to the previous example, a review must be made by one and only one doctor and cannot be changed in that instance of a review.
17	Appointment	Has	Fee	Zero or many to zero or many	Pass	None
18	Doctor	Makes	Prescription	Zero or many to one	Fail	One and only one doctor can make an instance of a prescription. Others can be filled by new doctors but they would be a different prescription number.
19	Patient	Has	Prescription	Zero or many to one and only one	Pass	None
20	Doctor	Has	Language	One or many to zero or many	Pass	None
21	Medical record	Tracks	Appointment	Many to one	Pass	None
22	Medical record	Tracks	Prescriptions	Many to one	Pass	None
23	Employee	Is a	Doctor	One to one and only one	Pass	None
24	Employee	Is a	Receptionist	One to one and only one	Pass	None

25	Insurance Info	Has a	Provider	One and only one to zero or many	Fail	Insurance information cannot only have one and only one provider because insurances can be changed.
26	Insurance Info	Has a	Provider	One to zero or many	Pass	None
27	Employee	Supervises	Employee	Recursive	Pass	None
28	Patient	Has a	Account	Zero or one to one and one only	Pass	None
29	Employee	Has	Permissions	Zero or many to zero or many	Pass	None
30	Patient	Has	Payment	One to many	Pass	None
31	Patient	Has	Medical Record	One and only one to one and only one	Pass	None
32	Patient	Makes	Review	Zero or many to one and only one	Pass	None
33	Doctor	Has	Review	Zero or many to one and only one	Pass	None
34	Doctor	Provides	Service	One or many to one or many	Pass	None
35	Nurse	Provides	Service	One or many to one or many	Pass	None
36	Doctor	Works with	Nurse	Aggregation	Pass	None
37	Doctor	Makes	Prescription	Zero or many to one and only one	Pass	None