UNIVERSITI PENDIDIKAN SULTAN IDRIS
اونيۏرسيتي ڤندidikan سلطان ادريس
SULTAN IDRIS EDUCATION UNIVERSITY

UNIVERSITI PENDIDIKAN SULTAN IDRIS
35900 TANJONG MALIM, PERAK.

MTD3033

DATABASE SYSTEM

HEALTHONE MEDICAL DATABASE DESIGN

BIL	NAMA PELAJAR	NO. MATRIK
1	HAZIQAH SYASYA BINTI NASIP	D20181083273
2	AMIRUL ASYRAFF BIN AHMAD JAILANI	D20201095577
3	MOHAMMAD YUSUF BIN SUMARDI	D20201095601
4	MOHD IZZUL IKHWAN BIN MOHD YUSOF	D20201095609
KUMPULAN KULIAH	E	
NAMA PENSYARAH	TS. DR. CHEE KEN NEE	

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INTRODUCTION

Since a hospital has a million or more patients in a day, it needs a database system to keep track of all the details related to them. With the development of medical information, a large number of digital data has been produced in the process of medical service, health care, and health management forming medical big data. There are variety types of data in health informatics such as administrative data, electronic health records, clinical data, insurance claims data and patient surveys. This project aims to develop a data model that will allow a health insurance company to manage all the details related to their patients so we just focus to develop a data model for a database application system for a mid-size health insurance company to keep track of health claims including patient information, doctor information, information about patient visits to their doctor as well as prescription drugs that prescribed to patients.

OVERVIEW

Problem Issues:

There's a mid-size health insurance company having a problem in keeping track of health claims such as their patient information, doctor information, information about patient visits to their doctor and the prescription drugs that prescribed to their patients, primary doctor information, insurance company information as well as hospital information. This mid-size health insurance company also having problem in information on doctor specialty on this hospital.

Objectives:

As a small database consulting company specializing in developing databases for the medical industry, so we have to develop a data model for a database application system for a mid-size health insurance company to keep track of health claims such as their patient information, doctor information, information about patient visits to their doctor and the prescription drugs prescribed to their patients, primary doctor information, insurance information as well as hospital information.

Information By Step

STEP 1

Determining entities, attributes, and UID's. Create entities and attributes based on project scenario (healthOne Medical). Create entities and attribute that related to medical information and insurances company such as Patient, Doctor, Hospital, and Prescription. The entities' purpose is to knowing how to organize and classify data makes it possible to draw useful conclusion about seemingly random facts and it is important to learn about entities because they are the things about which we stored the data. Meanwhile, the purpose of attributes is they provide more specific information about an entity. Attributes also help you distinguish between one instance and another

by providing greater detail for the entity. For the unique identifiers, it is important because they distinguish one instance of an entity from another.

STEP 2

Supertype and subtype in our Entity Relationship Diagram (ERD) is Hospital Visit following with New Visit, Follow Up Visit, and Routine Visit. The purpose is you can typically associate ‘choices’ of something with supertypes and subtypes and understanding real world examples helps us understand how and when to model them. Often some instances of an entity have attributes or relationships that other instances do not have. Like this HealthOne Medical, we have new patient that visit to the hospital also we have followed up visit and routine visit to the hospital and doctor will treated patient differently based on they visit to hospital.

STEP 3

Relationship between each entity. The purpose of this relationship is we look at the example that once the patient has been allocate with a doctor, can another doctor treat with that patient? Usually yes, because maybe some doctor has another patient to the take care and you will be taken care with another doctor. Some patient can be treated by another doctor, but for the patient who have a chronic disease or cancer must been treated by just specialist doctor only. In this relationship, we have four type of relation such as one to one, one to many, many to one, and many to many.

STEP 4

Normalization is used for eliminate the redundant data in our database. What happens if data is stored in more than one place in a database? What if someone changes the information in one place and not the other and how do you want to know which information is correct? Redundancy like this can causes unnecessary problems in a database. Normalization is a process that is used to eliminate these kinds of problems. One of your goals as a database designer is to "store information in one place and in the best possible place “.

STEP 5

Arcs in data modeling help designers clarify an exclusive OR across relationships. The more explicitly you can define the client's requirements, the more accurate your final implementation will be. We created a refillable and non-refillable on the prescription entities because drug can’t be both and doctor must refer to the patient it self before give the drug.

STEP 6

Recursive relationship and hierarchy. It this case we use the recursive relationship instead hierarchy because recursive relationships tend to be simpler because you are using only one entity and your diagram will be less “busy.” However, they are less specific, you cannot have mandatory attributes or relationships unless they are mandatory in all instances of the entity.

STEP 7

Modelling historical data is we keeping the data for the long time so we can save all data for the references to the hospital. For example, primary doctor history is useful for the references to the hospital to keep track which doctor is on duty, start date, end start and reason for leaving.

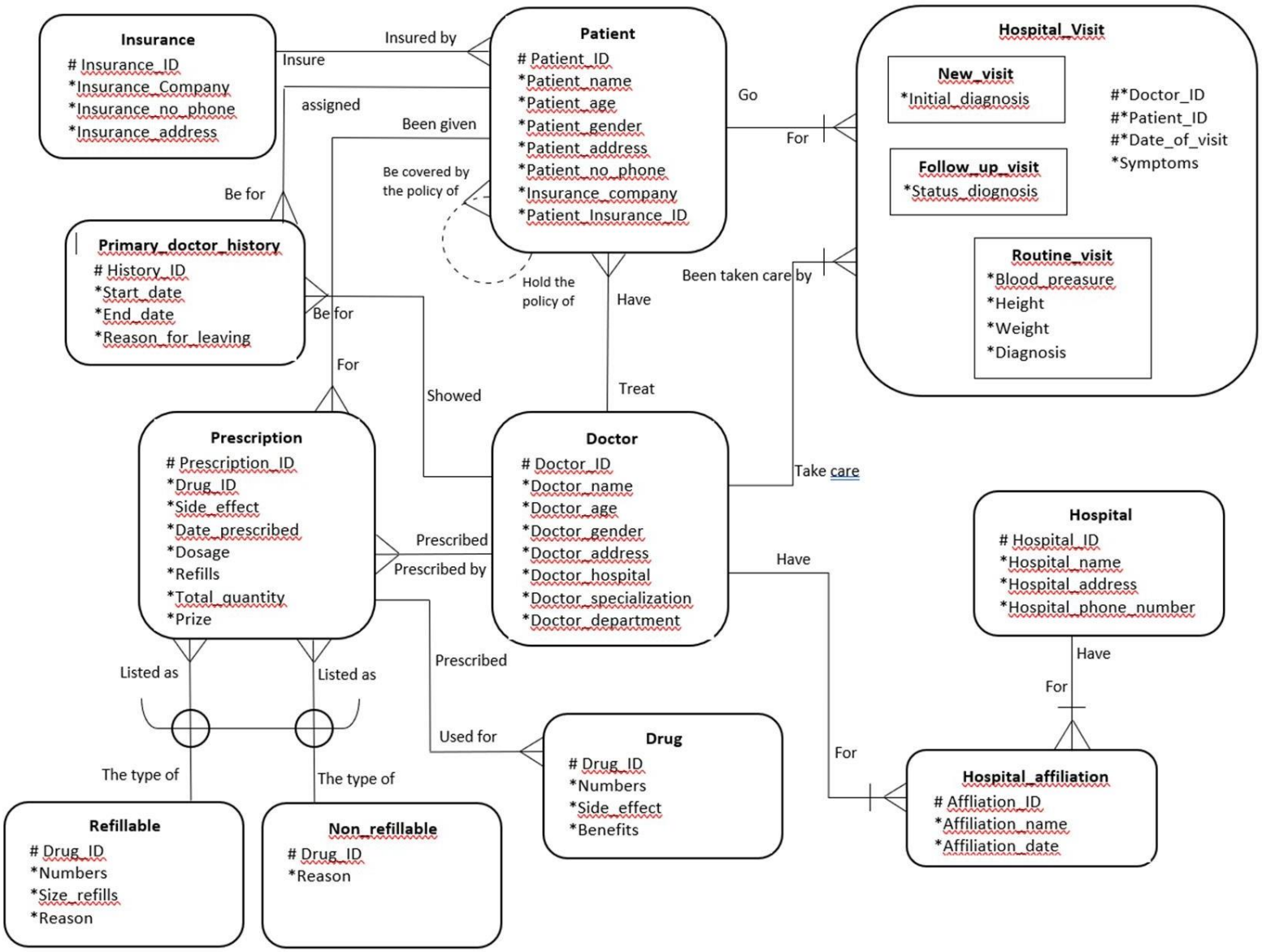
STEP 8

Basic mapping is a build the table to classify the primary key, foreign key, and unique key in this database design. Relationships are mapped between primary keys and foreign keys to allow one table to reference another. If we don't map relationships, we just have a lot of standalone tables containing information that does not connect to anything else in the database. Mapping relationships between entities serves as a critical 'first-step' to facilitate discussion between the patient, doctor, hospital, and prescription of the database.

ASSUMPTION

- Each PATIENT must have one and only one DOCTOR.
- Each DOCTOR may treat one or more PATIENT.
- Each DOCTOR may have one or more HOSPITAL AFFILIATION.
- Each HOSPITAL AFFILIATION must be for one and only one DOCTOR.
- Each HOSPITAL may have one or more HOSPITAL AFFILIATION.
- Each HOSPITAL AFFILIATION must be for one and only one HOSPITAL.
- Each DOCTOR may have one and only one HOSPITAL.
- Each HOSPITAL must be for one and only one DOCTOR.
- Each PATIENT may be given one or more PRESCRIPTION.
- Each PRESCRIPTION must be for one and only one PATIENT.
- Each PATIENT may have one or more HOSPITAL VISIT.
- Each HOSPITAL VISIT must be for one and only one PATIENT.
- Each DOCTOR may preside over one or more HOSPITAL VISIT.
- Each HOSPITAL VISIT must be presided over by one and only one DOCTOR.
- Each DOCTOR may prescribe one or more PRESCRIPTION.
- Each PRESCRIPTION must be prescribed by one and only one DOCTOR.

ENTITY RELATIONSHIP DIAGRAMS (ERD)



BASIC MAPPING TABLES

DOCTOR

Key Type	Optionality	Column Name
pk	*	Doctor_ID
	*	Doctor_name
	*	Doctor_age
	*	Doctor_gender
	*	Doctor_address
	*	Doctor_hospital
	*	Doctor_specialization
	*	Doctor_department
fk1	*	Patient_ID
fk2	*	Prescription_ID
fk3	*	Affiliation_ID
fk4	*	History_ID
fk5	*	Visit_ID

PATIENT

Key Type	Optionality	Column Name
pk	*	Patient_ID
	*	Patient_name
	*	Patient_age
	*	Patient_gender
	*	Patient_address
	*	Patient_no_phone
	*	Insurance_company
fk1	*	Insurance_ID
fk2	*	Prescription_ID
fk3	*	History_ID
fk4	*	Doctor_ID
fk5	*	Visit_ID

PRESCRIPTION

Key Type	Optionality	Column Name
pk	*	Prescription_ID
	*	Side_effect
	*	Date_prescribed
	*	Dosage
	*	Refills
	*	Total_quantity
	*	Prize
fk1	*	Patient_ID
fk2	*	Doctor_ID
fk3	*	Refillable
fk4	*	Non_refillable
fk5	*	Drug_ID

HOSPITAL

Key Type	Optionality	Column Name
pk	*	Hospital_ID
	*	Hospital_name
	*	Hospital_address
	*	Hospital_phone_number
fk	*	Affiliation_ID

HOSPITAL AFFILIATION

Key Type	Optionality	Column Name
pk	*	Affiliation_ID
	*	Affiliation_name
	*	Affiliation_date
fk1	*	Hospital_ID
fk2	*	Doctor_ID

INSURANCE

Key Type	Optionality	Column Name
pk	*	Insurance_ID
	*	Insurance_company
	*	Insurance_no_phone
	*	Insurance_address
fk	*	Patient_ID

PRIMARY DOCTOR HISTORY

Key Type	Optionality	Column Name
pk	*	History_ID
	*	Start_date
	*	End_date
	*	Reason_for_leaving
fk1	*	Doctor_ID
fk2	*	Patient_ID

DRUG

Key Type	Optionality	Column Name
pk	*	Drug_ID
	*	Numbers
	*	Side_effect
	*	Benefits
fk	*	Prescription_ID

REFILLABLE

Key Type	Optionality	Column Name
pk	*	Drug_ID
	*	Numbers
	*	Size_refills
	*	Reason
fk	*	Prescription_ID

NON-REFILLABLE

Key Type	Optionality	Column Name
pk	*	Drug_ID
	*	Reason
fk	*	Prescription_ID

TABLES

Patient _ ID	Patient _ name	Patient _ age	Patient _ gender	Patient_ address	Patient_ phone	Insurance _ company	Insurance_ ID
A200	Haziqah	24	Fimale	No.15 Taman Sri Indah, Tawau Sabah	0155669512	GELA	T0089
A201	Shasha	25	Fimale	No.23 Taman Apas Permai, Kunak Sabah	0103215789	PAMB	K3569
A202	Izzul	21	Male	No.31 Flat Sri Titingan, Lahad Datu Sabah	0112356421	MLA	L6542
A203	Amirul	30	Male	No.03 Rumah Kakitangan, Semporna Sabah	0189547865	MLA	S9874
A204	Ikhwan	28	Male	No.36 Taman Ranggu, Ranau Sabah	0162564123	GELA	R0235

CONCLUSION

In a conclusion, we have designed a data model for a database application system for a mid-size health insurance company called HealthOne Medical Database to keep track of a health claims. As the company that elected in the making of database medical industry, it is important that the company has access to a wide range of information to do with each customer that company has. This system will allow the company to gain better insights into their customers' health care needs and provide them with more effective and efficient services. Finally, the database will be used to track trends and for some extrapolative modelling based on the accumulated data.

RECOMMENDATION

The concept of an ER diagram shows how a weakness in one particular attribute can affect the whole database application of a health insurance company. This issue can be solved through system thinking. We can also create an online self-service system for our customers. This system will allow them to easily manage their health insurance claims and pay their bills online. We can also create a translation for various languages such as Malay, Mandarin, and Tamil. So customers that using our database will be complacent with this recommendation.