Tutorial 5 – Data Modeling I

WITH SUGGESTED SOLUTIONS

Answers to Review Questions

1. Explain the following terms:
   a. *Entity type:* A collection of entity occurrences that share common properties
   b. *Entity instance:* A single occurrence of an entity type
   c. *Attribute:* A property or characteristic of an entity type
   d. *Simple attribute:* A simple attribute cannot be decomposed into (smaller) constituent parts
   e. *Multivalued attribute:* An attribute that may take on more than one value for a given entity instance
   f. *Relationship type:* An association between (or among) entity types
   g. *Identifier:* An attribute (or combination of attributes) that uniquely identifies individual instances of an entity type
   h. *Associative entity:* An entity type that associates the instances of related entity types and contains attributes that represent the relationship between those entity instances.
   i. *Cardinality constraint:* Specifies the number of instances of one entity that can (or must) be associated with each instance of another entity
   j. *Weak entity:* An entity type whose existence depends on some other (parent) entity type
   k. *Identifying relationship:* The relationship between a weak entity type and its owner (parent) entity
   l. *Derived attribute:* An attribute whose values can be calculated from another attribute values
   m. *Business rule:* A rule that defines how business should be conducted, e.g. discount that can be given to customers – maximum of 20%. Note that not all business rules can be represented on an ERD.

2. Discuss the following:
   a. *Strong entity type vs weak entity type:* A strong entity type is an entity that exists independently of other entity types, while a weak entity type depends on some other entity type.
   b. *Degree of a relationship:* is the number of entity types that participate in that relationship
   c. *Cardinality of a relationship:* cardinality is a constraint on the number of instances of one entity type that can (or must) be associated with each instance of another entity type (i.e. can participate in the relationship).
   d. *Required attribute vs optional attribute:* A required attribute must have a value for each entity instance, whereas an optional attribute may not have a value for every entity instance.
   e. *Ternary relationship:* A ternary relationship is a simultaneous relationship among the instances of three entity types.

Solutions to Problems and Exercises

New Oriental Hospital Case Study

New Oriental Hospital (NOH) is a small private hospital run by a team of medical professionals in a local suburb. According to hospital policy, each patient has to fill in a patient registration form (shown in Figure 1) on his/her first visit. On the patient registration form each patient is uniquely identified using patient ID, and the form records registration date, patient's personal details and insurance company details. Each patient must nominate an insurance company, which will pay the account directly to the hospital after the patient is discharged. NOH uses a separate system to manage payment processing. Information recorded on the registration form may be updated at any time without the need to fill in another registration form.

NEW ORIENTAL HOSPITAL PATIENT REGISTRATION FORM	
Patient ID: p0122	**Registration Date:** 11/01/00
First Name: Sally	**Last Name:** Robinson
Age: 72	**Gender:** Female
Date of Birth: 13/04/33	
Address: 5, Doodle Street, Alexandria, NSW, 2015	**Phone:** 9136 2801
Insurance Company (ID): AU-51	
Company Name: Allianz Australia **Company Address:** GPO Box 135, Sydney, NSW 2001. **Company Phone:** 9516 6978 **Company Representative:** Nikki Ron	

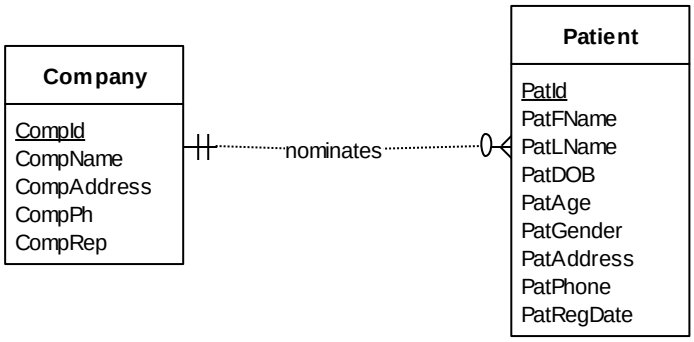
Figure 1: Patient Registration Form

Task 1

1. Document all relevant business rules.
2. Draw an ERD for the above patient registration scenario and the information captured during this process, as depicted in Figure 1.

Business rules (reasonable assumptions, not specified in case study)

a) Each patient has to fill in a patient registration form on his/her first visit.
b) NOH uses a separate system to manage payment processing.
c) Insurance company will pay the account directly to the hospital after the patient is discharged.
d) Information recorded on the registration form may be updated at any time without the need to fill in another registration form.



A new patient medical chart form (shown in Figure 2) is completed by hospital staff for each patient visit, and is numbered using the patient chart number. A staff nurse is responsible for recording patient's symptoms on the medical chart before the patient is diagnosed by a doctor. A doctor is responsible for recording the diagnosis and prescribed medication. Patients may be assigned a different doctor for each visit. Patients that need to be hospitalized are allocated to a ward.

NEW ORIENTAL HOSPITAL PATIENT MEDICAL CHART FORM

Patient ID: p0122 **Patient Chart No:** 13

Admission Date: 24/03/06	**Ward No.:** 12 **Discharge Date:** 25/04/06
Symptoms: swelling and joint pain	**Recorded by (Staff ID):** s099
Diagnosis: Osteoporosis with arthritis	**Diagnosed by (Staff ID):** s028

PRESCRIPTION

Drug No	Name	Description	Dosage	Method	Unit Price	Amt / Day	Start Date	End Date
10223	Morphine	Pain Killer	10mg/ ml	Oral	2.50	4	24/03/06	24/04/06
10334	Calcitonin	Bone Protection	0.5mg/ ml	Nasal Spray	5.15	4	24/03/06	17/04/06

Figure 2: Patient Medical Chart Form

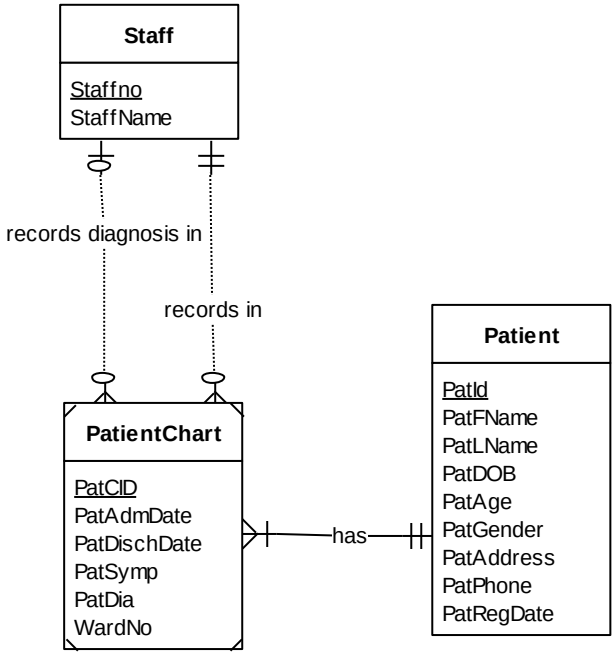
Task 2

1. Document all relevant business rules.
2. Extend your ERD for Task 1 to include the top part of the Patient Medical Chart form described above and as depicted in Figure 2 (i.e. do not include the prescribed medicine information at this stage).

Business rules (reasonable assumptions, not specified in case study)

a) A new patient medical chart form is completed by hospital staff for each patient visit.

b) Patients that need to be hospitalized are allocated to a ward.



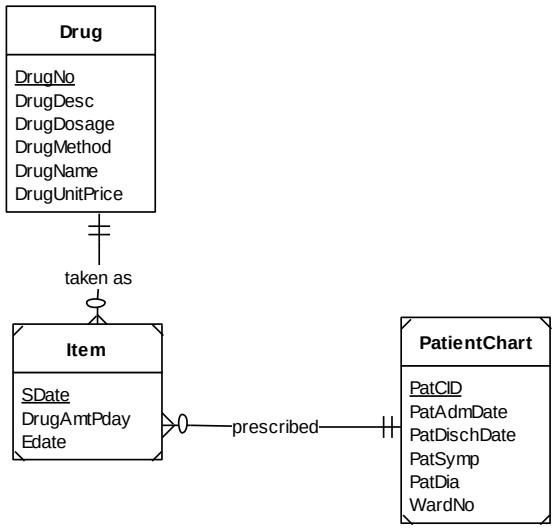
The patient medical chart form shows the drugs prescribed by the doctor on a particular visit. Each drug is uniquely identified by a drug number. Patients may be prescribed several drugs; the amount per day and the period covered by the prescription (start date to end date) as well as details of the drug are recorded on the form. See figure 2 for further information.

Task 3

1. Document all relevant business rules.
2. Extend your ERD for Task 2 to include the prescribed medicine information for a patient, see the table on the bottom part of the Patient Medical Chart in Figure 2.

Business rules (reasonable assumptions, not specified in case study)

a) A particular drug may only be prescribed once per patient chart.



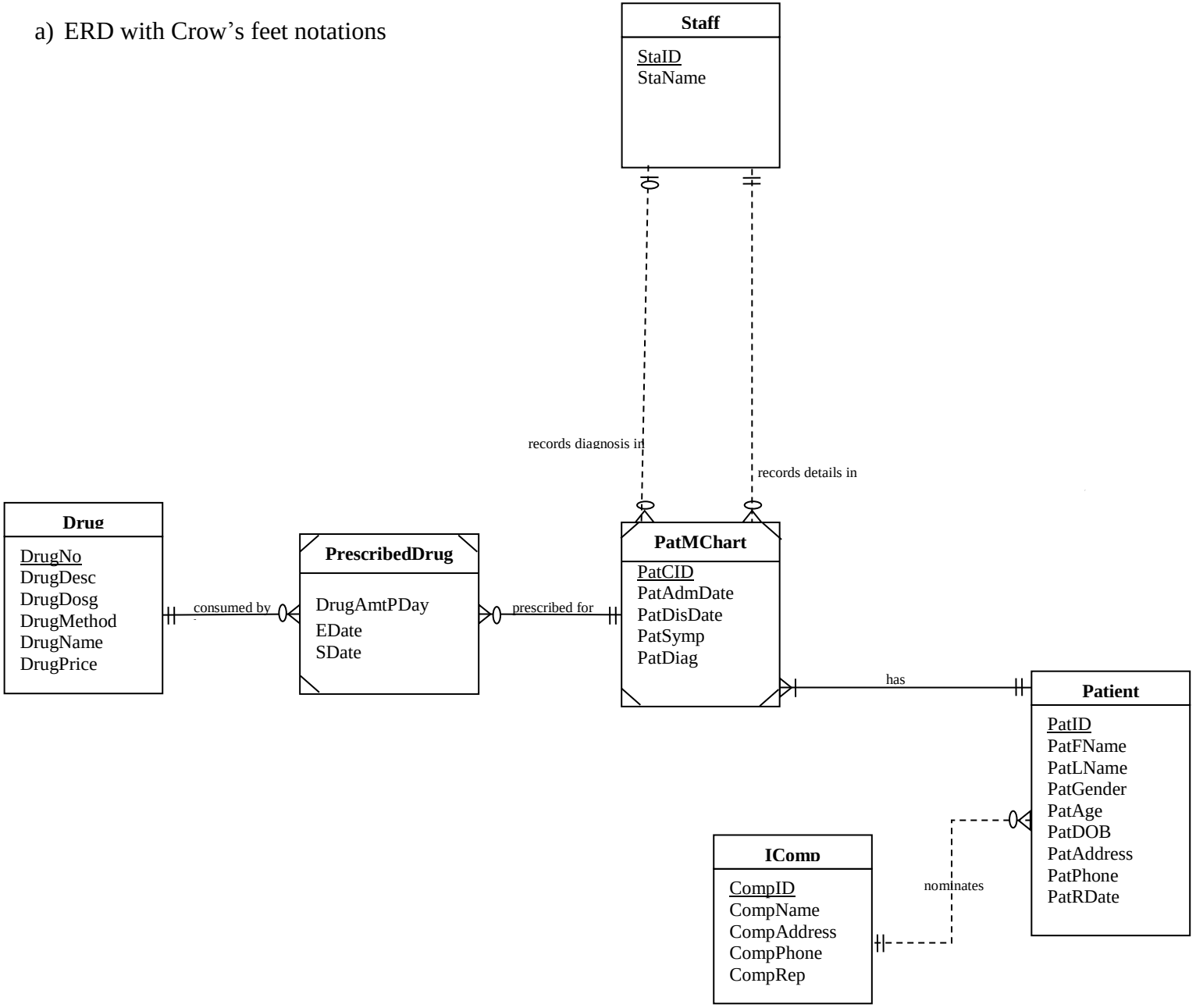
Business Rules:

b) Each patient has to fill in a patient registration form on his/her first visit.
c) NOH uses a separate system to manage payment processing.
d) Insurance company will pay the account directly to the hospital after the patient is discharged.
e) Information recorded on the registration form may be updated at any time without the need to fill in another registration form.
f) A new patient medical chart form is completed by hospital staff for each patient visit.
g) Patients that need to be hospitalized are allocated to a ward.
h) A particular drug may only be prescribed once per patient chart.

ERD Suggested Solution

a) EDR with lecture note notations
b) EDR with book notations

a) ERD with Crow's feet notations



b) ERD with textbook notations