

Medical Informatics: Tutorial 1

ER modelling

- Please attempt all questions on this worksheet in advance of the tutorial, and bring with you all work. Tutorials cannot function properly unless you do the work in advance.
- You are welcome to bring along any questions you may have, e.g. from the lectures.
- Assessment is formative, meaning that tutorials do not contribute to your final grade.

Introduction

In this tutorial you are asked to design an Entity Relationship Model for a database to be used by the NHS (National Health System) in Scotland for a particular clinical scenario. You should read the scenario carefully, thinking about the main constructs of the ER model as you do this. You can then answer the series of questions in this tutorial, which will guide you towards designing and producing a final ER diagram for it.

Scenario description

You've been asked to design a relational database to keep track of patients, their General Practitioners (GPs), drugs prescribed by the GPs to their patients, and pharmacies that sell drugs. Here is some information that you have been given:

- Patients are uniquely identified by their Community Health Index (CHI)¹. They also have a name, a year of birth, a postcode, a phone number and an email address.
- General Practitioner information that is of interest includes their name, their current practice, their years of experience and their email address.
- Drugs have a unique identifier (up to 20 characters), a brand name and a generic name. The name of the pharmaceutical company that produces them also needs to be recorded.
- Pharmacy information to be included in the database includes the pharmacy name, postcode and phone number.
- Each patient needs to be registered with a single GP, while a GP can have several patients.
- When GPs see their patients, they may decide to prescribe them a particular drug. The date of the prescription and the quantity of the drug prescribed need to be recorded in the database.
- Drugs are sold in pharmacies. Each pharmacy sells several drugs at prices that they specify. A drug can have a different price in different pharmacies.

¹ The Community Health Index is a population register, which is used in Scotland for health care purposes. The CHI number uniquely identifies a person on the index.



Question 1: Determining entity sets

What are the candidate entity sets based on the scenario described above? Finalise your selection, making sure that you include 'Patient', 'GP' and 'Drug'.

Do you think that there might be more than one possibility for modelling these entity sets? What considerations did you make for deciding whether something is captured as an entity set or not?

Question 2: Specifying attributes for entity sets

What are the attributes of the entity sets determined in Question 1, based on the scenario description? What are their domains?

Things to think about: According to the scenario given, the quantity of the drug prescribed by a GP to their patient needs to be recorded in the database. Should this be captured as an attribute? If not, what is it? If yes, is it an attribute of Drug, Patient or GP, or none of them? How would you capture it in the ER model? Similarly, how would you capture the date of the prescription?

Question 3: Identifying primary keys

What are the primary keys for the entity sets in your ER model?

Things to think about: The scenario given does not clearly specify how some entities might be uniquely identified. Do you think it's best to use the existing attributes specified in Question 2 for those cases, or would you rather create a new identification number? What are the pros and cons of each approach?

Question 4: Determining relationship sets

What are the relationship sets between the entity sets that you identified in Question 1? Would you characterise them as many-to-many, many-to-one, one-to-many or one-to-one? Do the participating entity sets have total or partial participation in them? And do the relationship sets have any attributes?

Things to think about: The scenario given does not clearly specify key and participation constraints for all relationship sets. In those cases, it is best to make a reasonable assumption and write it down to accompany your ER diagram.

Question 5: Drawing the ER diagram

Draw the diagram representing your ER model, using the conventions given in the lecture slides. You can draw it by hand or use a diagram drawing software, such as Visio, Dia, OmniGraffle, etc.