Università degli Studi di Trieste

Corso di Laurea Magistrale in
INGEGNERIA CLINICA

RICHIAMI DI BASI DI DATI

Corso di Informatica Medica

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Dipartimento di Ingegneria e Architettura

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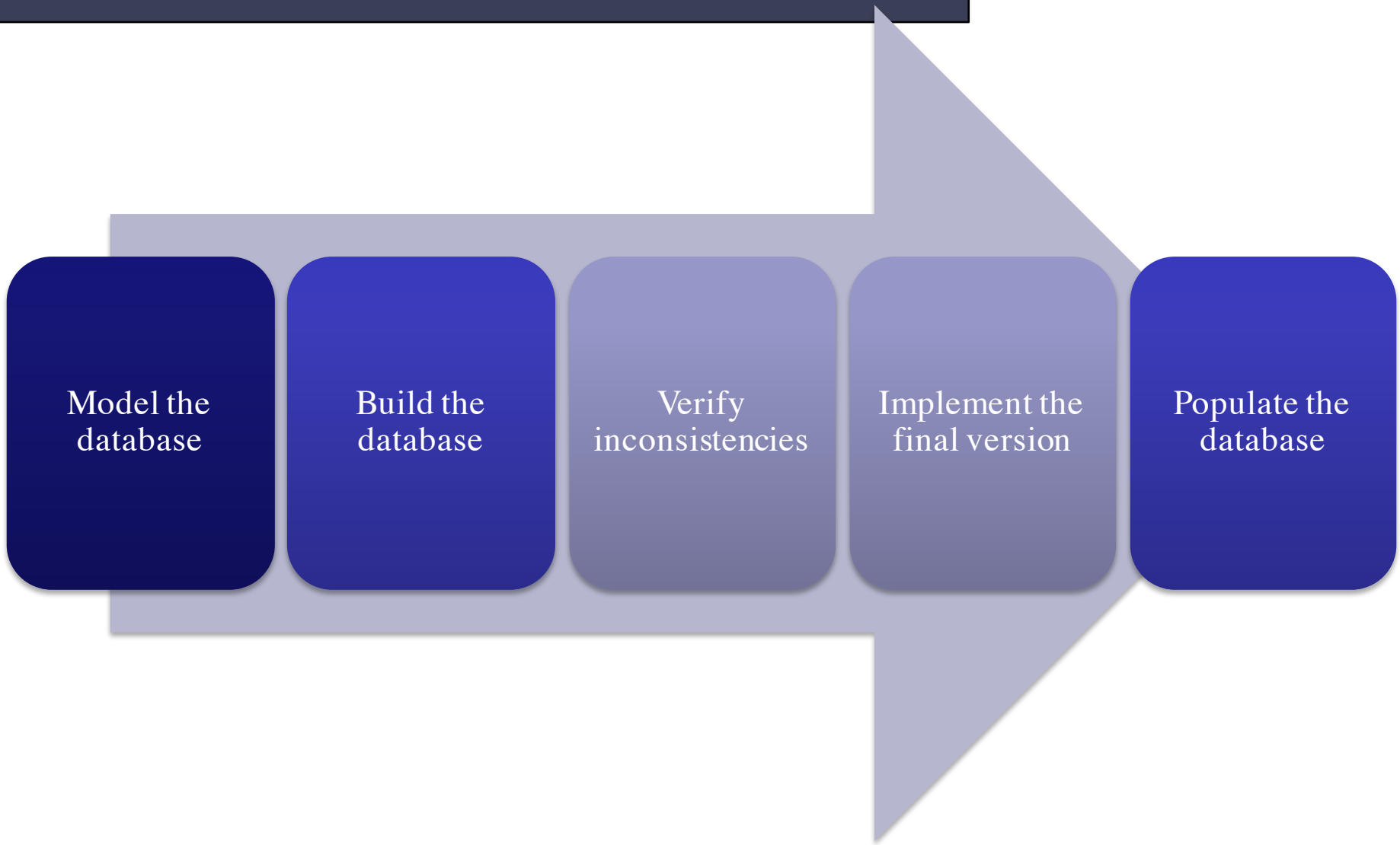
To create a database…



DATABASE LIFECYCLE

The database lifecycle is a complex process, usually composed by the following main phases:

1. Requirements collection and analysis
2. Conceptual database design
3. Choice of a Data Base Management System
4. Logical database design
5. Physical database design
6. Database implementation
7. Use & maintenance

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CONCEPTUAL DATABASE DESIGN

High level and abstract view of the reality

Independent from the DBMS that will be used

→

Entity-Relationship (E-R) Data Model

THE ENTITY-RELATIONSHIP (E-R) DATA MODEL

- Entity is an independent object or entity of the real world.
- Relationship is an association between more entities

- As well as each entity is the instance of an entity type, each relationshi is and instance (relationship instance) of a certain relationship type.

- **WARNING**:
- RELATIONSHIPs in the ER model are DIFFERENT from RELATIONs in the relational model

THE ENTITY-RELATIONSHIP (E-R) DATA MODEL

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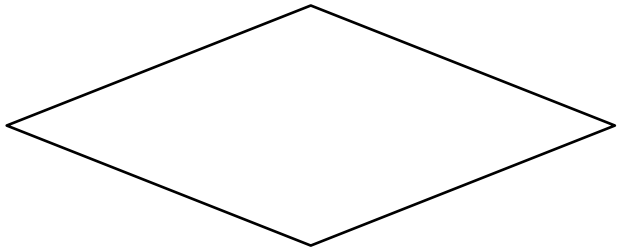
ENTITY

RELATIONSHIP



THE ENTITY-RELATIONSHIP (E-R) DATA MODEL

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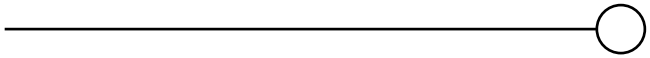
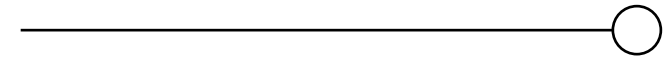
ATTRIBUTE

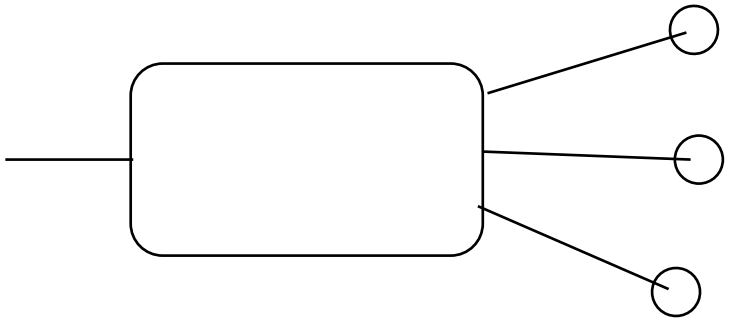


ATTRIBUTE WITH CARDINALITY

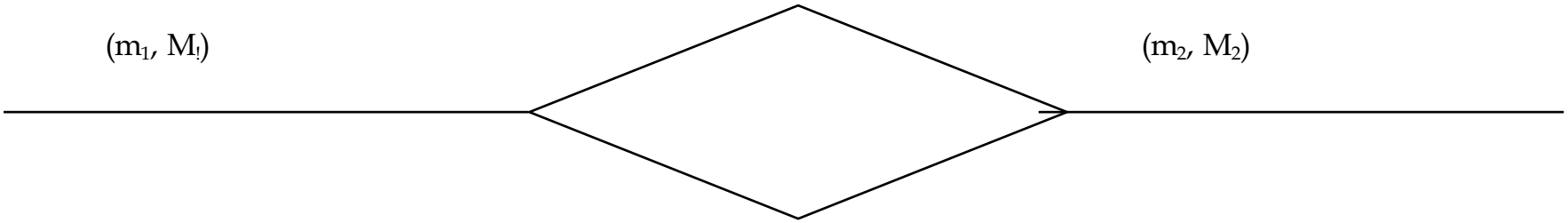
(m_A, M_A)



COMPOSITE ATTRIBUTE



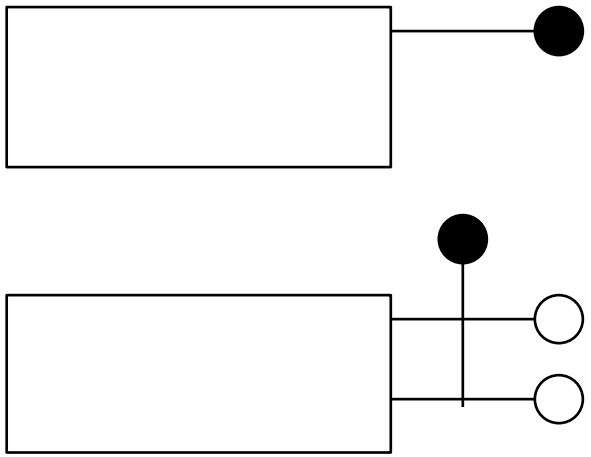
THE ENTITY-RELATIONSHIP (E-R) DATA MODEL



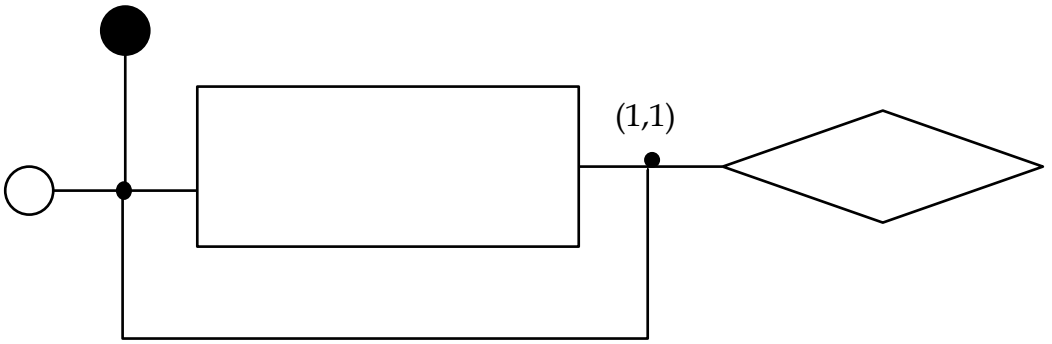
RELATIONSHIP CARDINALITY

THE ENTITY-RELATIONSHIP (E-R) DATA MODEL

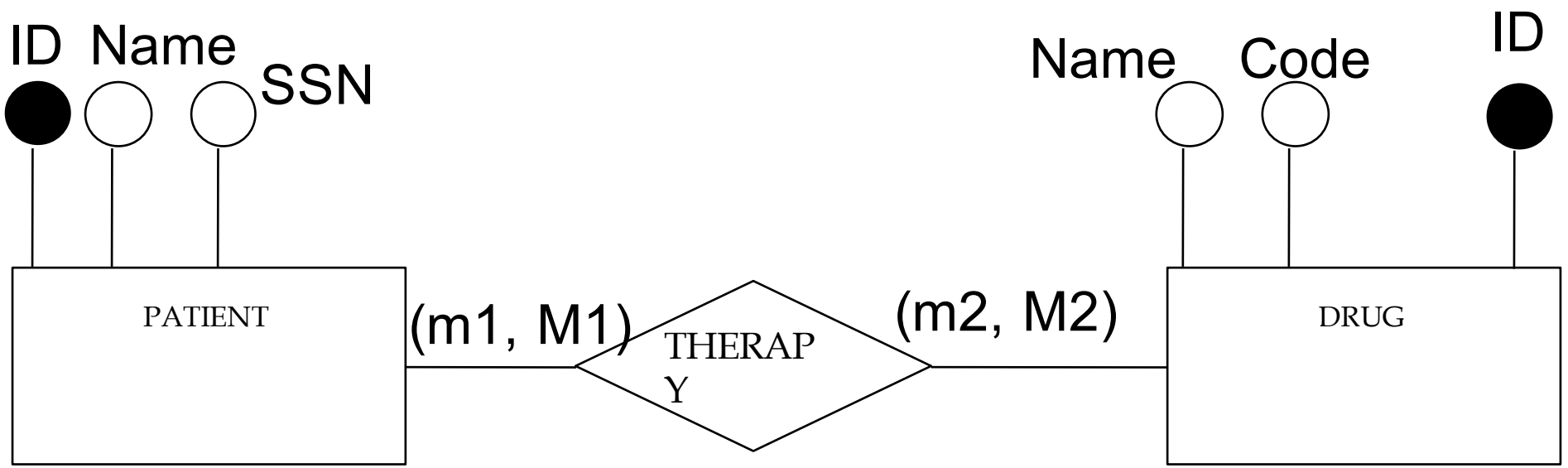
KEY ATTRIBUTES



WEAK ENTITY (with foreign key)



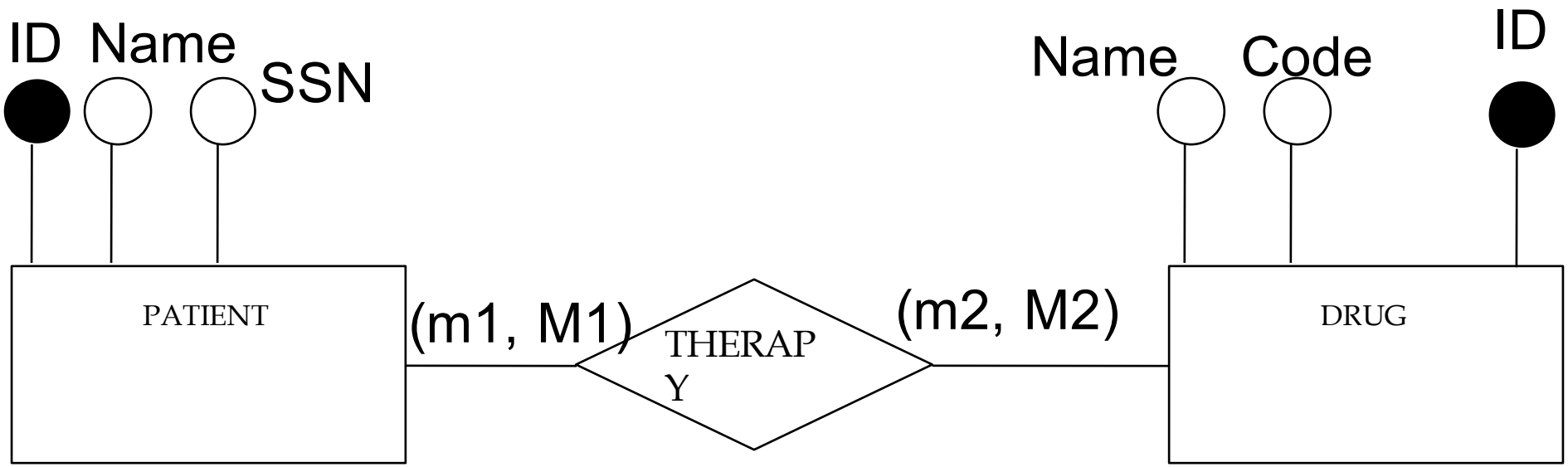
THE ENTITY-RELATIONSHIP (E-R) DATA MODEL



CARDINALITY

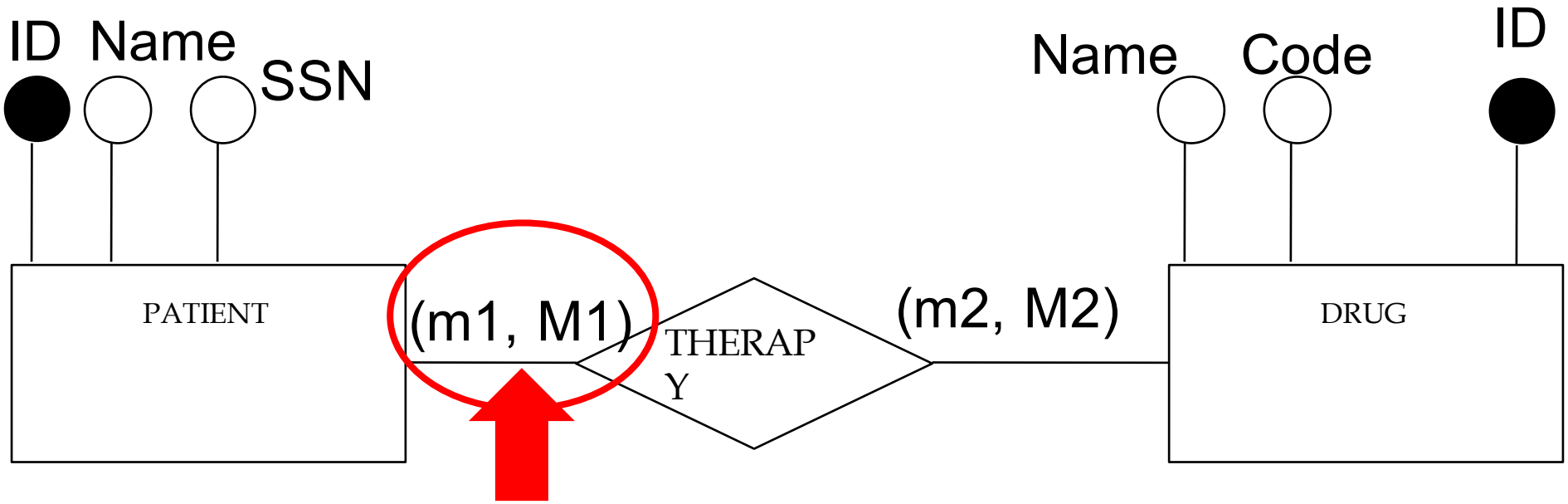
- Have to be specified for each entity participating in a relationship;
- They describe the minimum and maximum occurrencies of each entity in a relationship
- They define how many times each entity can be involved with other entities through the specified relationship

CARDINALITY



m1	M1	m2	M2	Cardinality
0	1	0	1	One-to-One
0	1	0	N	One-to-Many
0	N	0	N	Many-to-Many

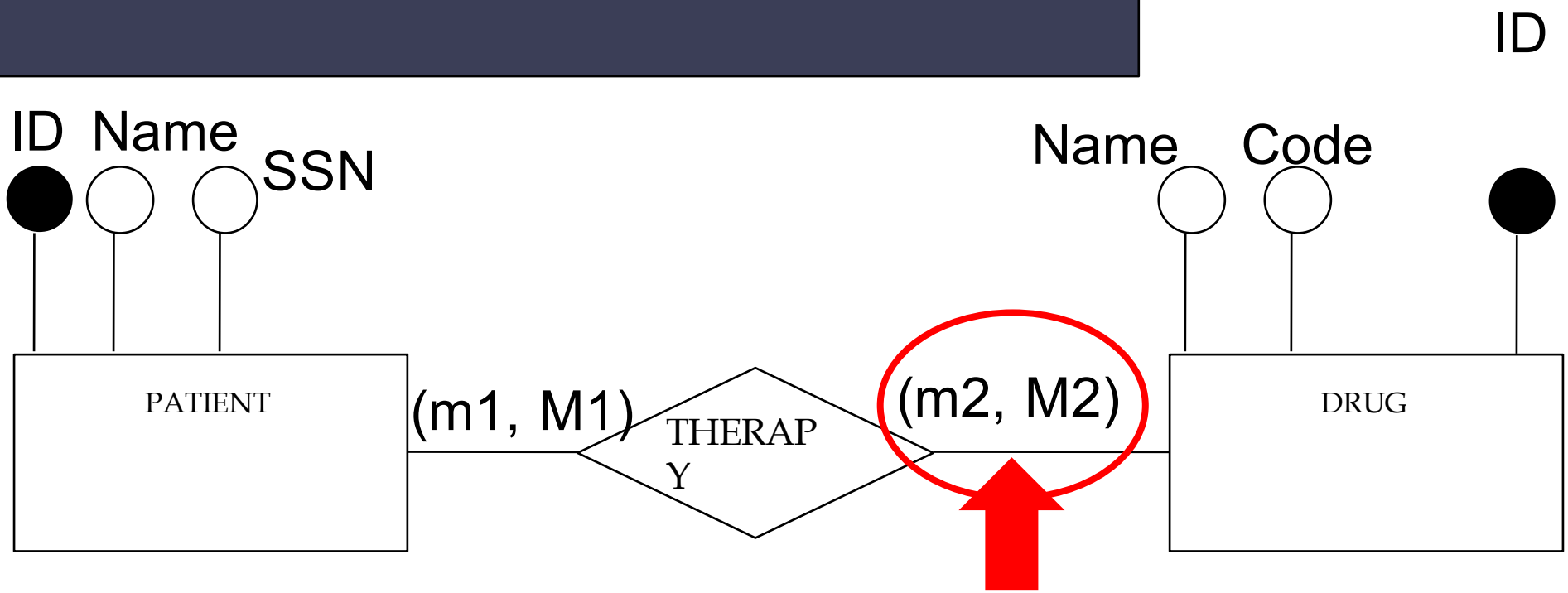
CARDINALITY



- If M1>m1>=0 → a patient has to (if m1>0) or can (if m1=0) participate to a minimum of m1 occurrences and a maximum of M1 occurrences of the THERAPY relationship.

- This implies that each patient has (or can have) at least m1 drugs assigned but no more than M1

CARDINALITY



- If M2>m2>=0 → a drug has to (if m2>0) or can (if m2=0) participate to a minimum of m2 occurrences and a maximum of M2 occurrences of the THERAPY relationship.

- This implies that each drug has to (or can be) assigned to at least m2 patients but no more than M2.

Entity-Relationship (E-R) Data Model: example

The entity-relationship diagram describing a centralized databank for neuronal bioelectrical signals recorded during stereotactic neurosurgery

Entity-Relationship (E-R) Data Model

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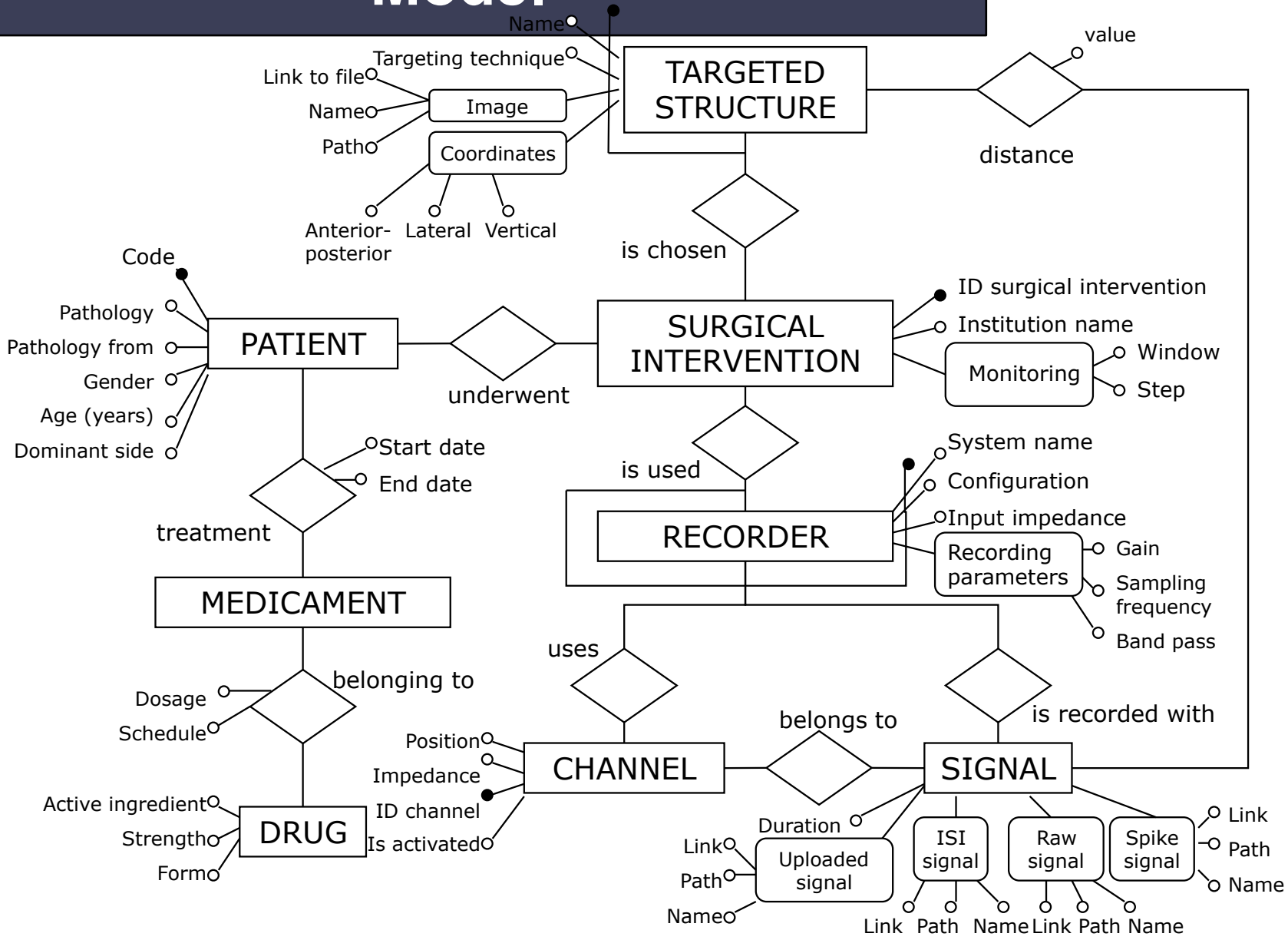

The NULL value: multiple meanings

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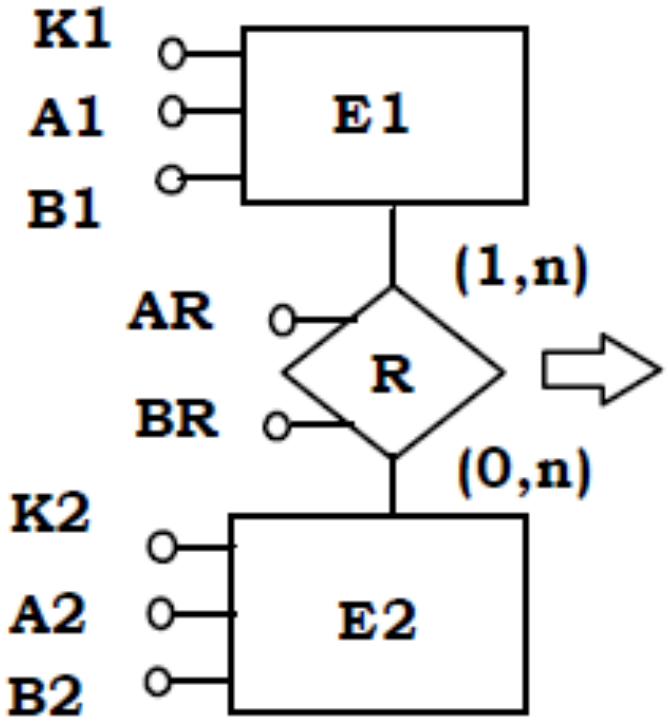
1. Not valid for the current instance (Husband surname for a male)
2. Valid but not yet existing (Husband surname for a non-martried woman)
3. Existing but it cannot be saved (patient's religion in some Countries cannot be stored to avoid discrimination)
4. Existing but unknown
5. Existing but not yet saved (patint's history noyt collected yet)
6. Stored and then deleted (erroneous information)
7. Available but in an updating phase (patient's therapy under modification)
8. Available but not reliable (a non final diagnosis)
9. Available but not valid (a blood parameter abovce the threshold of valid range)
10. Calculted from anothe NULL value (BMI if the weight is not present).

LOGICAL DATABASE DESIGN

- Translates the abstract representation of the conceptual model in specifications that can be implemented thorugh a DBMS
- The result is the logical schema.

1. Translation from the conceptual schema to the logical schema using the DBMS data model;
2. Adaptation of the logical schema to the characteristics of the specific DBMS
3. Logical schema optimization → Normalization

STANDARD TRANSLATION



E1 (<u>K1</u>, A1, B1,...)

E2 (<u>K2</u>, A2, B2,...)

R (<u>K1,K2</u>, AR, BR,...)