The Design & Implementation of a Personal Health Management (PHM) Database Application with Constraints and functional dependencies

1. Names and unity ids of team members:

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2. List of Entity and Relationship Types and their constraints

For constraints we have followed convention to underline the primary keys and dotted-underline for foreign keys.

- Entities:

Patient will have ISA to Well and Sick.

Person: (SSN, Name, Address, Dofbirth, Gender, Status)
Functional Dependency: SSN -> Name, Address, Dofbirth, Gender
Primary key : SSN
Not null: SSN,Name,Address,Dofbirth

Sick: (SSN, NoOfDisease, ExcerciseFrequency)
Functional Dependency: SSN -> NoOfDisease
Primary key : SSN (derived from strong entity)
Not null: NoOfDisease

Well: (SSN, ExcerciseFrequency)
Functional Dependency: SSN -> ExcerciseFrequency
Primary key : SSN (derived from strong entity)

Doctor: (DoctorID, dname)
Functional Dependency: DoctorID -> dname
Not null: DoctorID, dname

Health Supporter (SSN, H_SSN, Hname, h_special) ……*(weak entity)*
Functional Dependency: SSN -> H_SSN, H_SSN -> Hname, h_special
Primary key: H_SSN (foreign key from Person entity)
Foreign key : SSN (of patient Well/ Sick)
Not null : H_SSN,hname

--Health supporter will be dependent on Well/Sick patient and here H_SSN is foreign key from SSN of Person entity and Hname is name of health supporter and h_special will be attribute of specialization of particular HS e.g. Physiologist, Ophthalmologist, General etc. Type will record primary/Secondary Health supporter roles.

Health Observations (SSN, ObsID, Height, Weight, BP, recoFrequency) ……*(weak entity)*

Functional Dependency: SSN -> ObsID, ObsID -> Height, Weight, BP, recoFrequency

Primary key : SSN,ObsID

Foreign key: SSN

Not null: SSN, ObsID, Height, Weight, BP, recoFrequency

--Health Observation will be dependent on Well/Sick and ObsID will be locally unique identifier for each observation. Health Observation can be general or disease specific so we have ISA to following diseases.

Sub entities of Health Observations:

HIV: (SSN, ObsID, HIVtype, Temperature)

Functional Dependency: SSN -> ObsID, ObsID -> HIVtype, Temperature

Key : SSN,ObsID

Cancer: (SSN, ObsID, stage, ctype, NoOfTumours)

Functional Dependency: SSN -> ObsID, ObsID -> stage, ctype, NoOfTumours

Key : SSN,ObsID

COPD: (SSN, ObsID, …) *…disease specific*

TB: (..) *…disease specific*

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- Relationships:

BINARY relations ->

AssociatedWithW: (SSN, DOA, type, H_SSN, Hname) *….relation between Well and Health supporter*

Functional Dependency: SSN,H_SSN -> DOA, type, Hname.

Key : SSN.H_SSN

AssociatedWithS: (SSN, DOA, type, H_SSN, Hname) *….relation between Sick and Health supporter*

Functional Dependency: SSN,H_SSN -> DOA, type, Hname.

Key : SSN.H_SSN

WRecords: (SSN, WDate, ObsID, Height, Weight, BP) ….*relation between Well and Health Observations*
Functional Dependency: SSN, ObsID -> WDate, Height, Weight, BP
Key : SSN.H_SSN

SRecords: (SSN, SDate, ObsID, Height, Weight, BP) ….*relation between Sick and Health Observations*
Functional Dependency: SSN, ObsID -> WDate, Height, Weight, BP
Key : SSN.H_SSN

TERNARY Relations ->

There will recommends relation for every disease, Doctor and Health Supporter entities.

Recommends for HIV: (DoctorID, dname, H_SSN, Hname, Date of Reco, comment, SSN, ObsID ,HIVtype, temperature,frequency)

Functional Dependency: SSN->H_SSN, ObsID -> dname, Hname, Date of Reco, comment, HIVtype, temperature,frequency
Key: DoctorID,H_SSN,SSN,ObsID

Recommends for Cancer: (DoctorID, dname, H_SSN, Hname, Date of Reco, comment, SSN, ObsID, stage, ctype, NoOfTumours)

Functional Dependency: SSN->H_SSN, ObsID -> dname, Hname, Date of Reco, comment, stage, ctype, NoOfTumours,frequency
Key: DoctorID,H_SSN,SSN,ObsID

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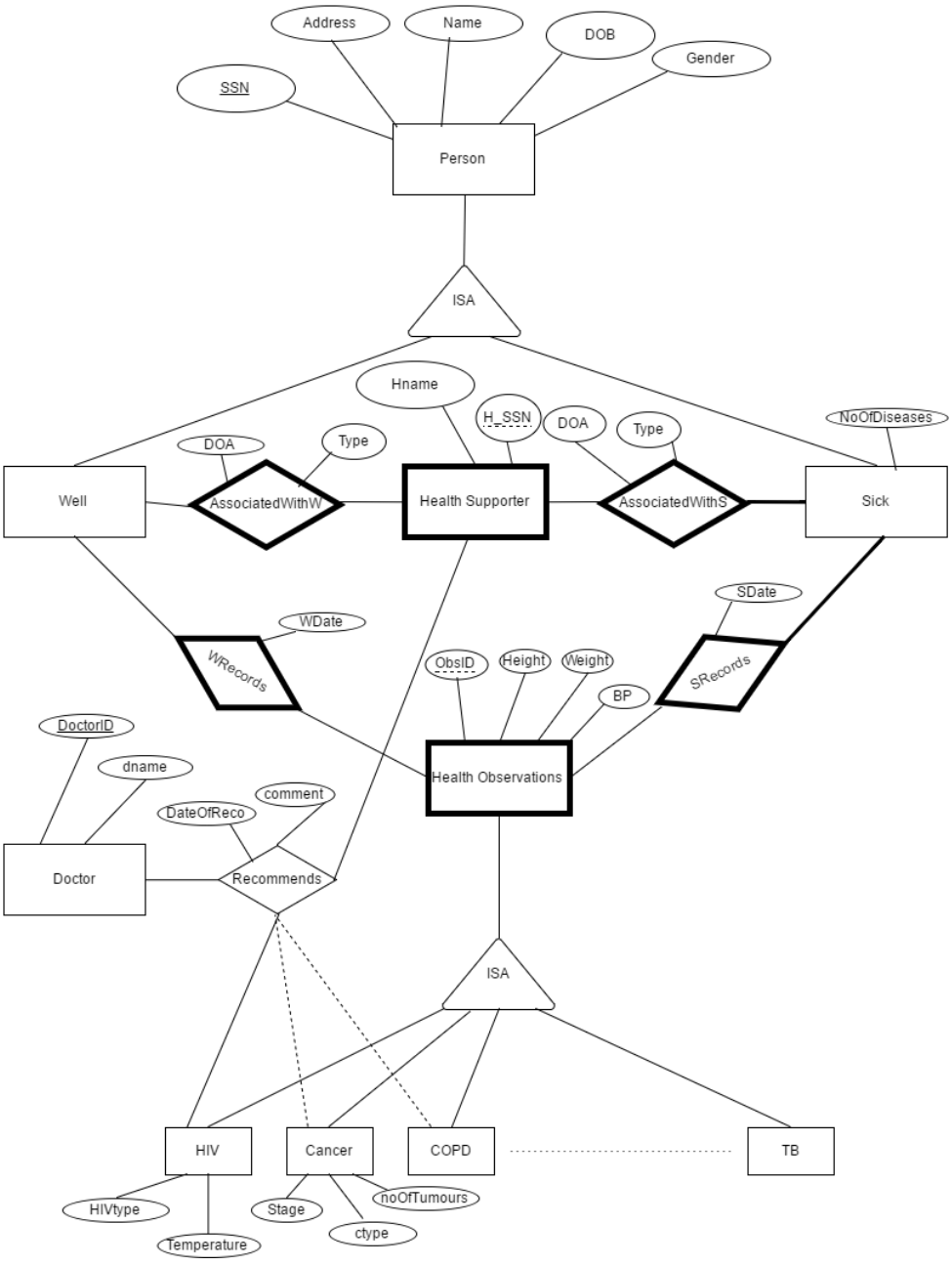
For every disease.

3. Other Application constraints:
   Person will hav SSN and health supporter will have H_SSN and this H_SSN will be derived from SSN of Person. So that all Well, Sick and health supporters are ultimately part of or derived from Person entity so as to avoid duplicity and redundancy. We have considered Doctor entity which is responsible for maintaining Recommends table for each disease and related patient SSN and ObsID so that Doctor will have access to all patient observation and can recommend frequency of observations or specific comments or range of observations accordingly.

- **ER Diagram :**


Address
Name
DOB
Gender
SSN
Person
ISA
Hname
H_SSN
DOA
Type
NoOfDiseases
DOA
Type
Well
AssociatedWithW
Health Supporter
AssociatedWithS
Sick
SDate
WDate
WRecords
ObsID
Height
Weight
BP
SRecords
DoctorID
dname
comment
DateOfReco
Health Observations
Doctor
Recommends
ISA
HIV
Cancer
COPD
TB
HIVtype
Temperature
Stage
noOfTumours
ctype