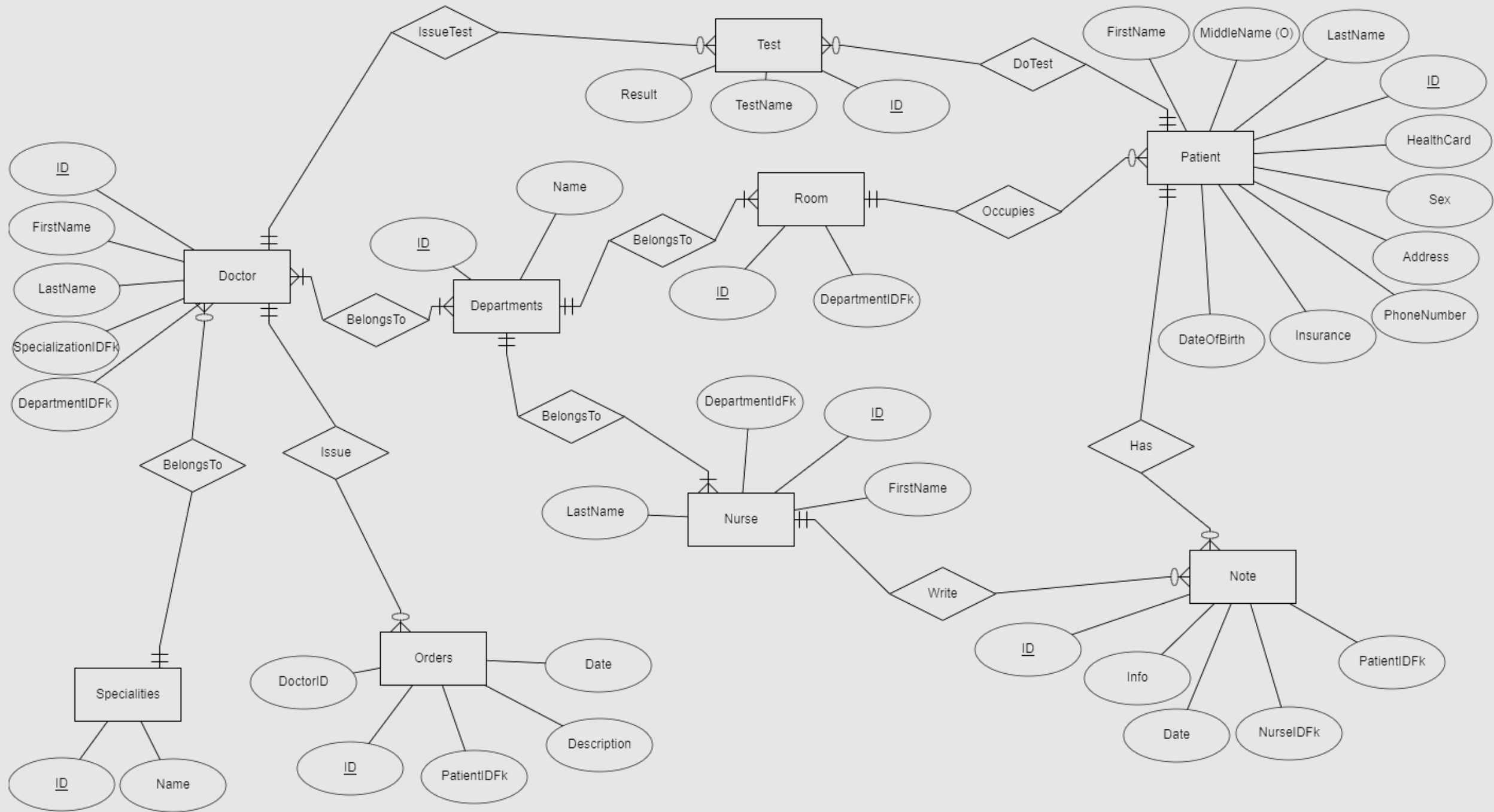
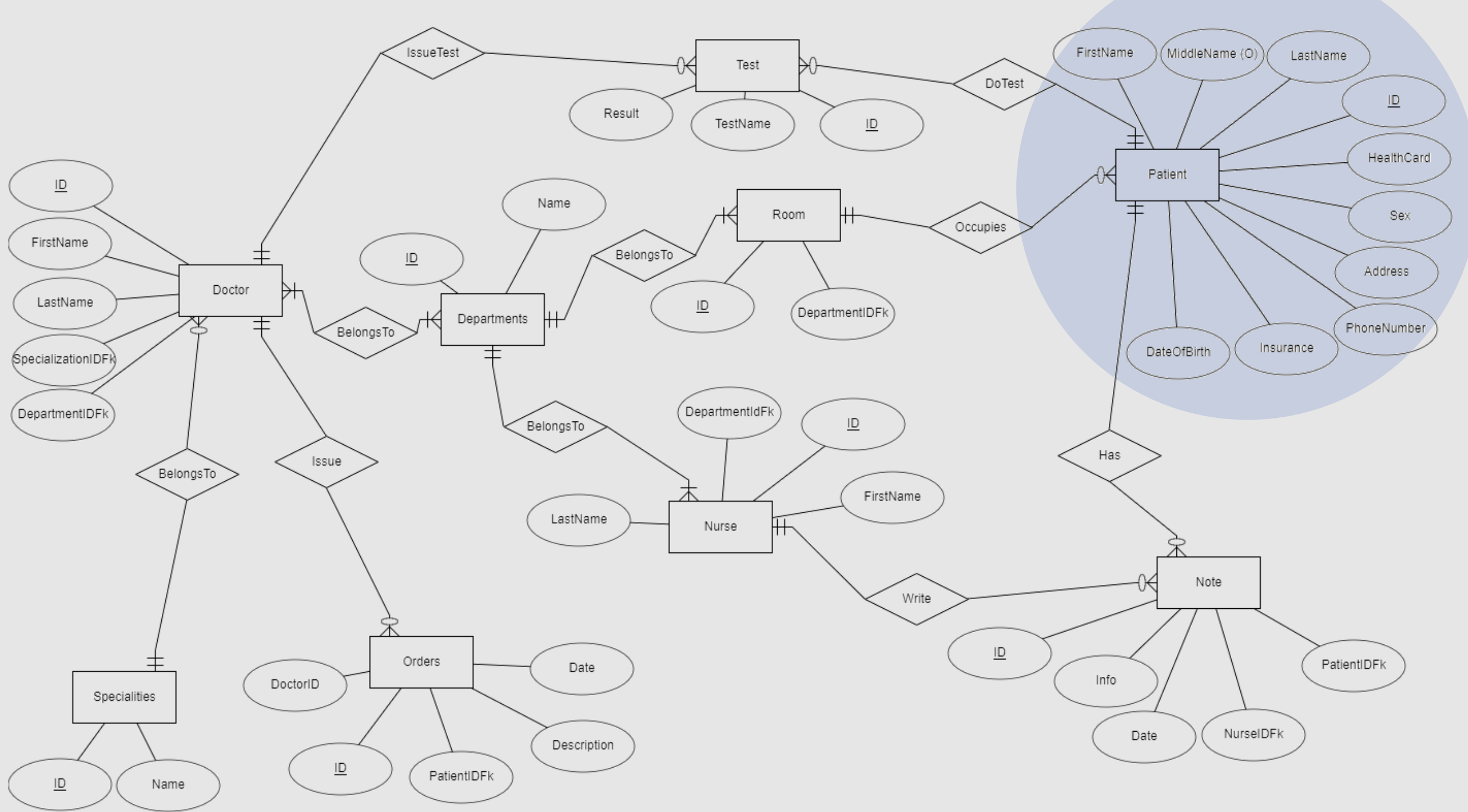


E/R 2 Relational × Workshop × Hospital 1

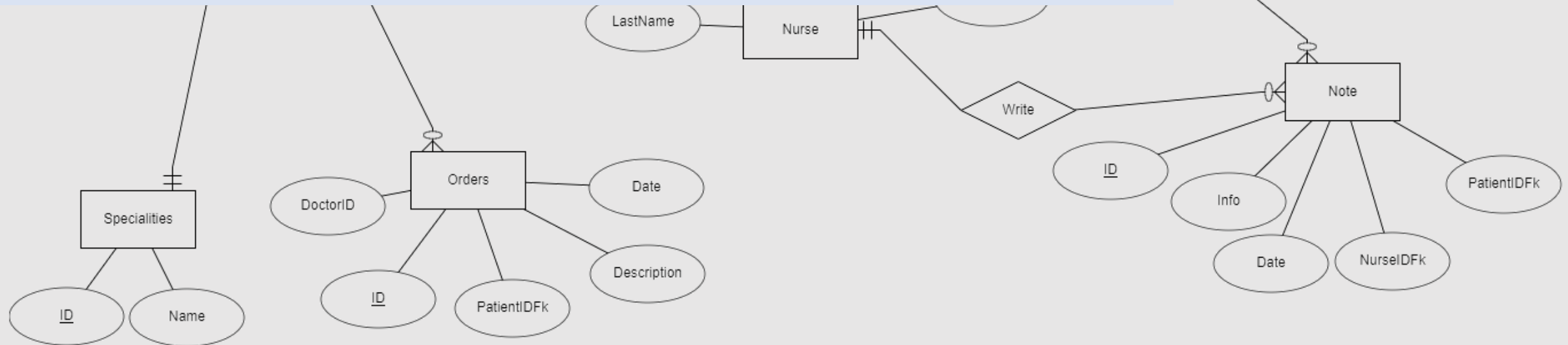




The designer models Address, PhoneNumber, and DateOfBirth as atomic attributes vs. composite.

The reason might be the fact that the subparts, e.g., AreaCode in PhoneNumber, is not essential for this system.

If needed, the designer extract the subparts at application level (programming level)



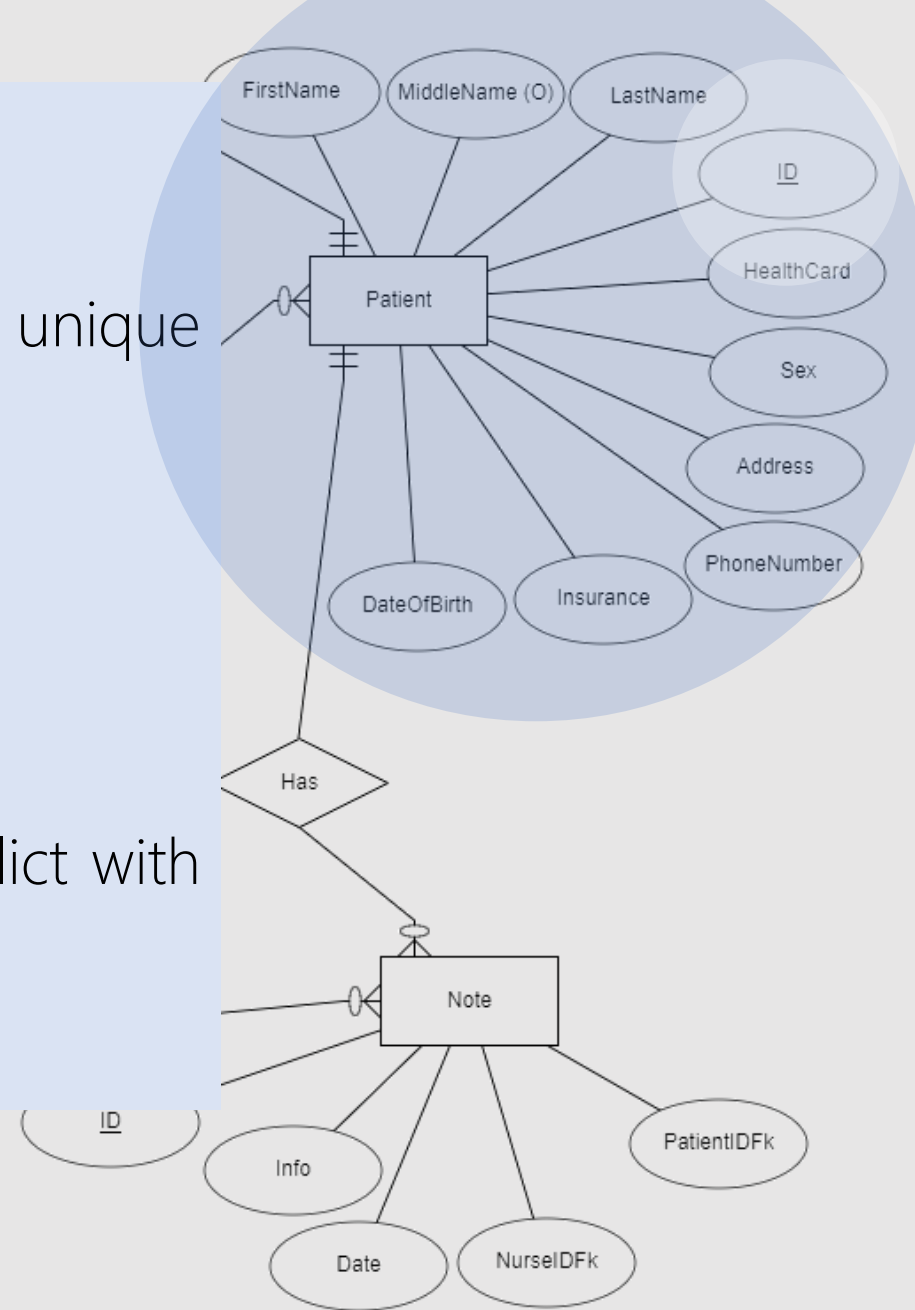
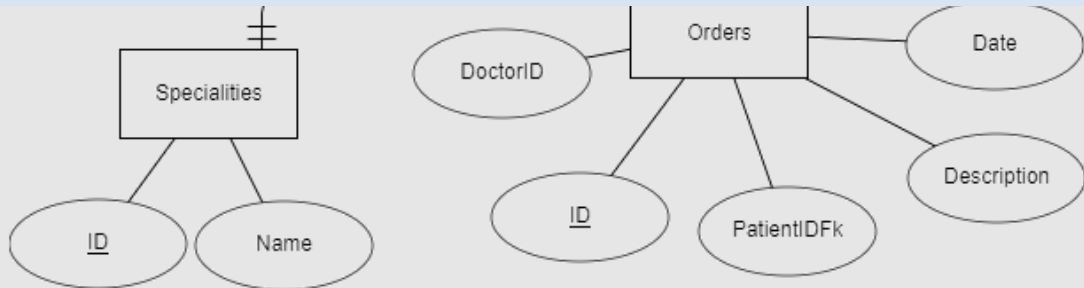
This is NOT a surrogate key.

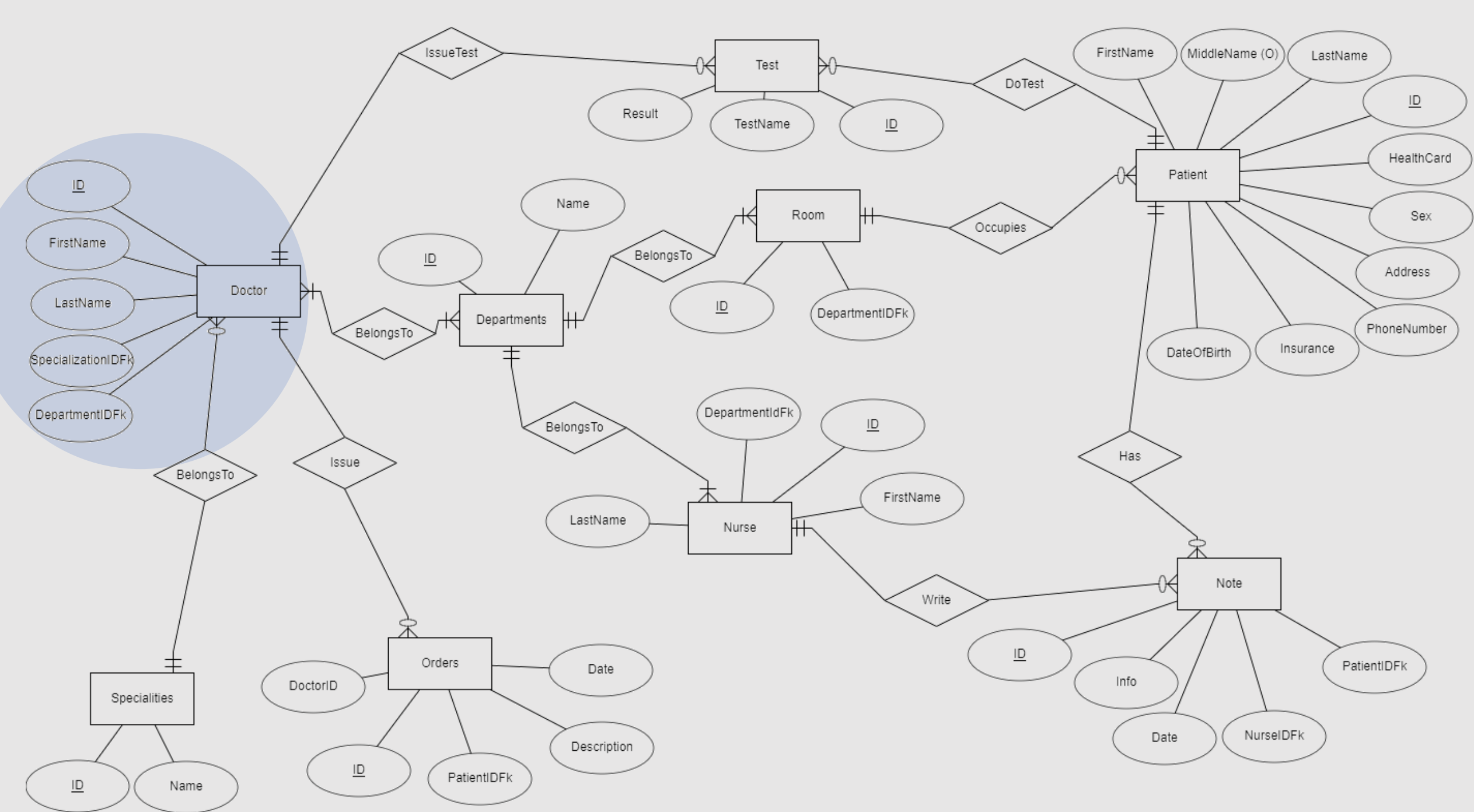
In real world, i.e., in a hospital, a patient is identified by a unique number.

Our system does not generate it!

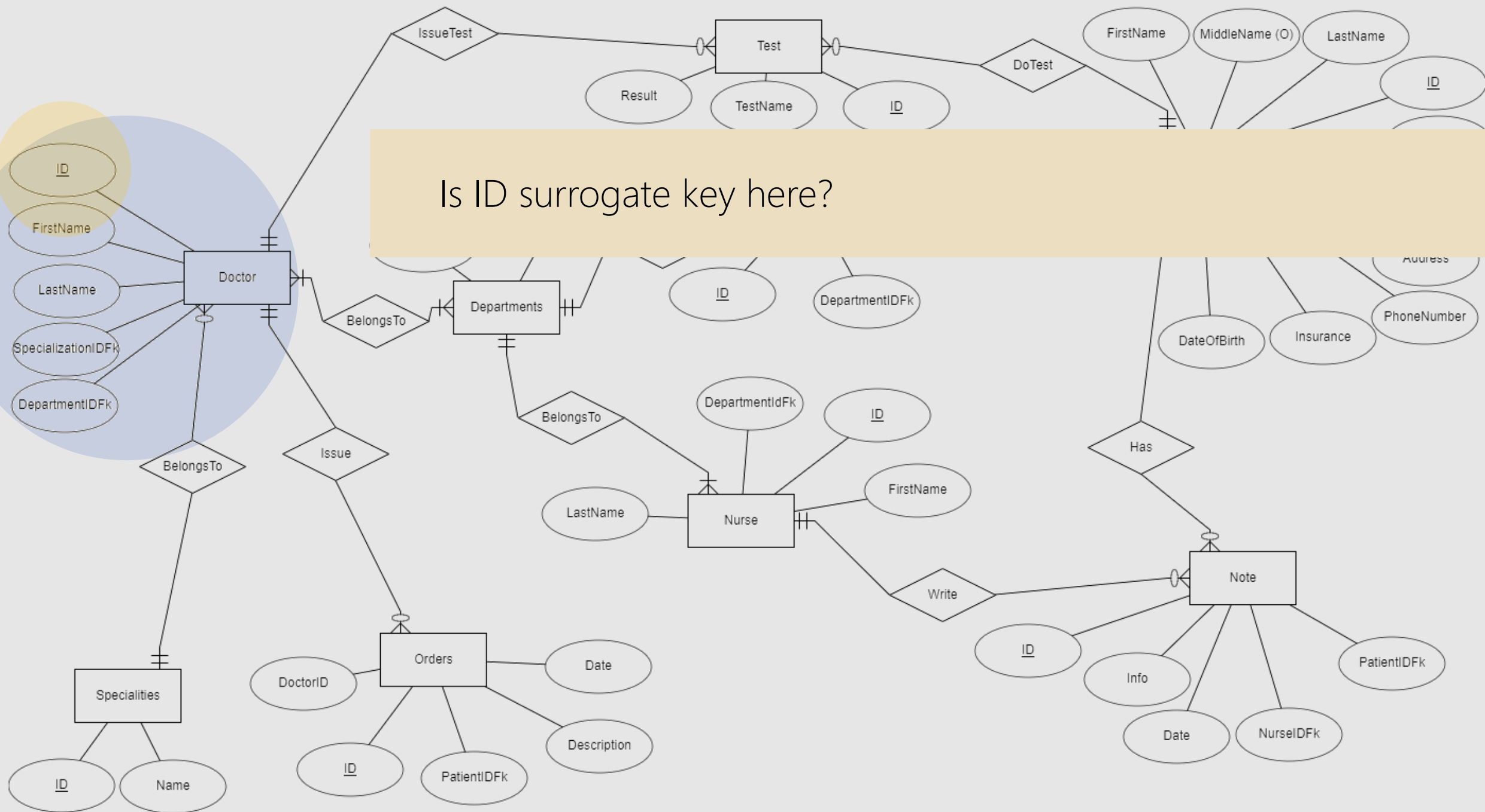
It is already assigned to a patient in a hospital.

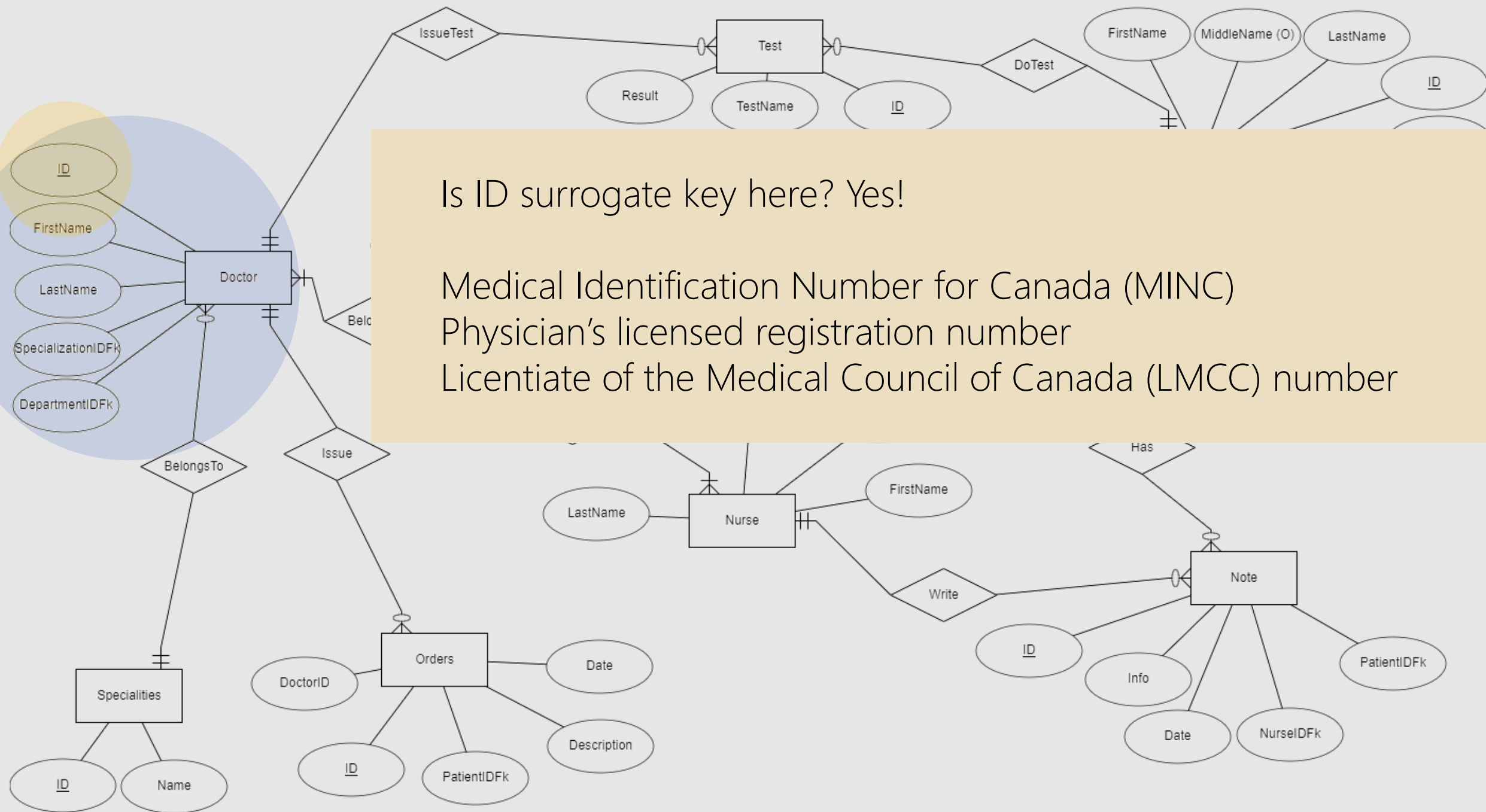
Let's rename it to Number in order to avoid name conflict with Id when creating surrogate key in our system.





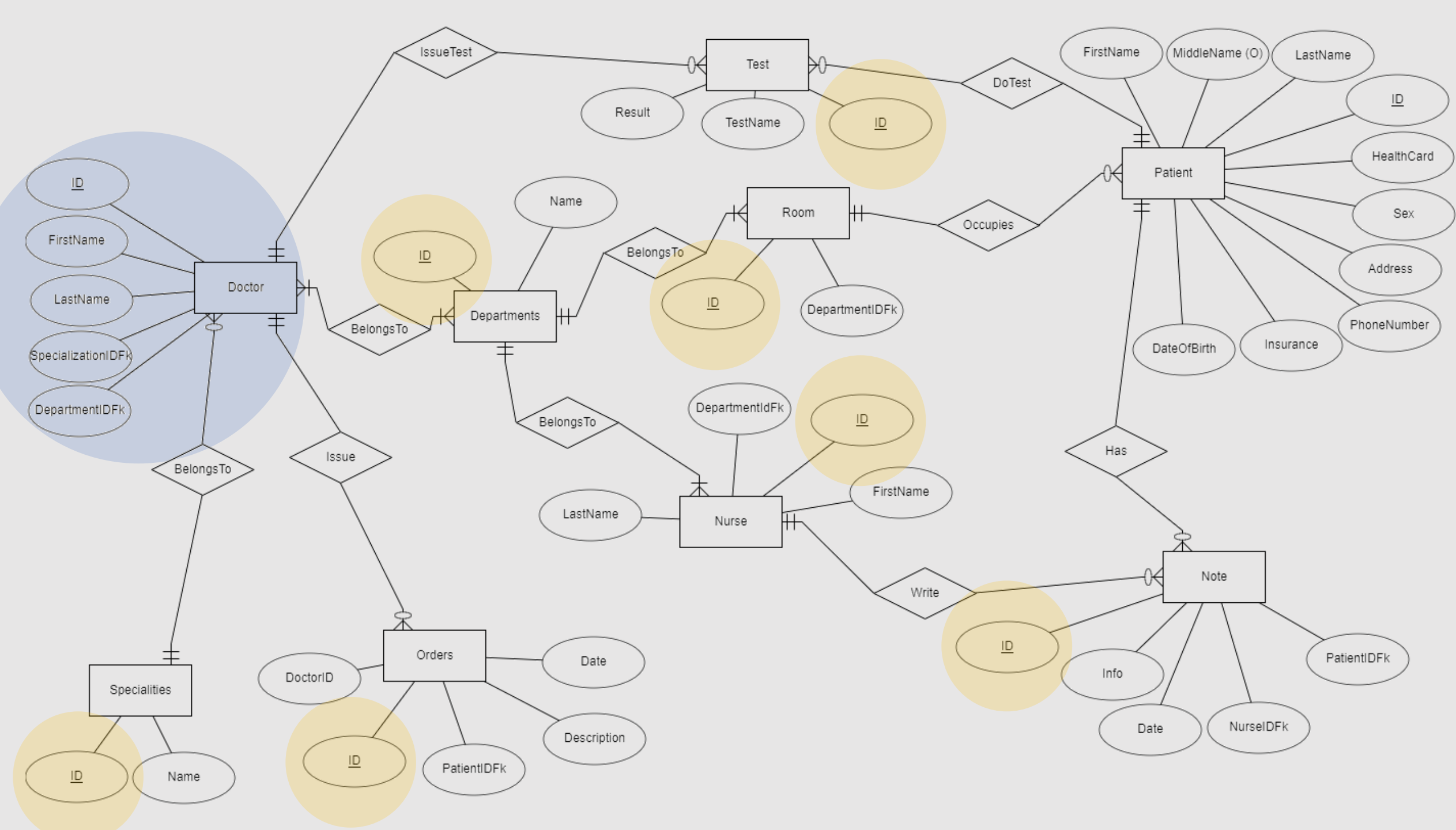
Is ID surrogate key here?

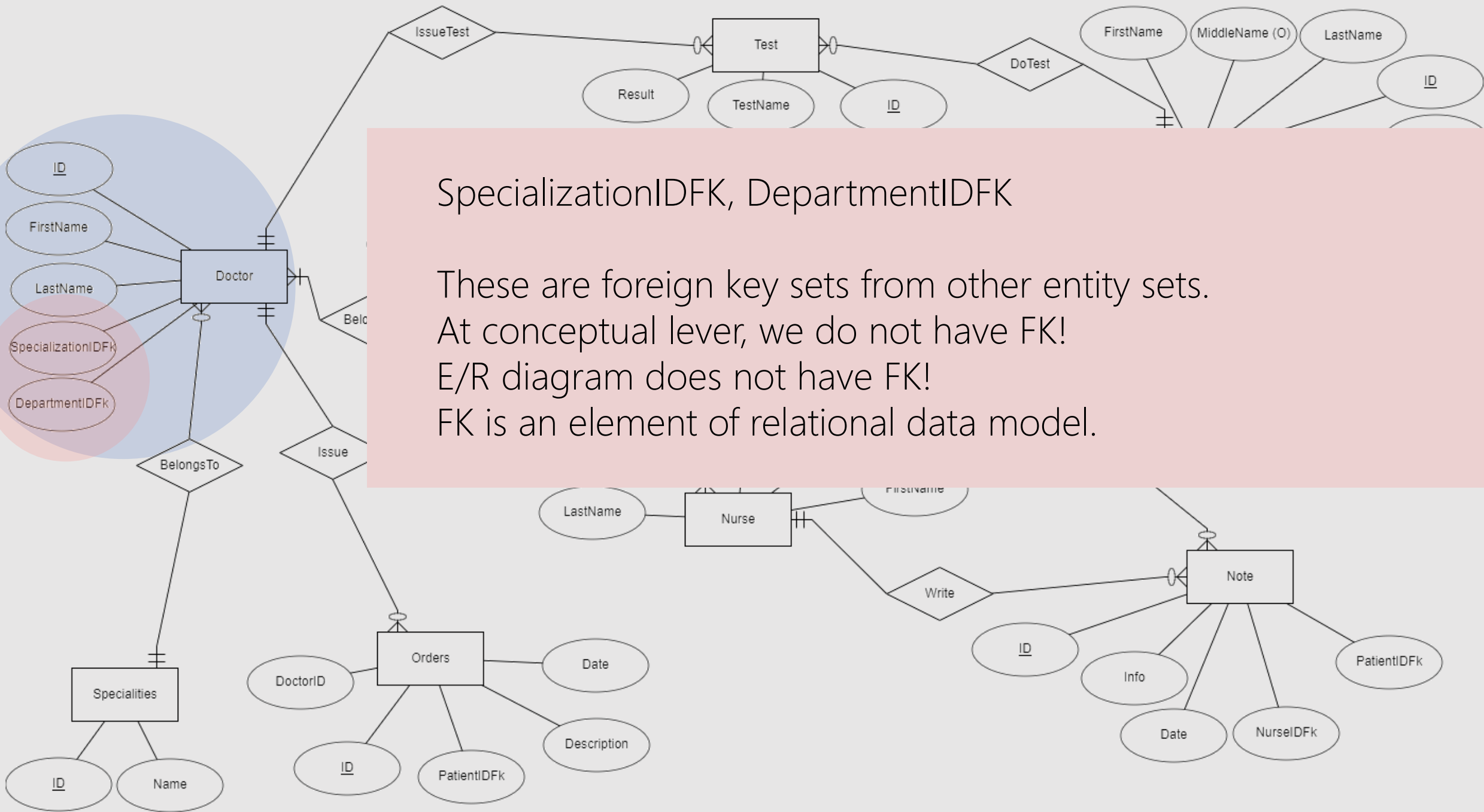




Is ID surrogate key here? Yes!

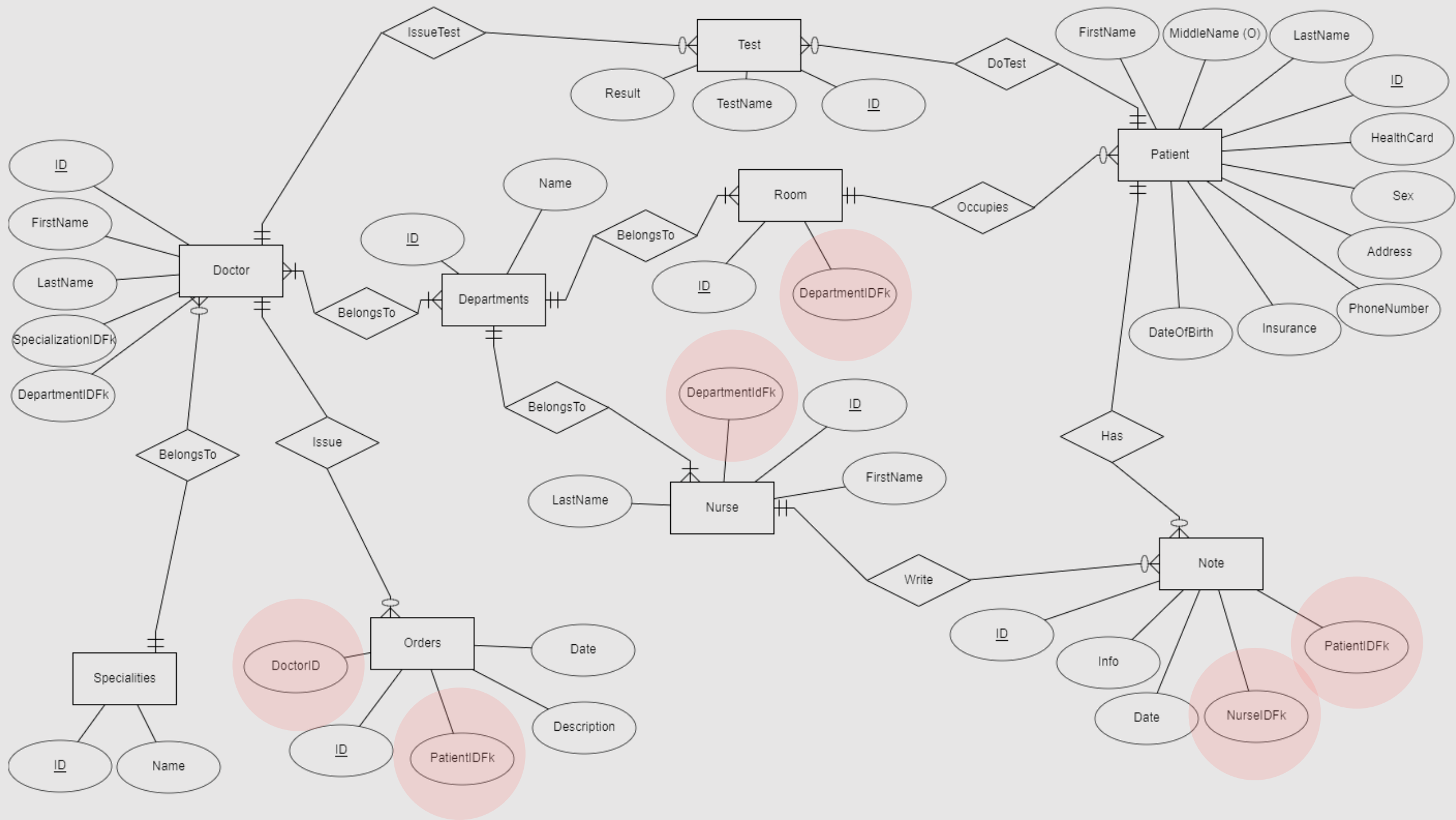
Medical Identification Number for Canada (MINC)
Physician's licensed registration number
Licentiate of the Medical Council of Canada (LMCC) number

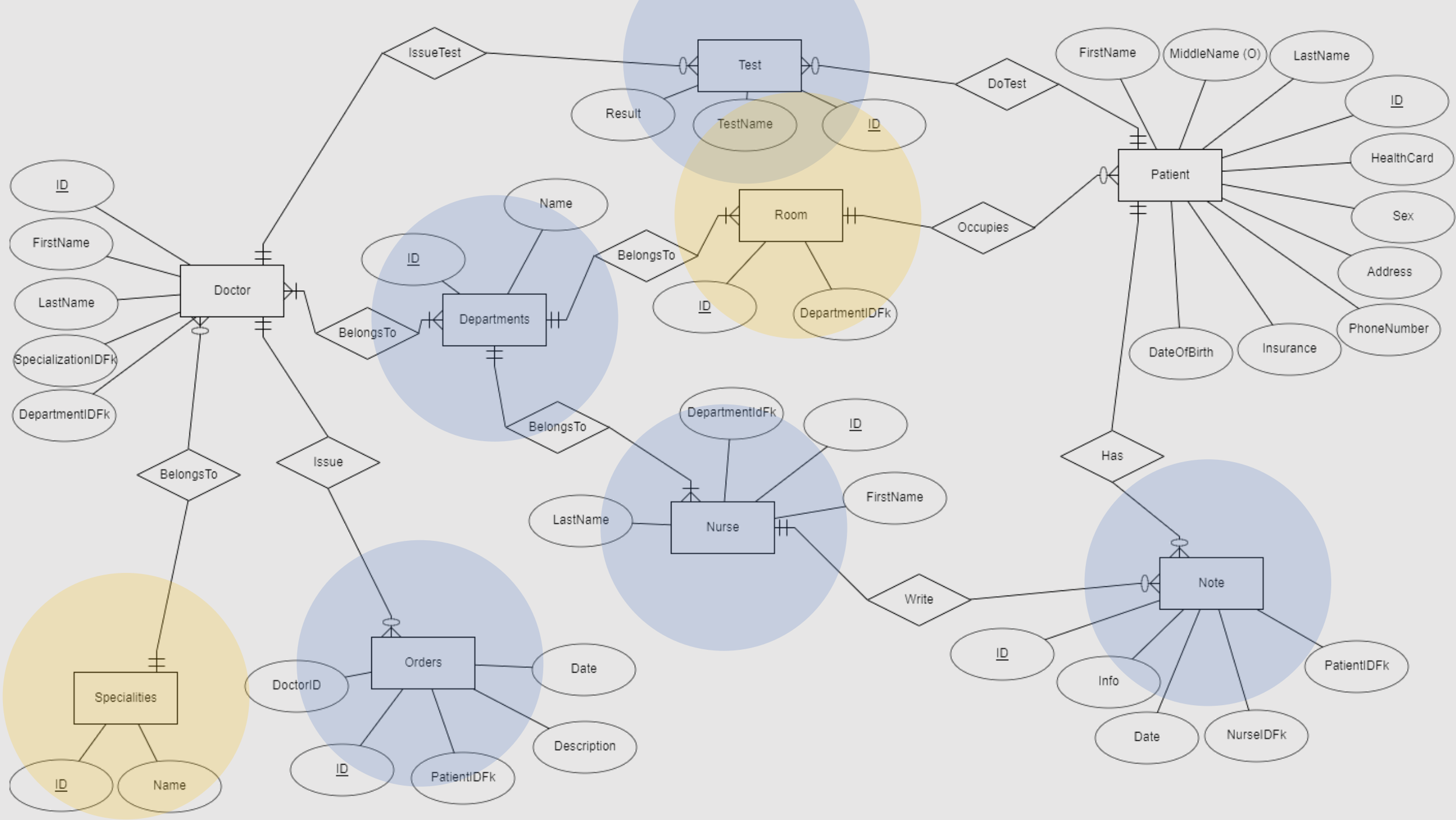


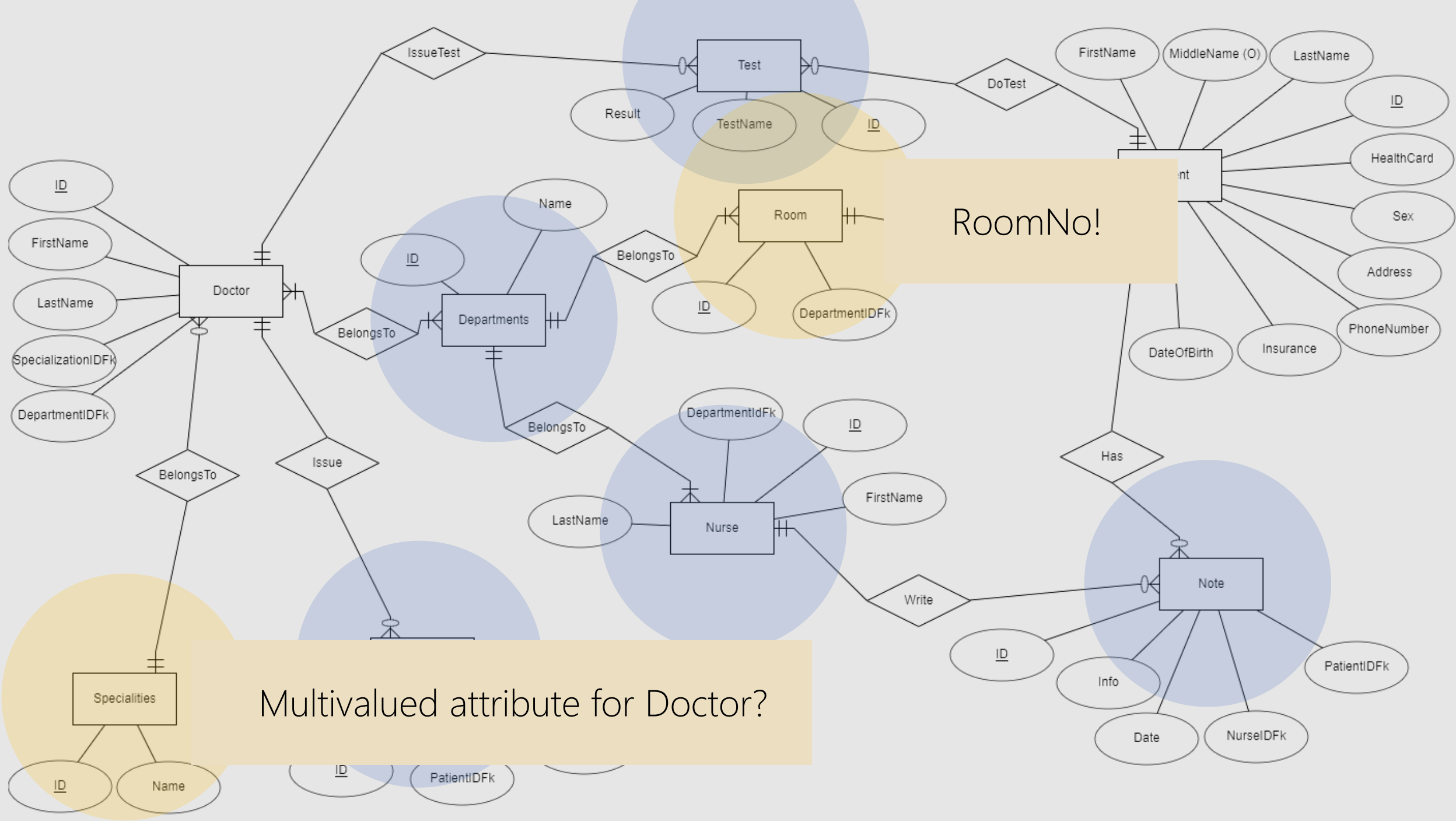


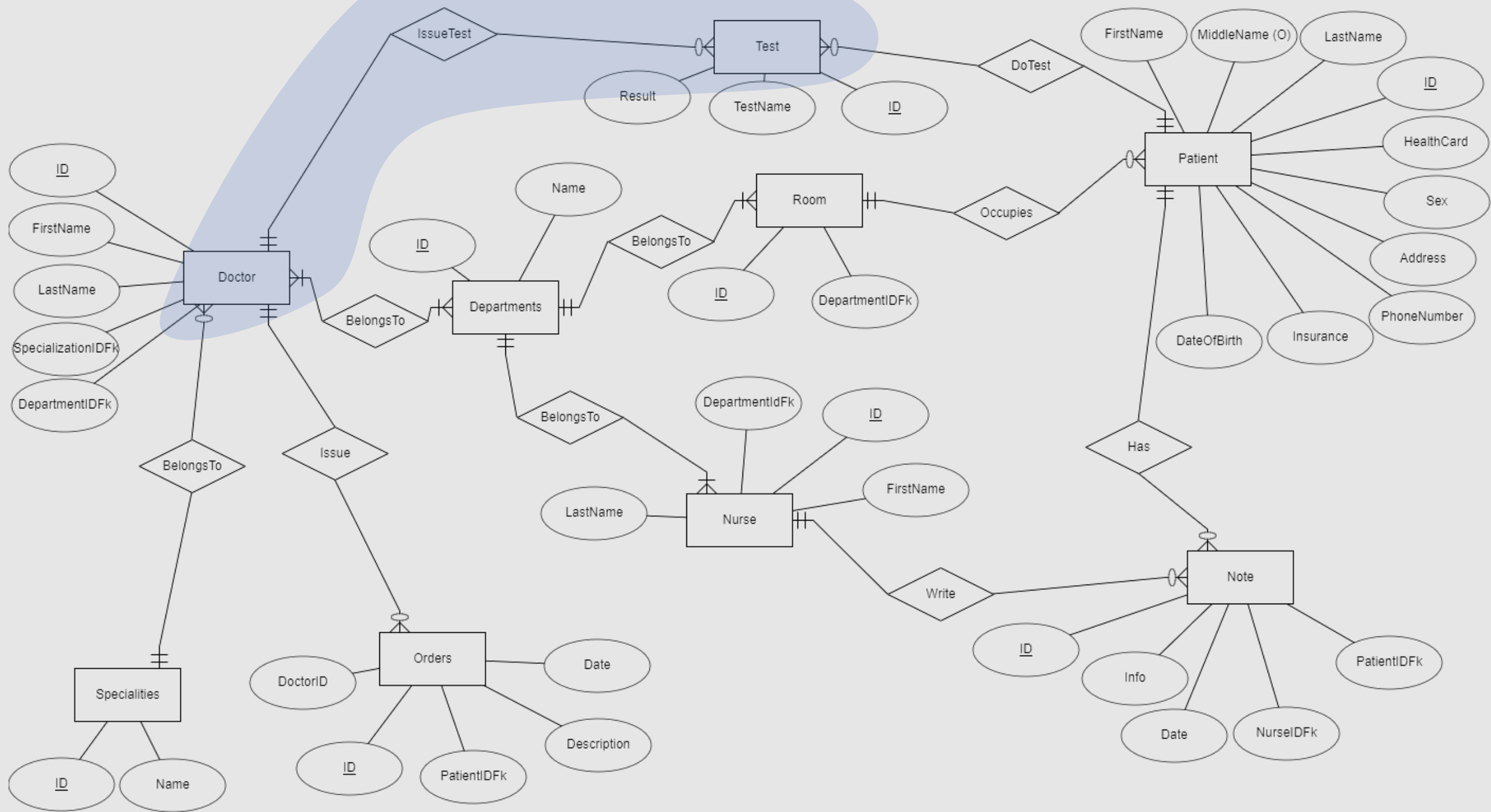
SpecializationIDFK, DepartmentIDFK

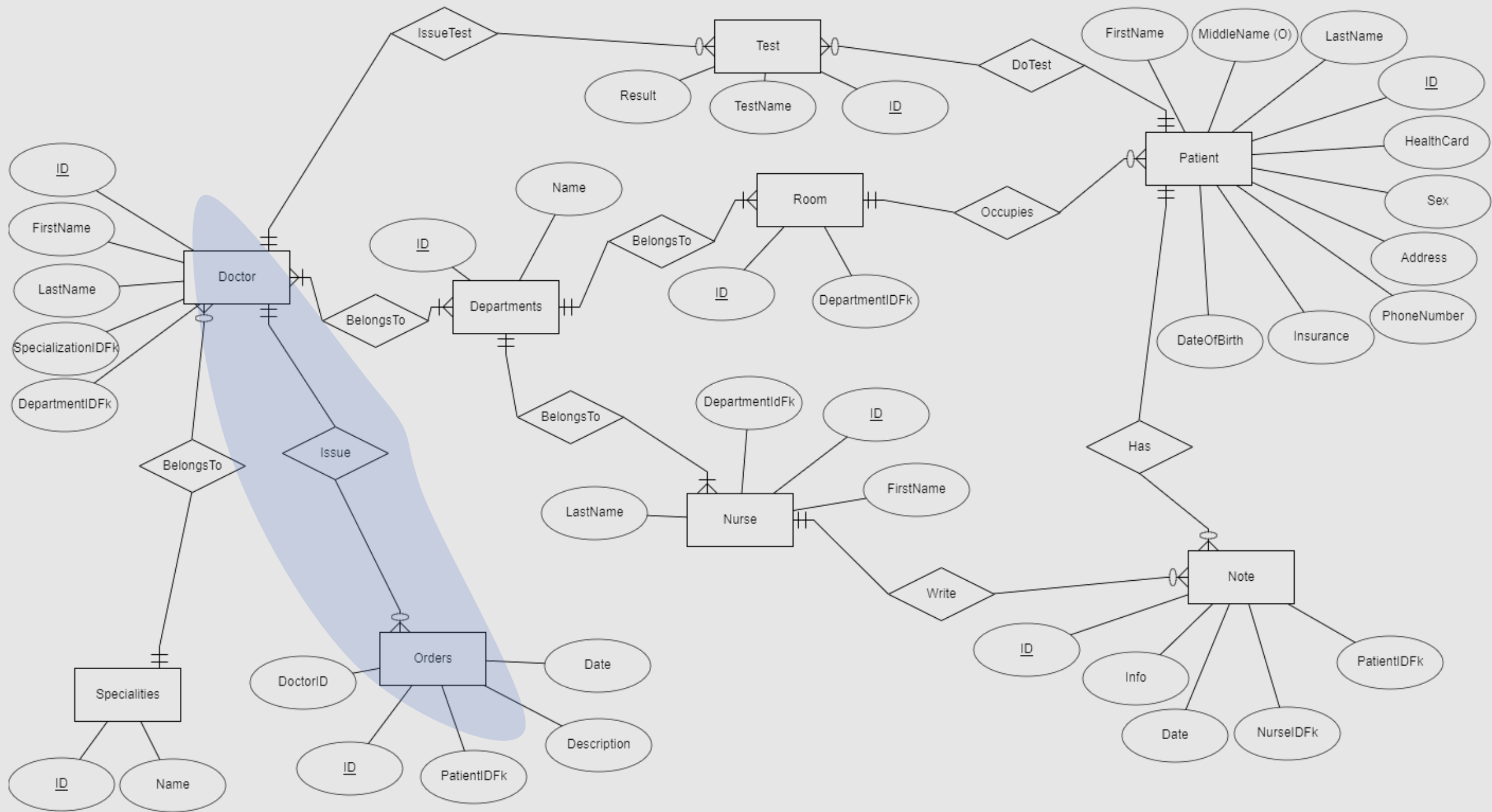
These are foreign key sets from other entity sets.
At conceptual lever, we do not have FK!
E/R diagram does not have FK!
FK is an element of relational data model.

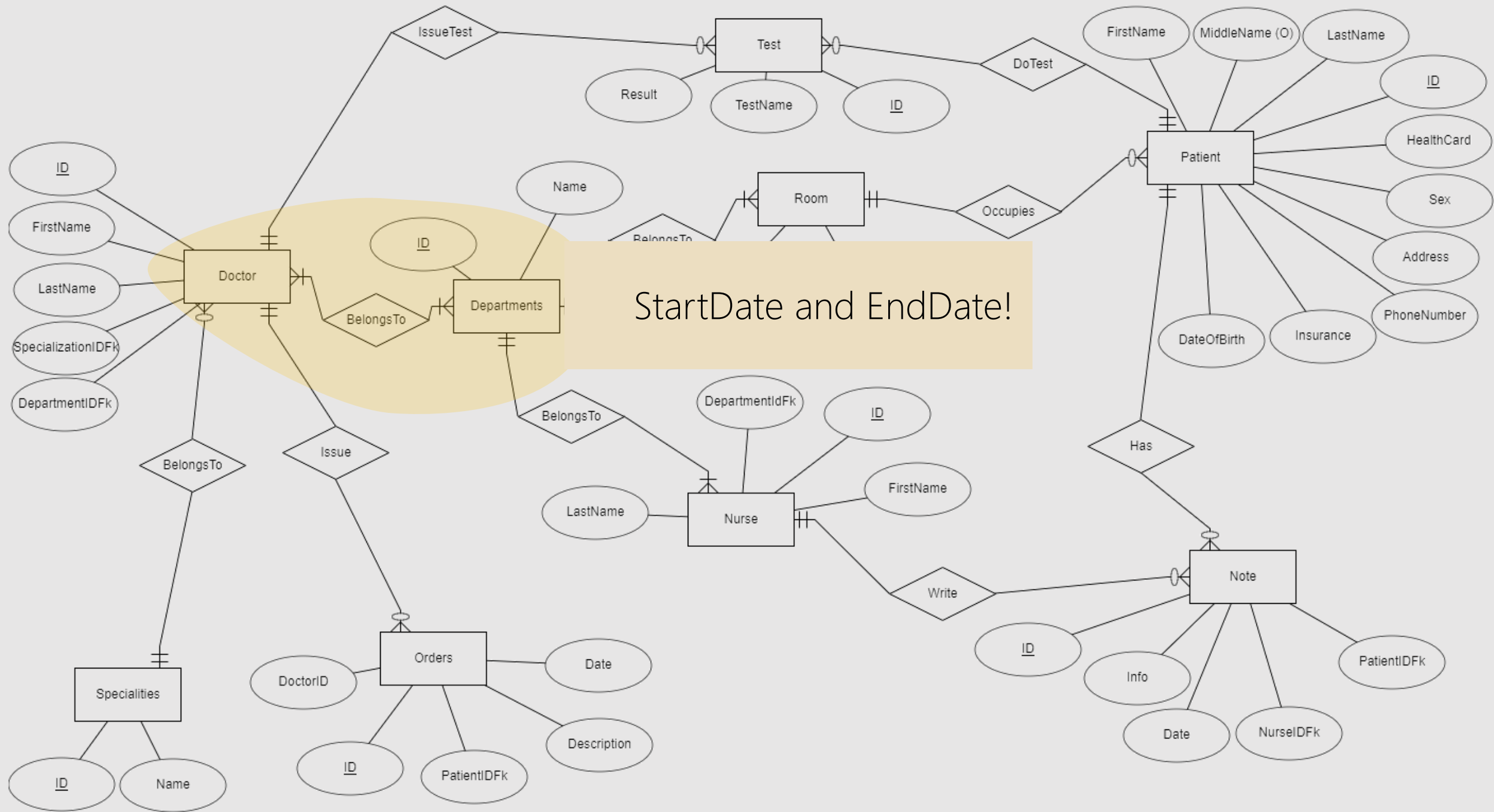


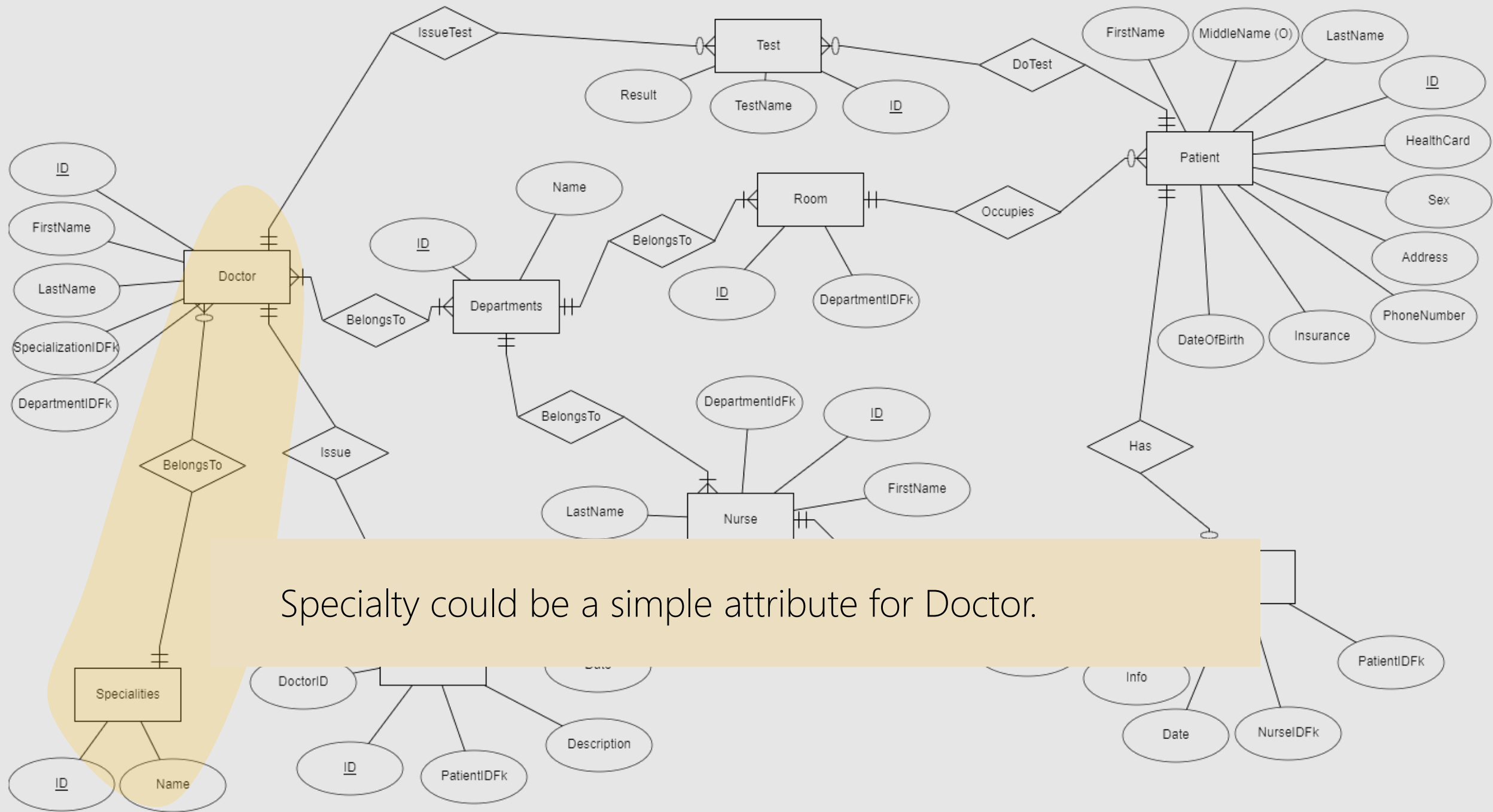


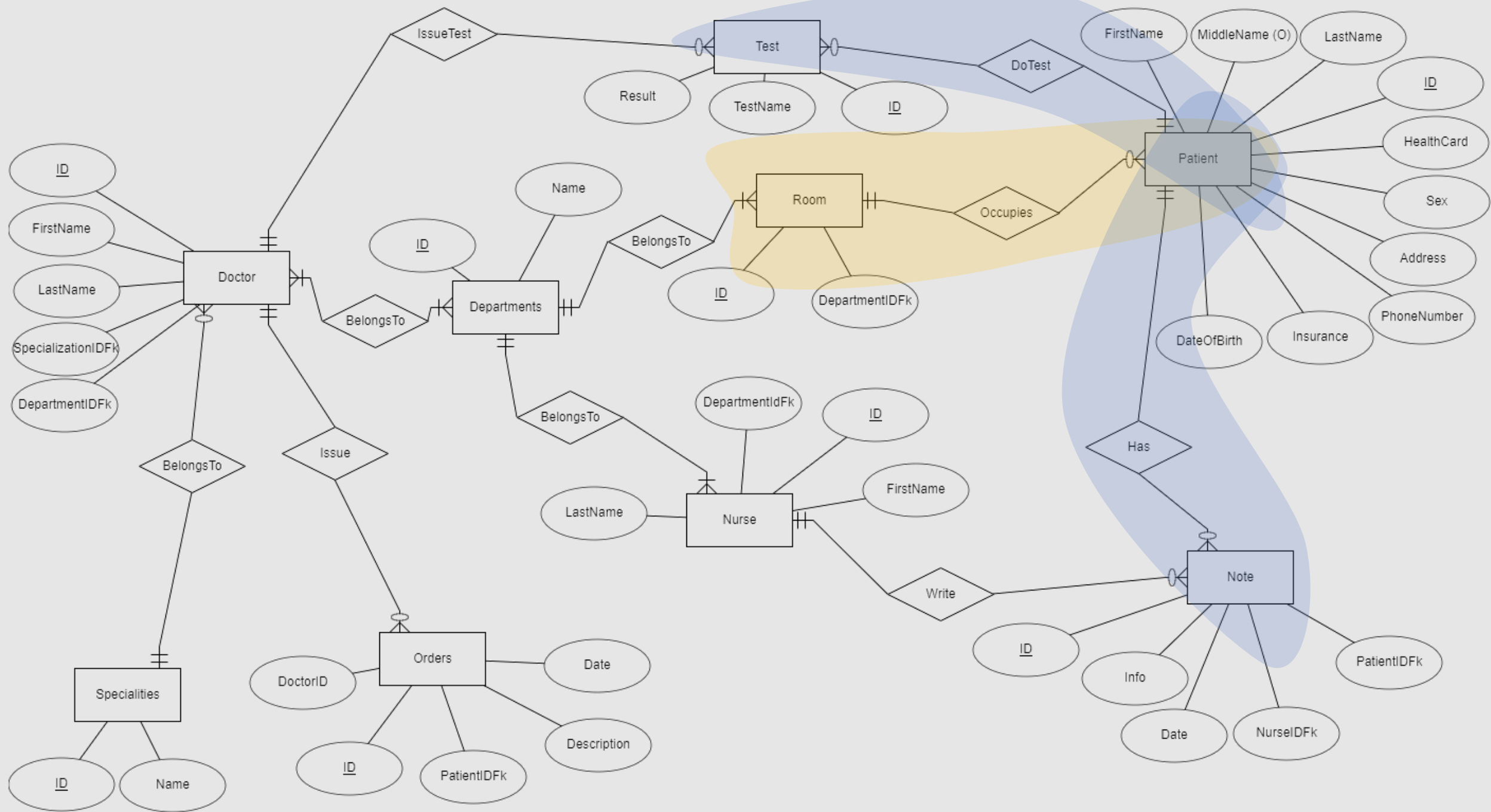






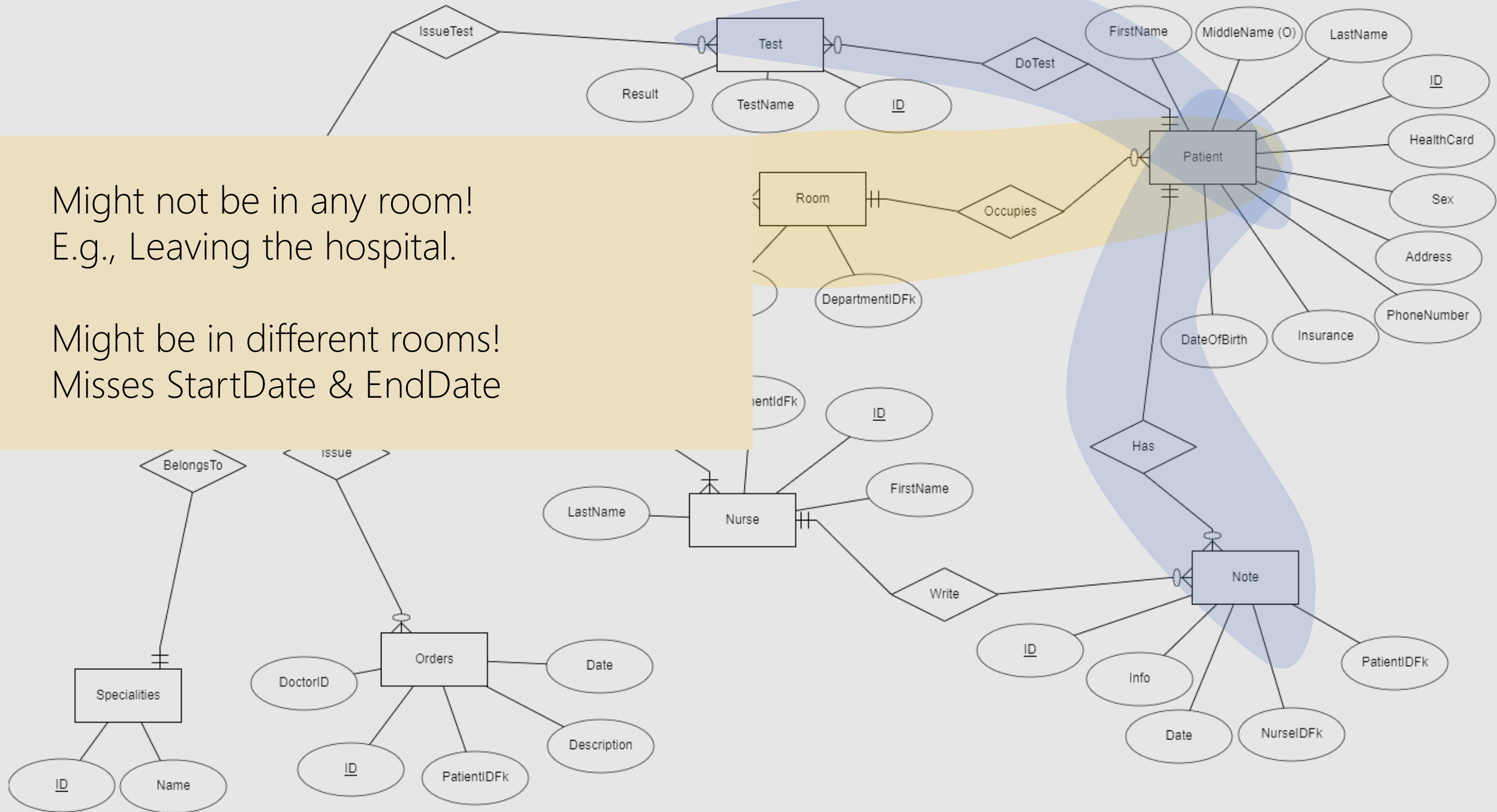


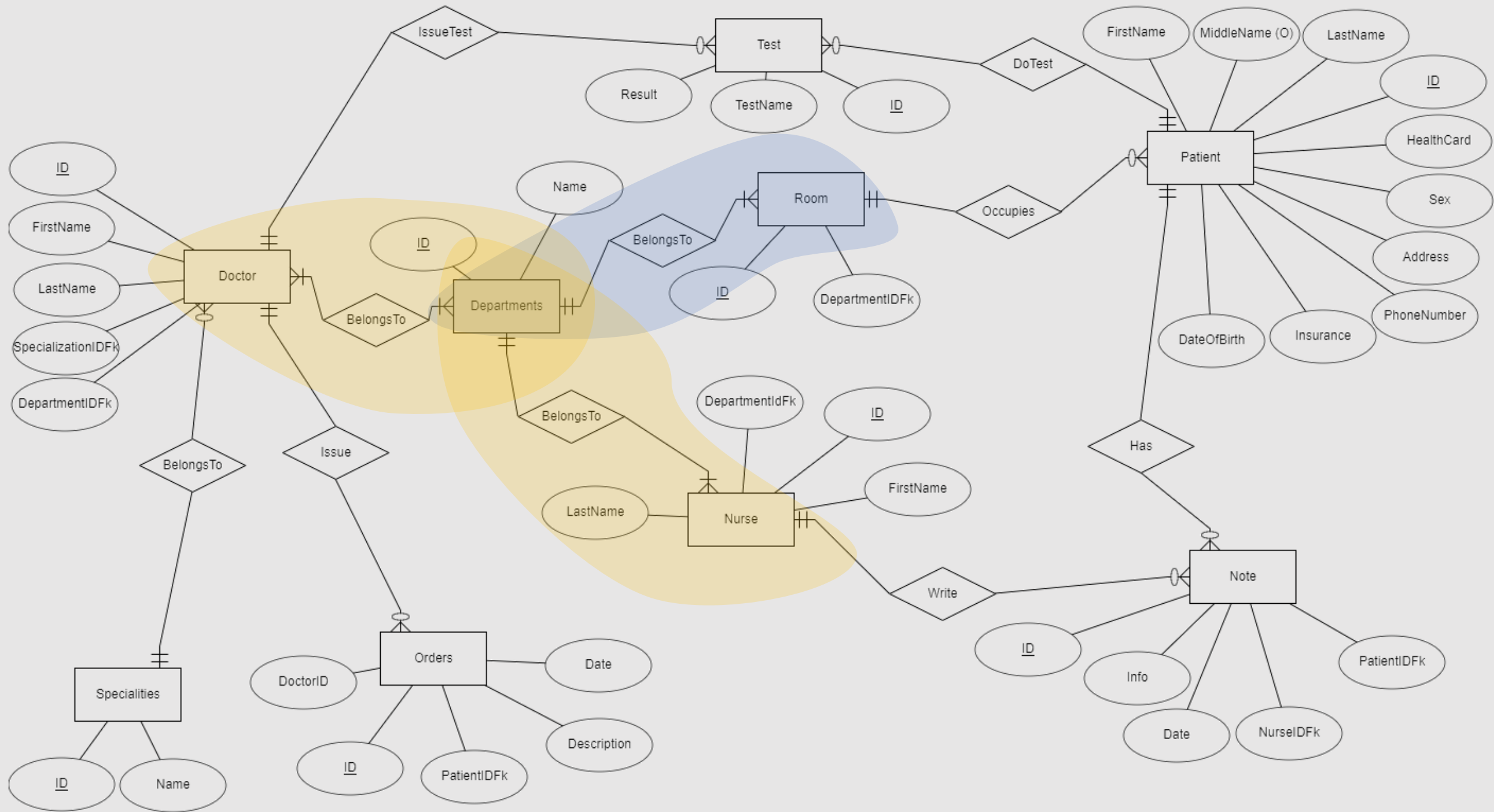


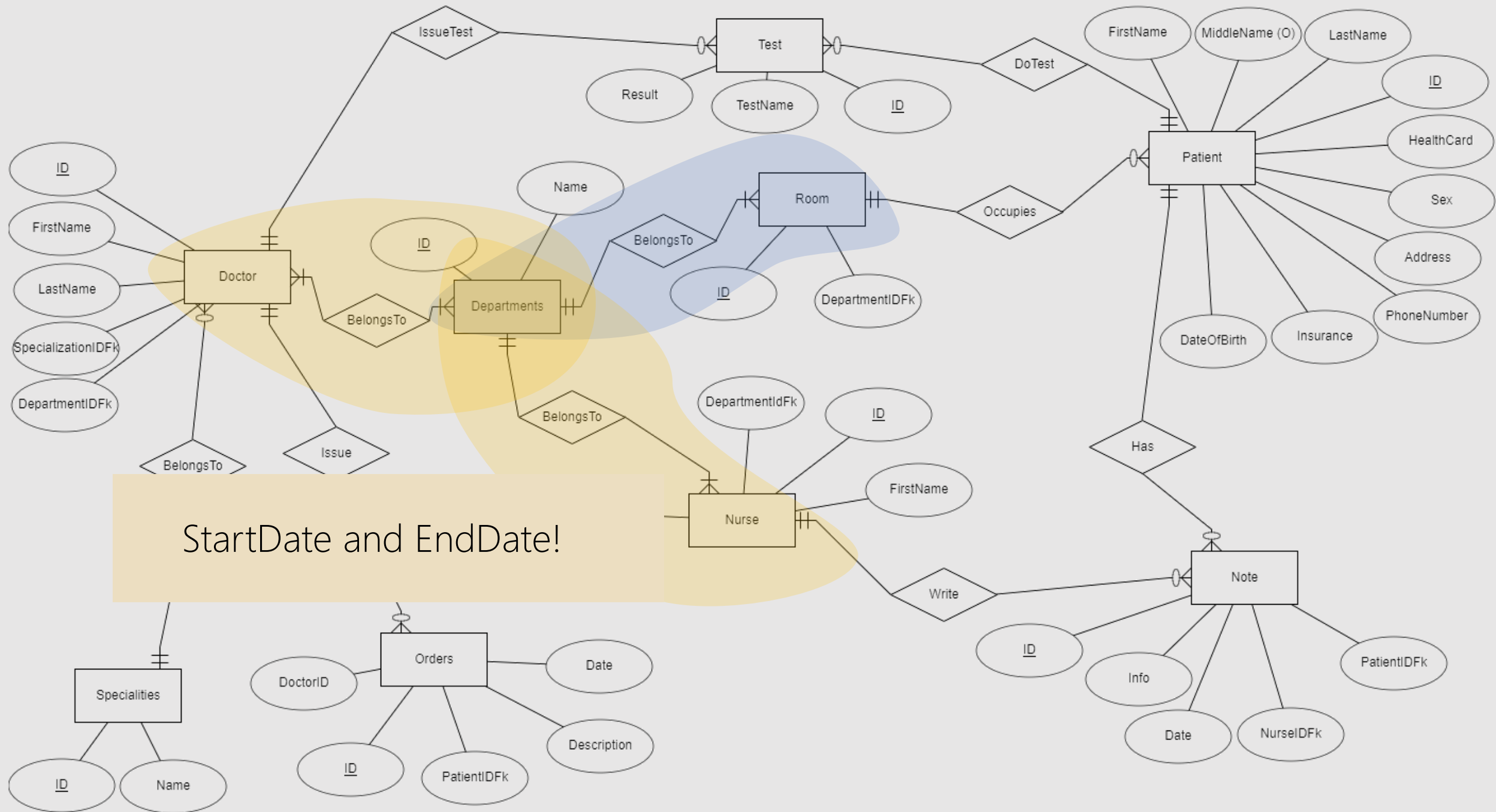


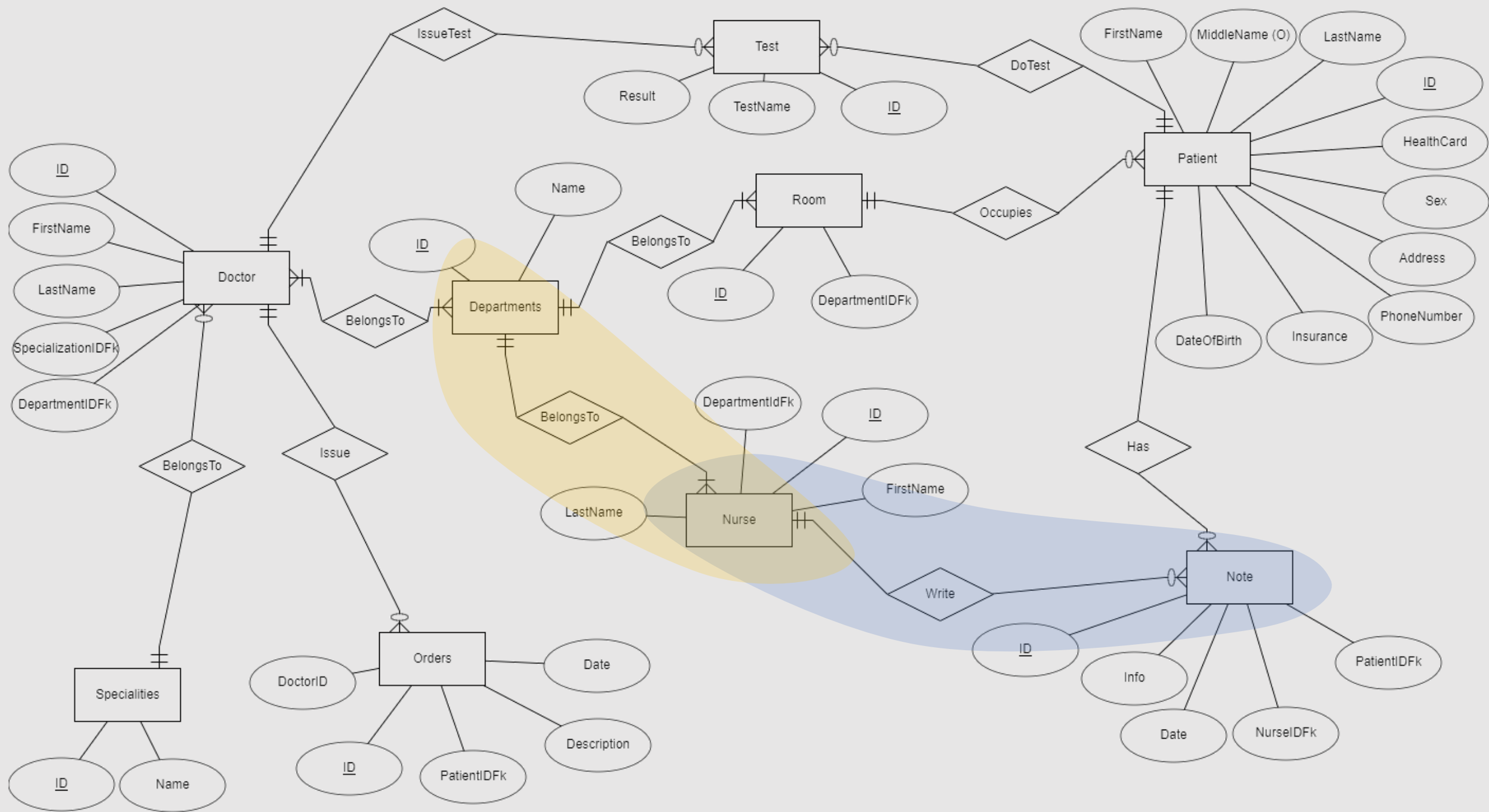
Might not be in any room!
E.g., Leaving the hospital.

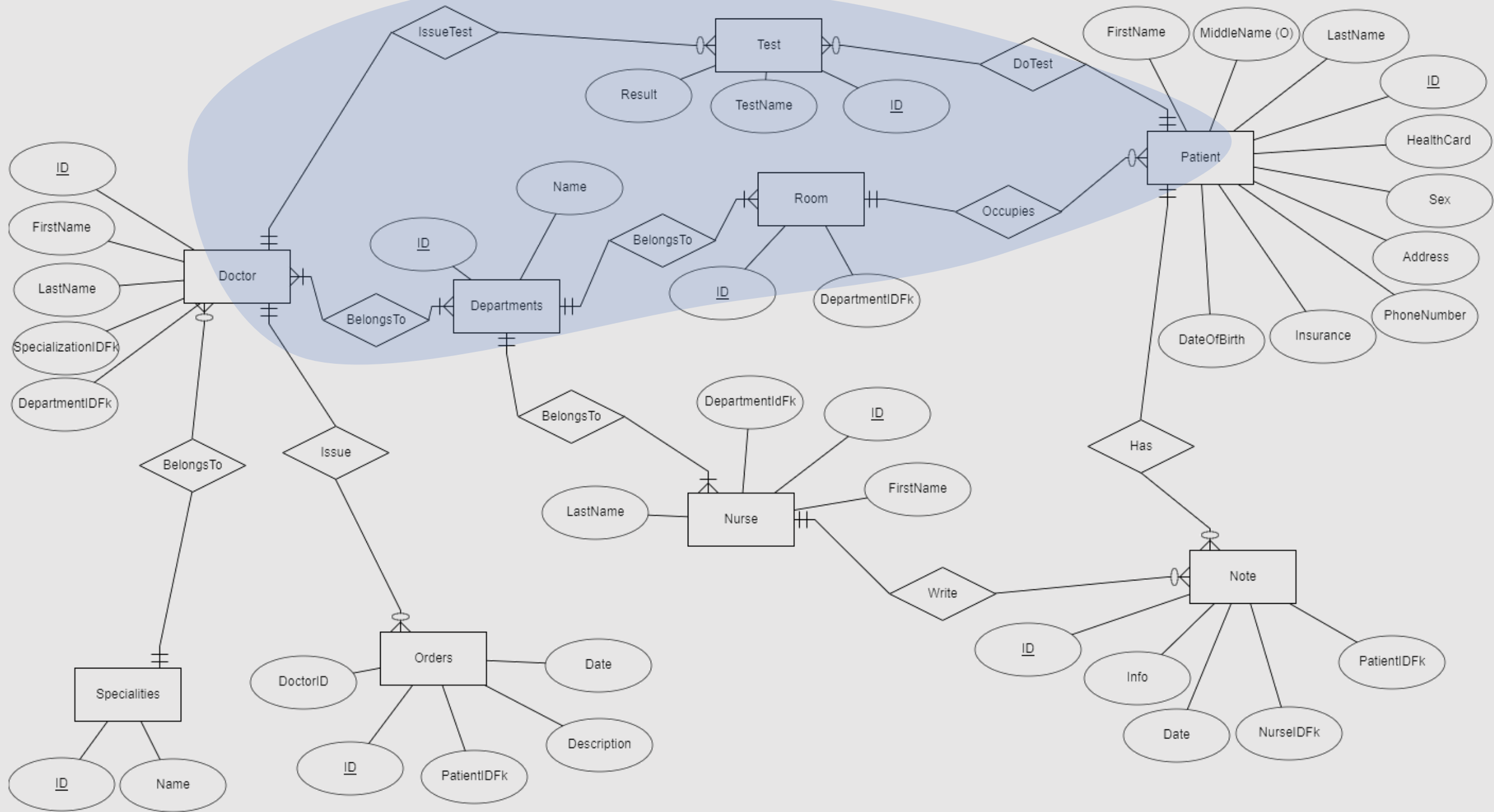
Might be in different rooms!
Misses StartDate & EndDate

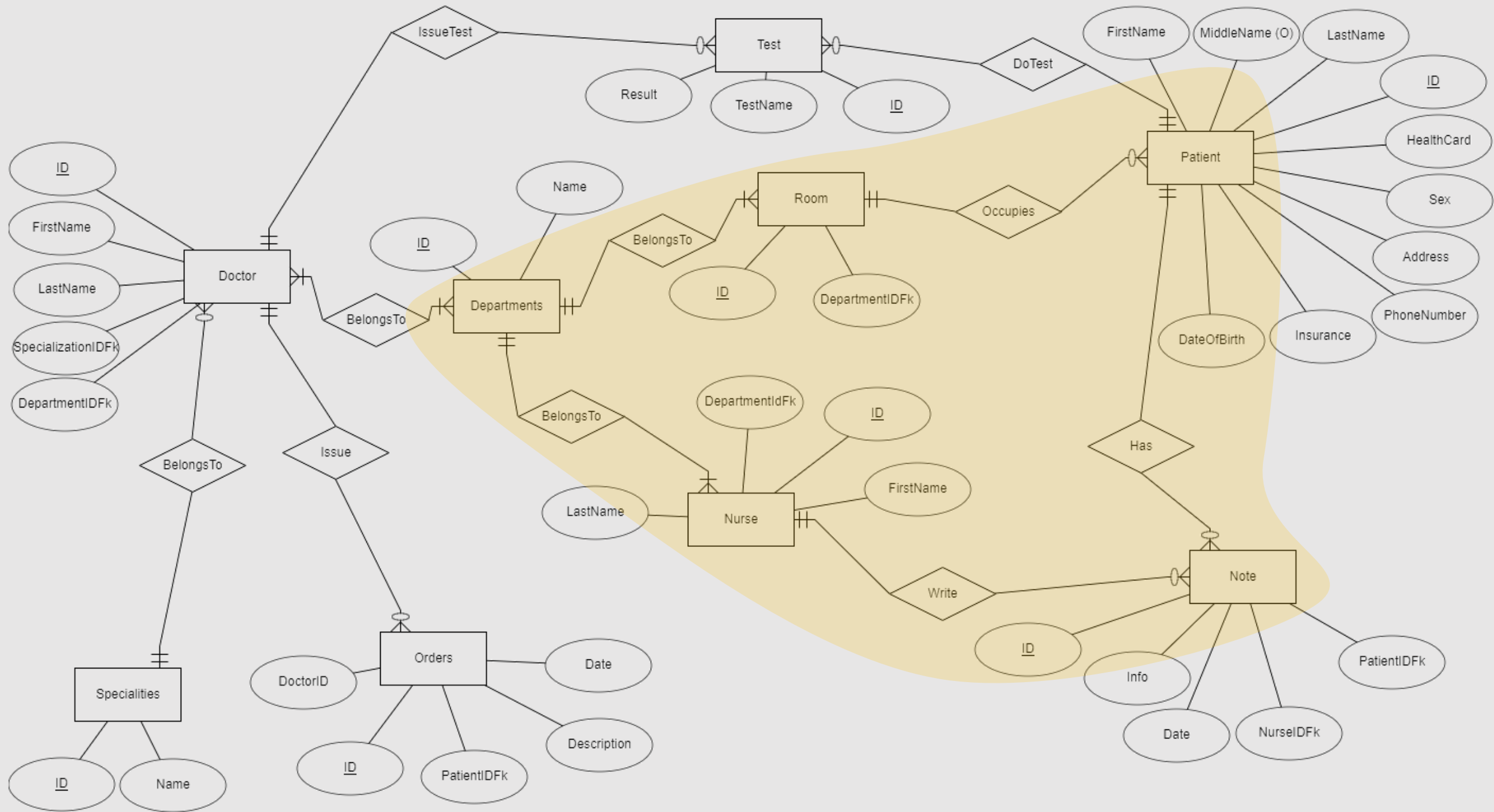


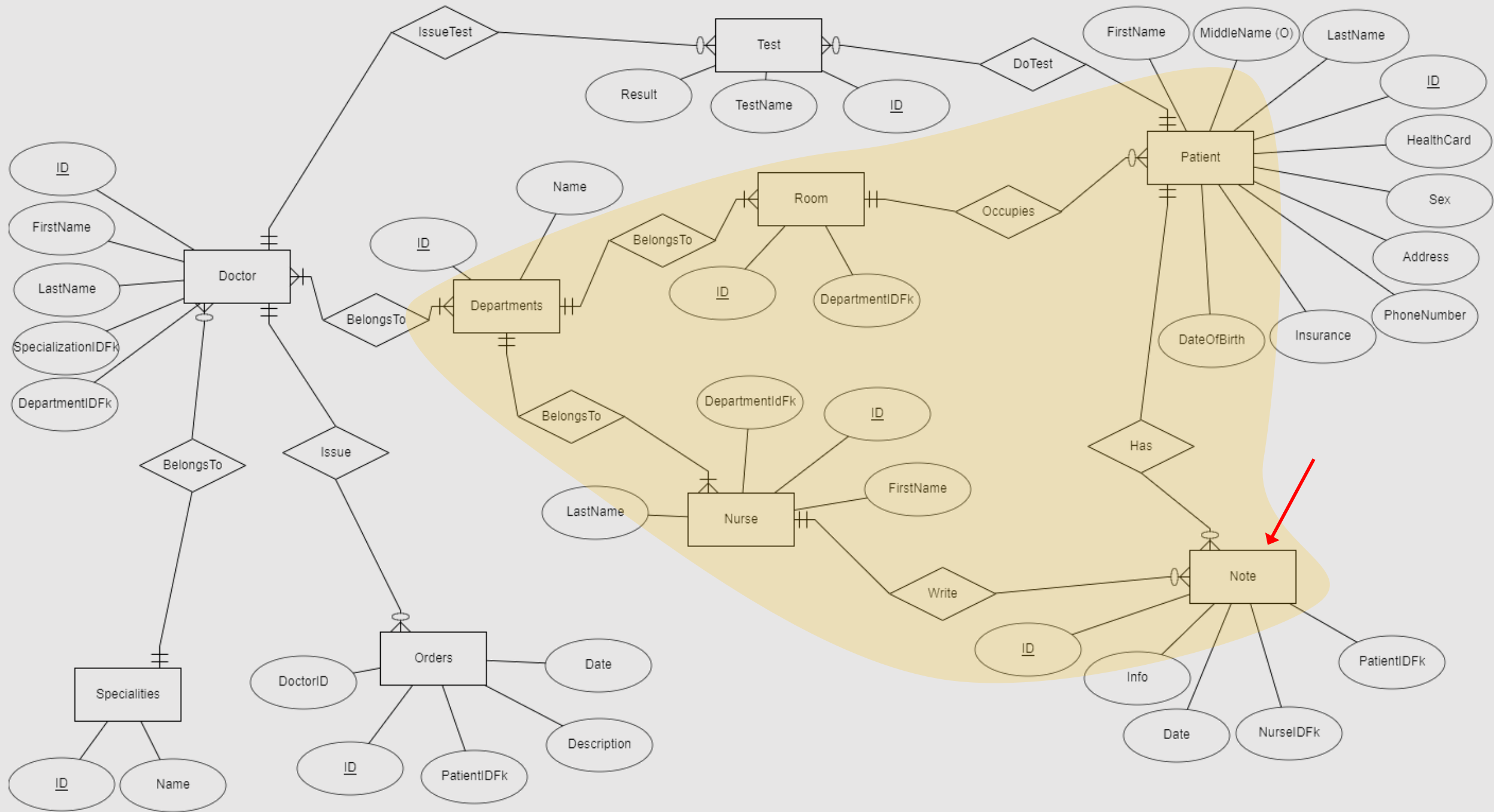


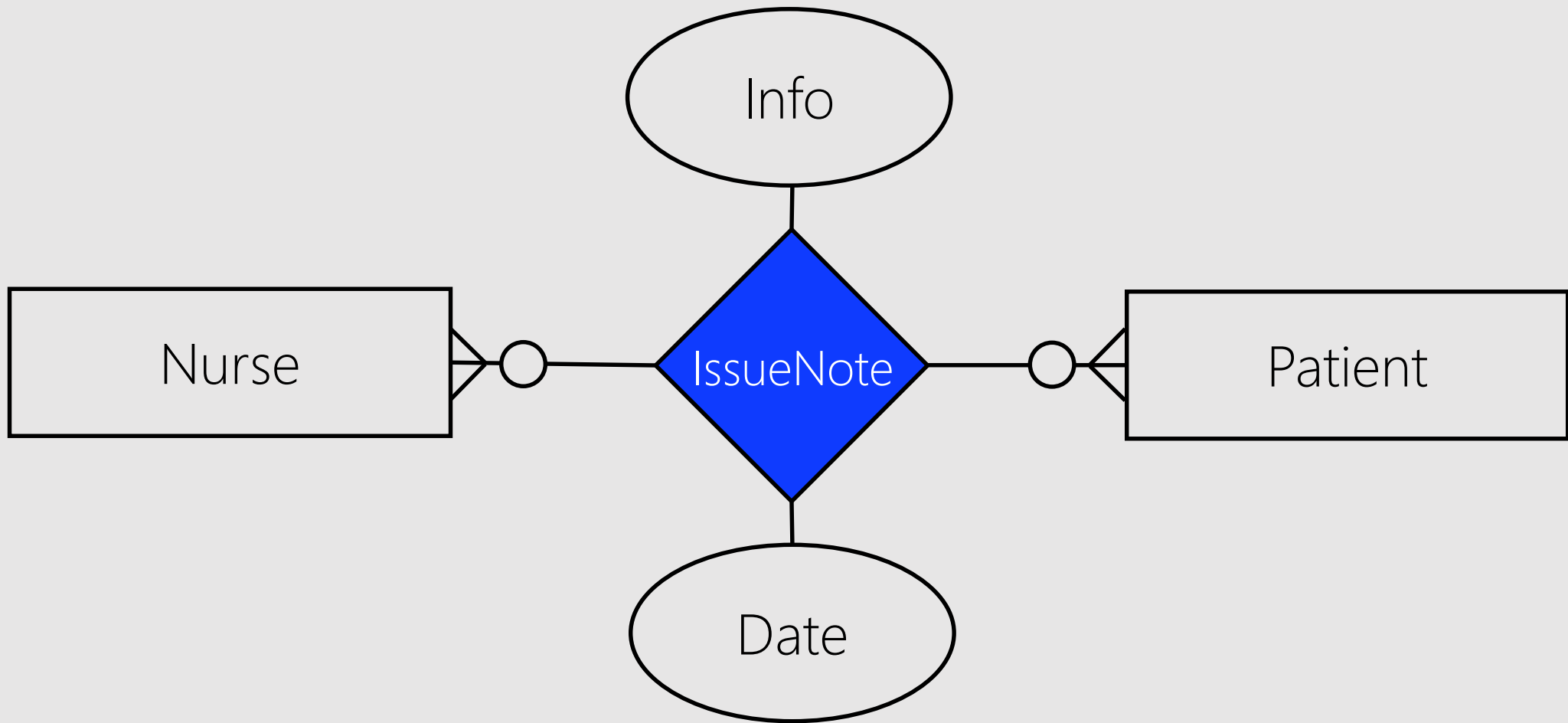


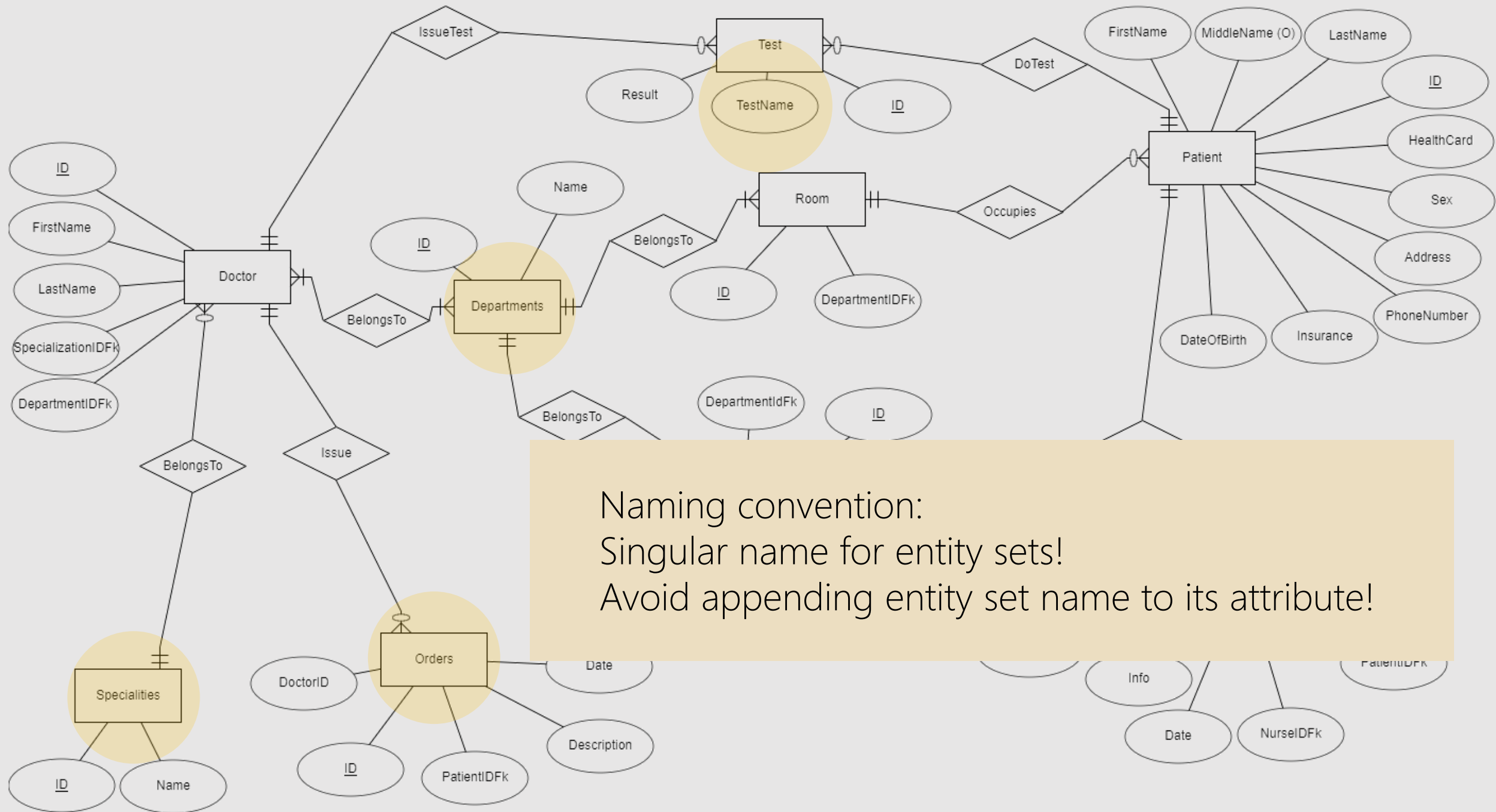


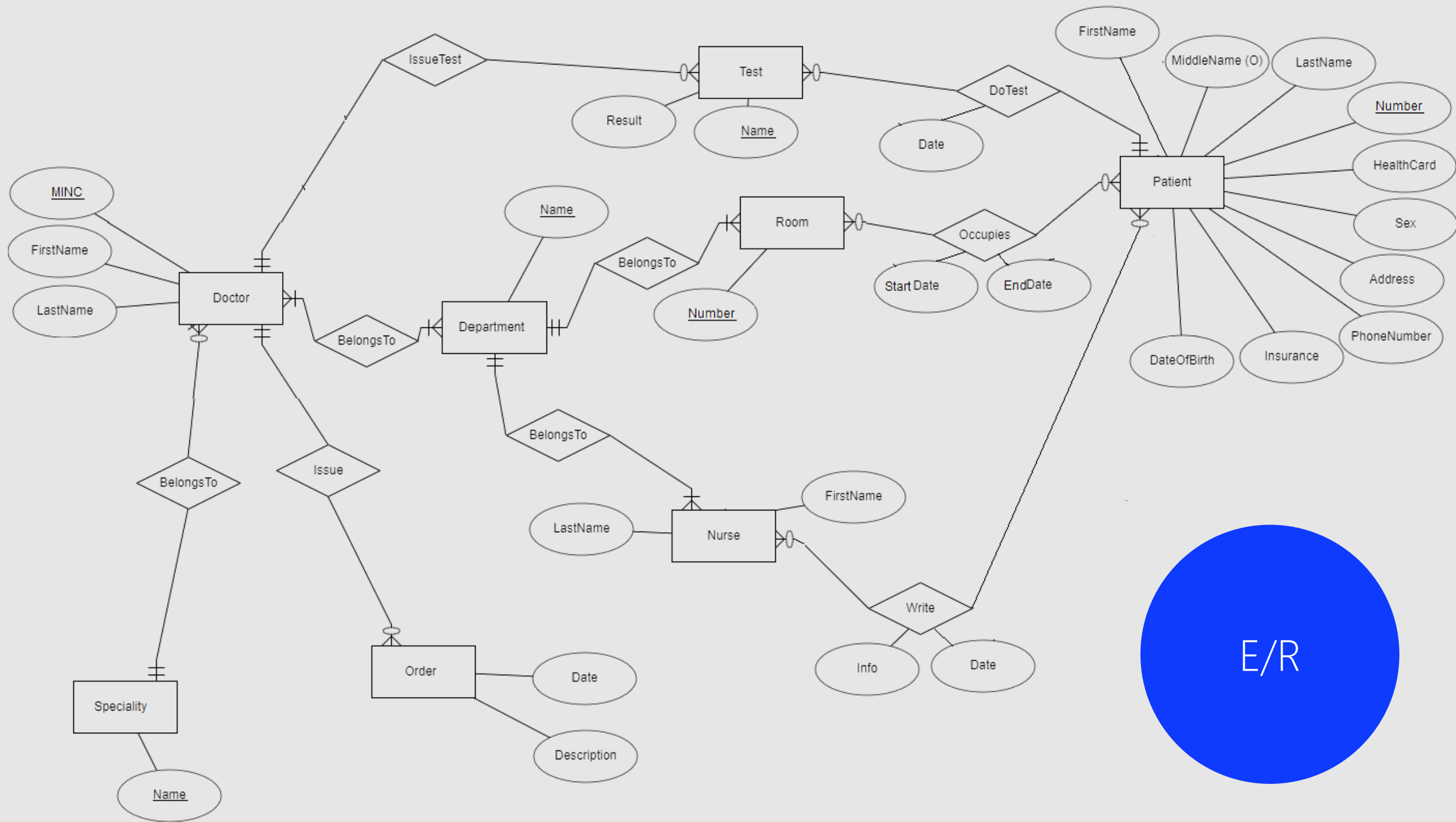












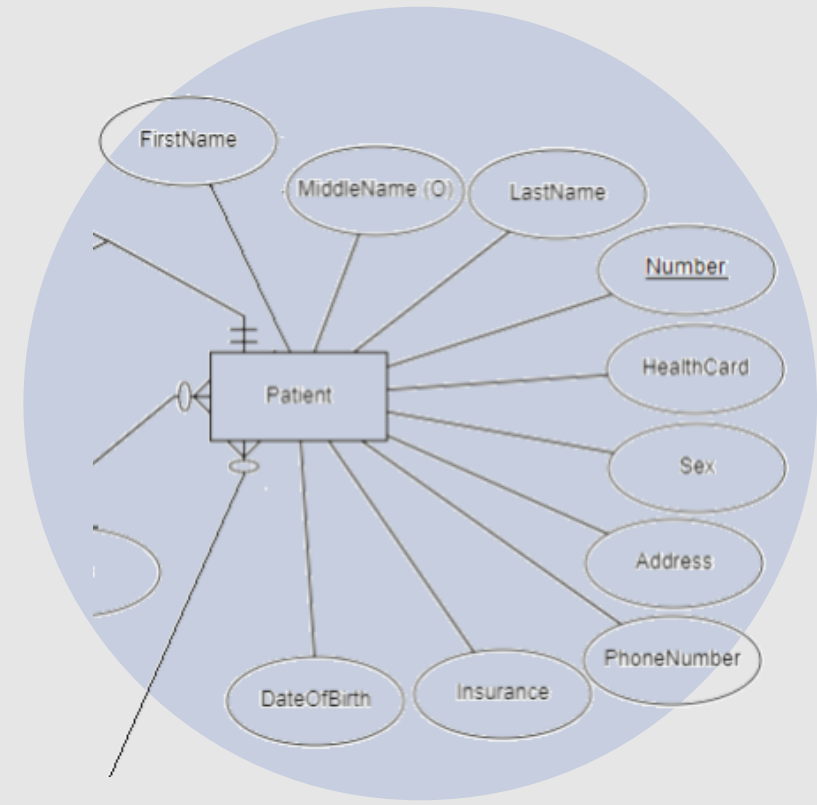
E/R

Hospital × Relational Mapping

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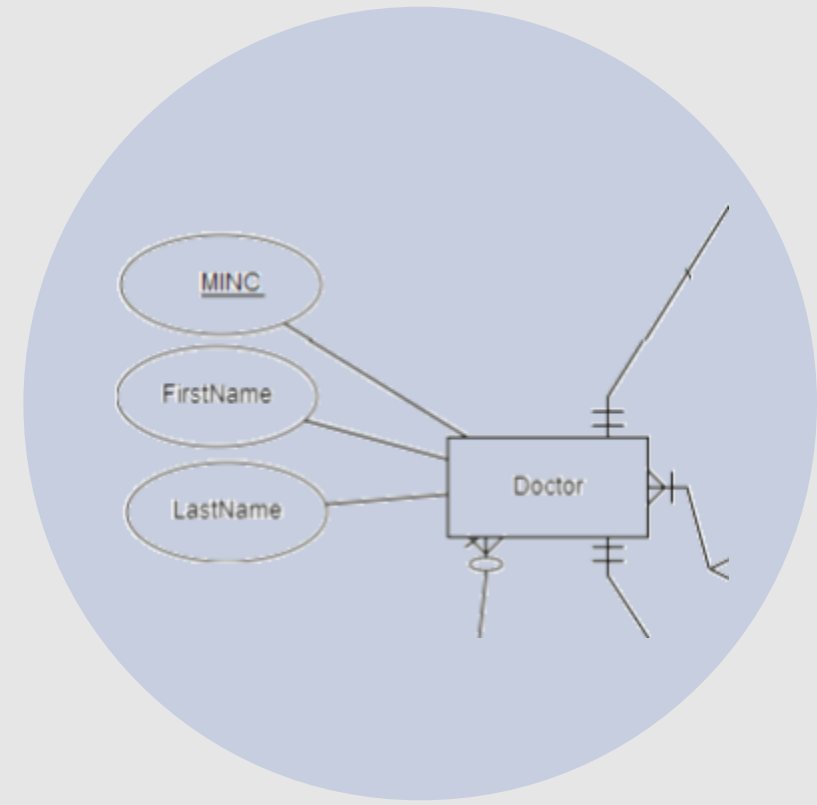
R1: Patient(Id,
Number,
FirstName,
MiddleName,
LastName,
Sex,
DateOfBirth,
Address,
Phone,
HealthCardNo,
InsuranceName)

CK={Number} & Mandatory



R2: Doctor(Id,
MINC,
FirstName,
LastName)

CK={MINC} & Mandatory



R3: Room(Id, Number)
CK={Number} & Mandatory

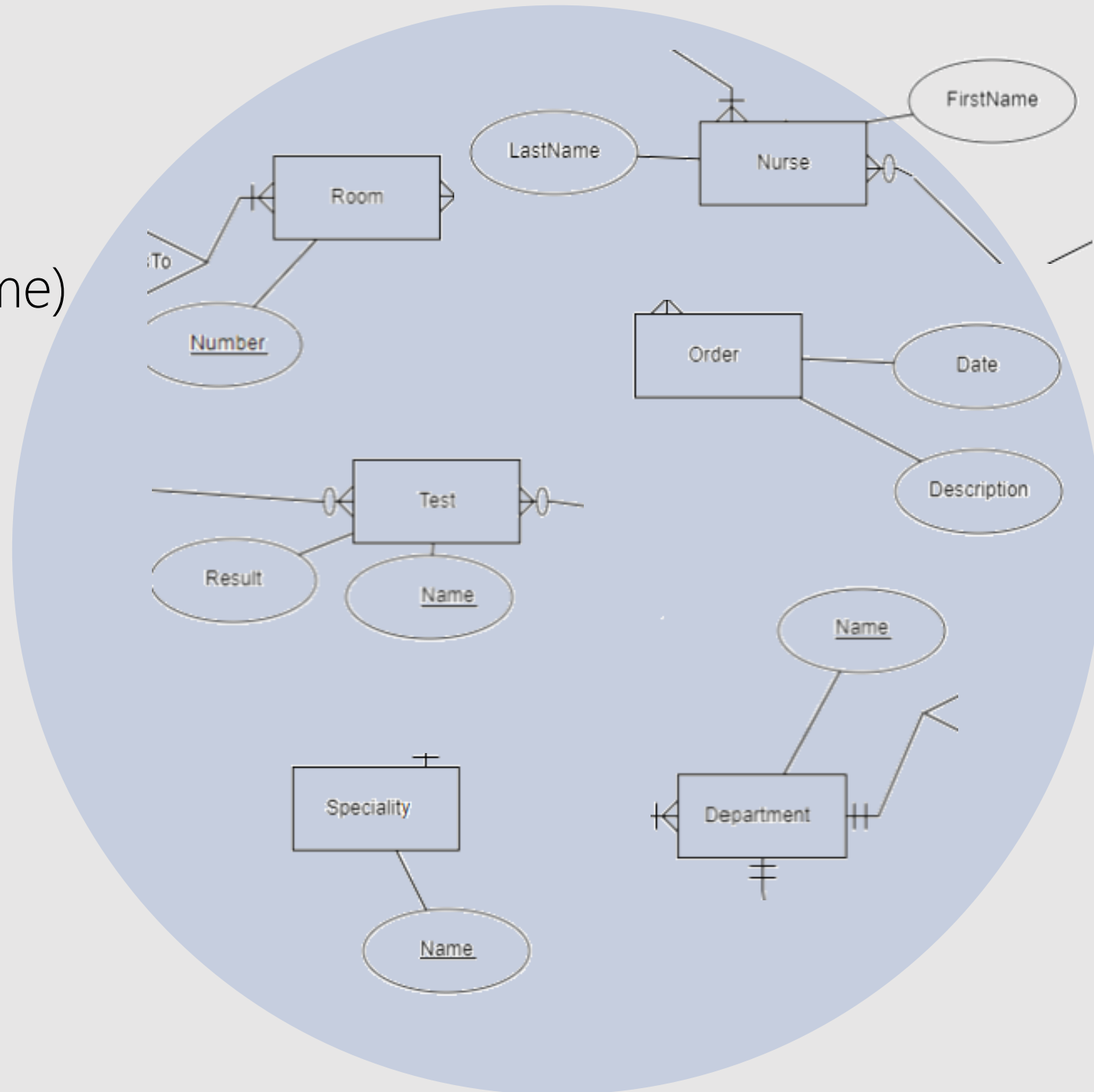
R4: Nurse(Id, FirstName, LastName)

R5: Test(Id, Name, Result)
CK={Name} & Mandatory

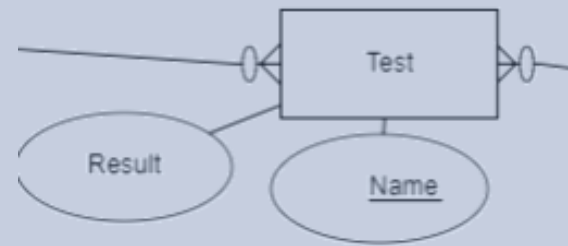
R6: Order(Id, Description, Date)

R7: Specialty(Id, Name)
CK={Name} & Mandatory

R8: Department(Id, Name)
CK={Name} & Mandatory



R5: Test(Id, Name, Result)
CK={Name} & Mandatory



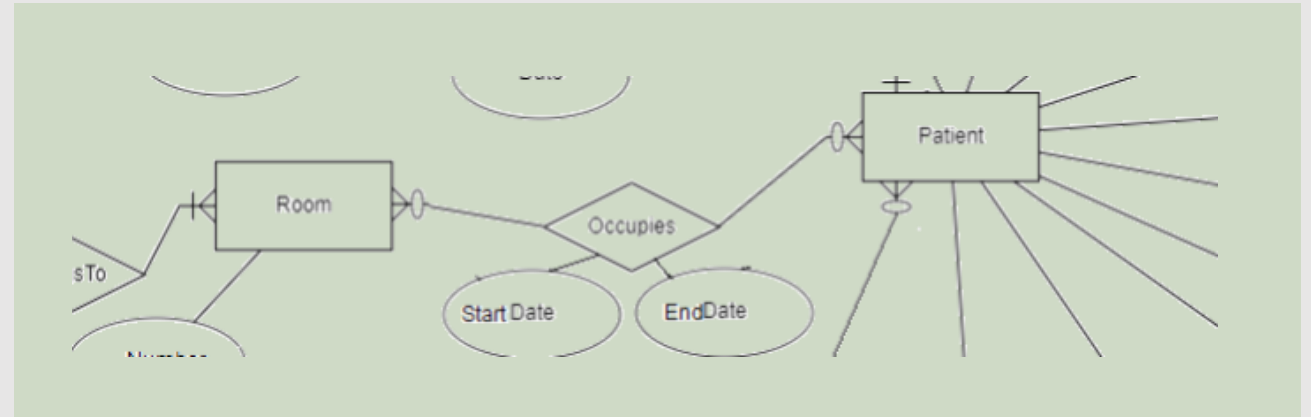
Result exist when a patient does a Test!
It should be on a relationship between Test and Patient

R9: PatientRoom(Id,
PatientId,
RoomId,
StartDate,
EndDate)

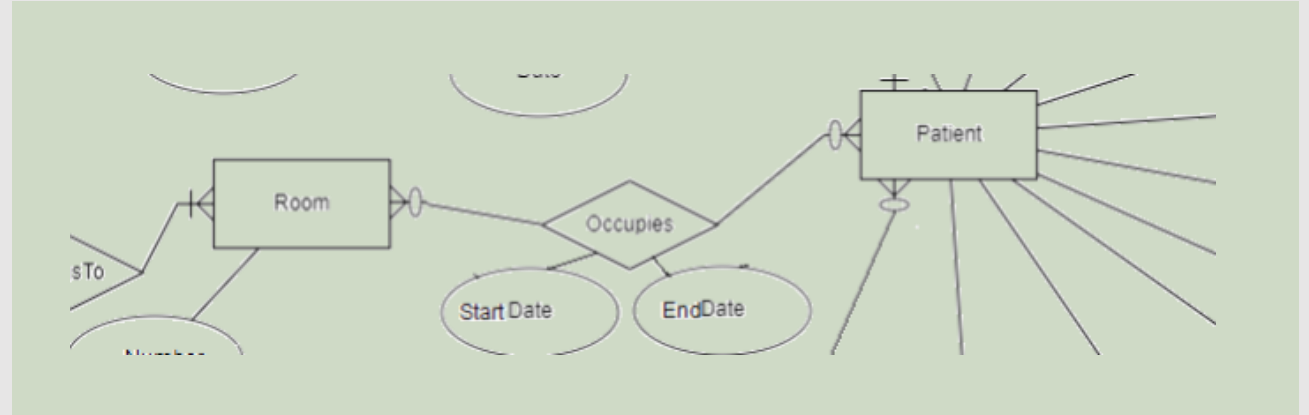
FK1={PatientId}

FK2={RoomId}

CK={PatientId, RoomId}



R9: PatientRoom(Id,
PatientId,
RoomId,
StartDate,
EndDate)



FK1={PatientId}

FK2={RoomId}

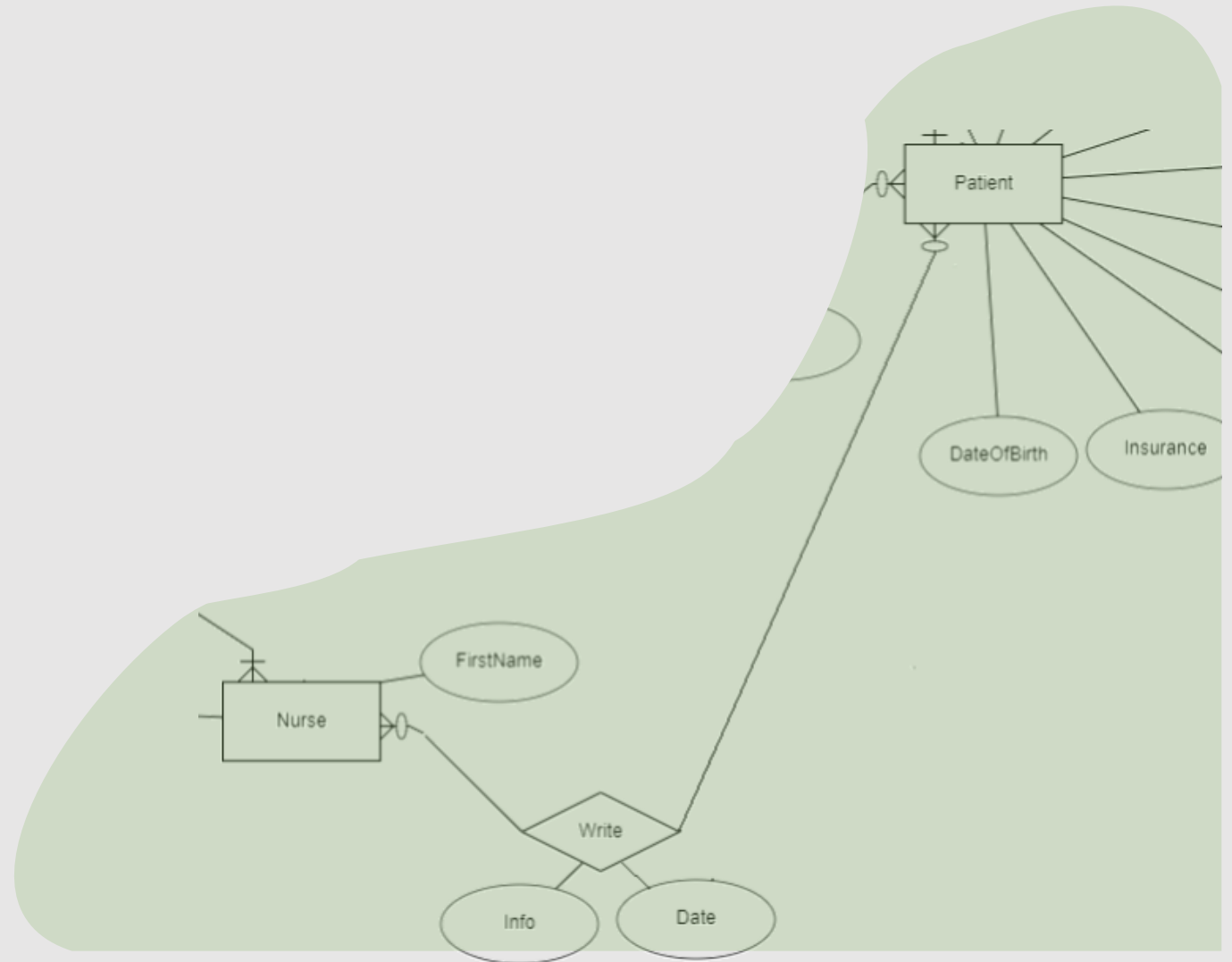
CK={PatientId, RoomId} U {StartDate} (Why?)

R10: PatientNurse(Id,
PatientId,
Nurseld,
Date,
Info)

FK1={PatientId}

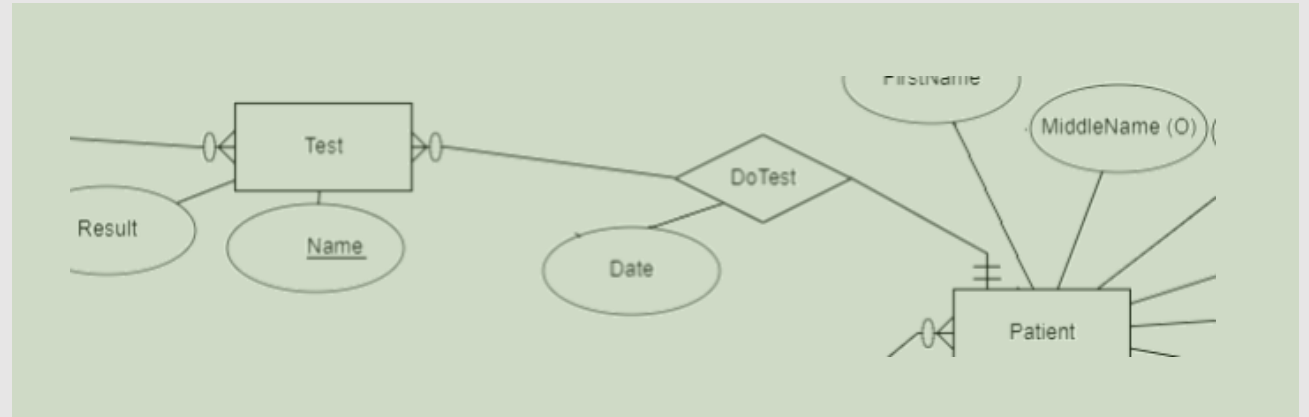
FK2={Nurseld}

CK={PatientId, Nurseld, Date}



R5: Test(Id,
Name,
Result
PatientId,
Date)

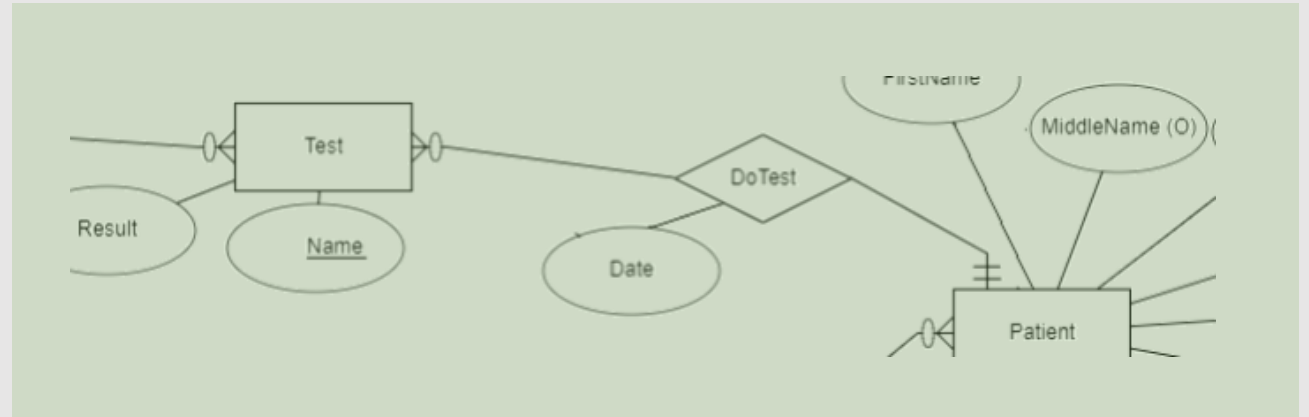
CK={Name} & Mandatory
FK={PatientId} & Mandatory



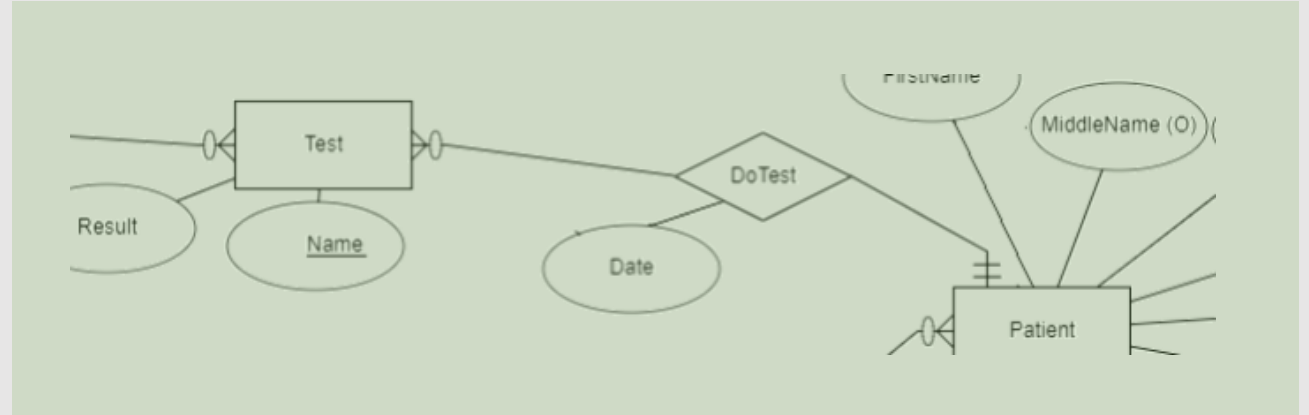
R5: Test(Id,
Name,
Result
PatientId,
Date)

CK={Name} & Mandatory
FK={PatientId} & Mandatory

Wait! There is a problem here!

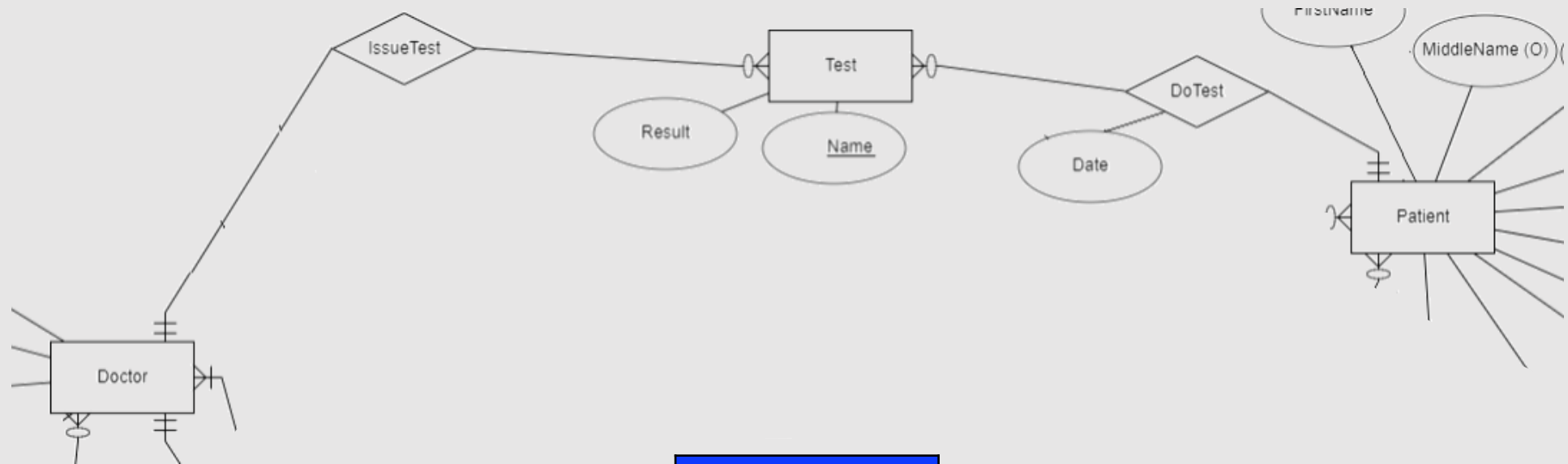


R5: Test(Id,
Name,
Result
PatientId,
Date)



CK={Name} & Mandatory
FK={PatientId} & Mandatory

Wait! There is a problem here!
Each test can be done at most by one Patient!
Let's review Doctor, Test, Patient relationships ...



Test Entity Set

t1

t2

t3

Doctor Entity Set

d1

d2

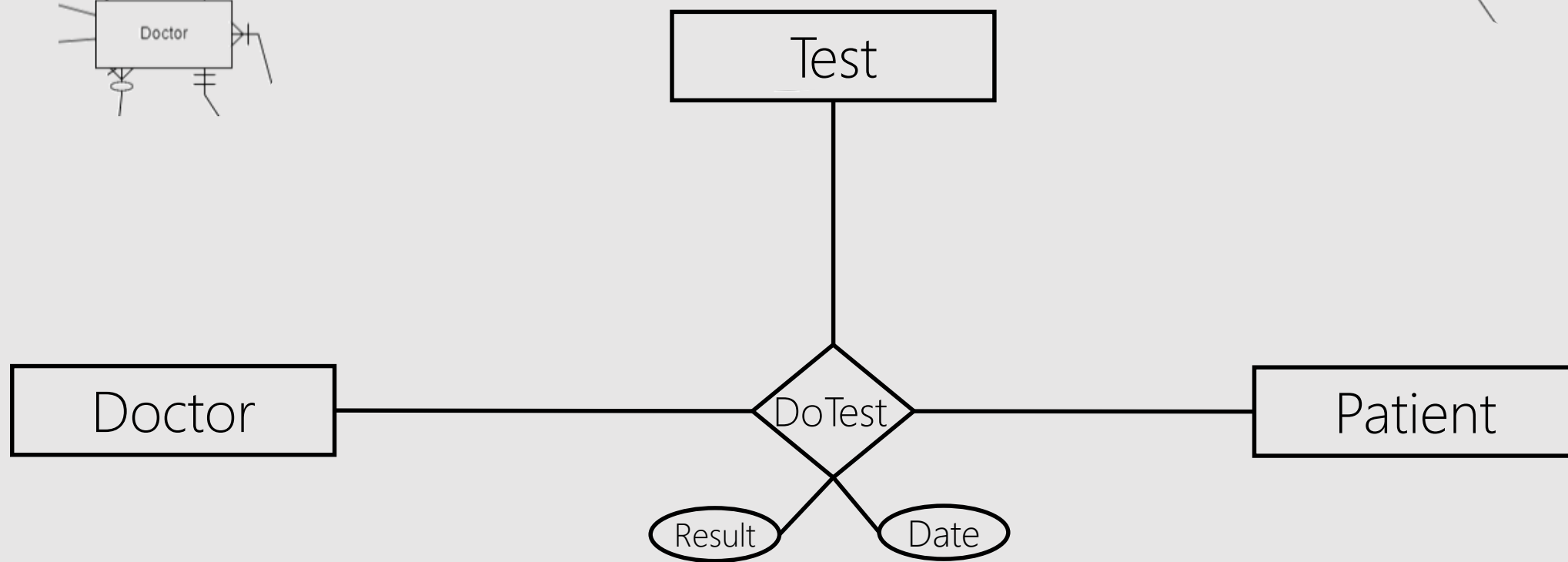
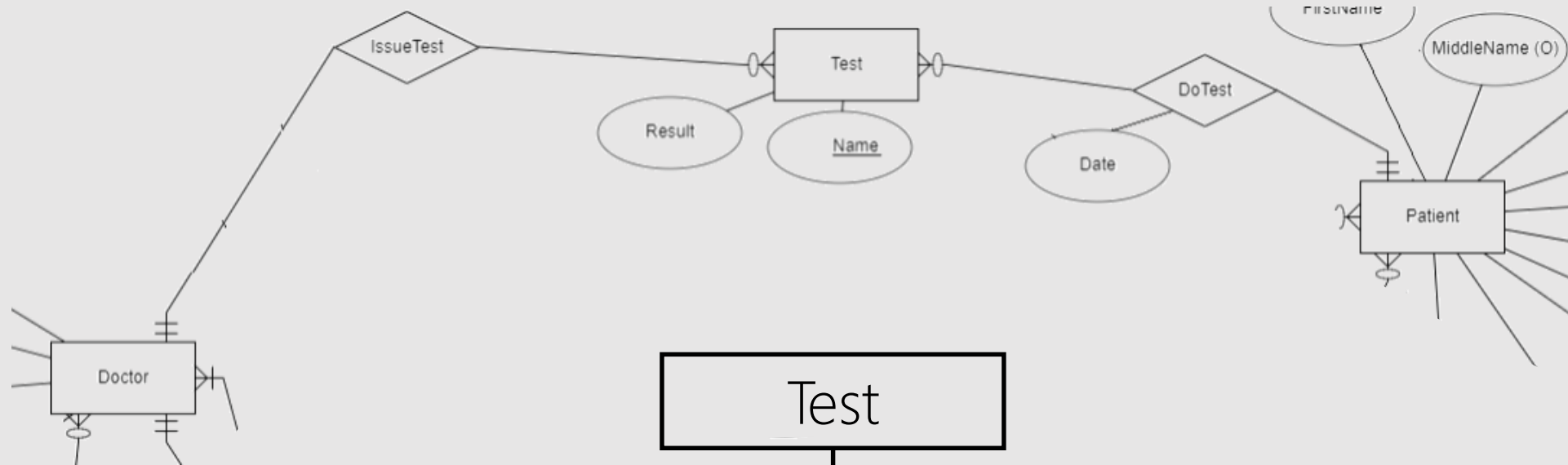
DoTest

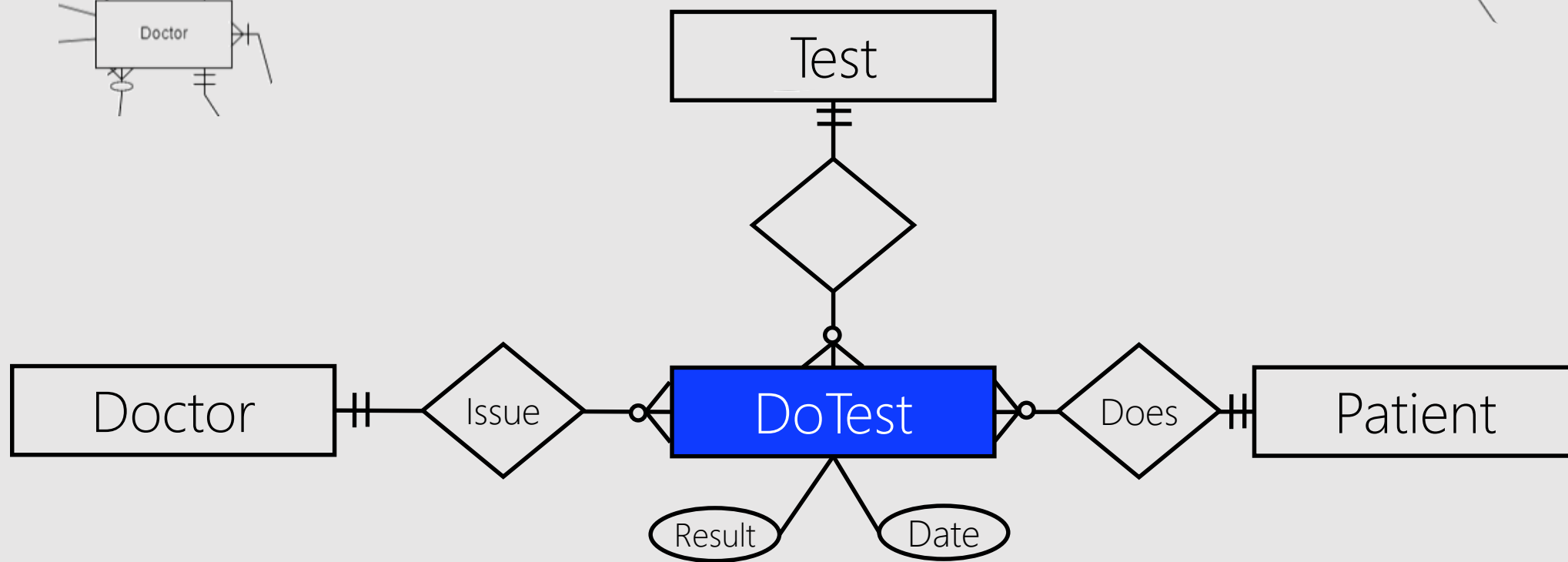
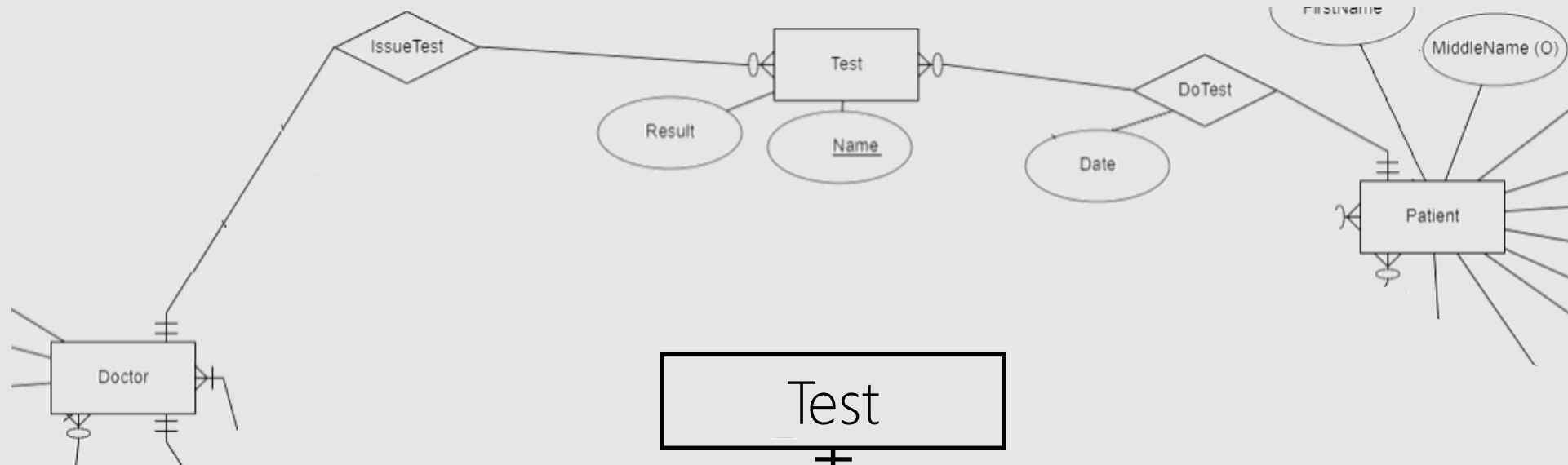
d1	p1	t1	r1	Fri.
d1	p1	t2	r2	Fri.
d2	p1	t3	r3	Tue.

Patient Entity Set

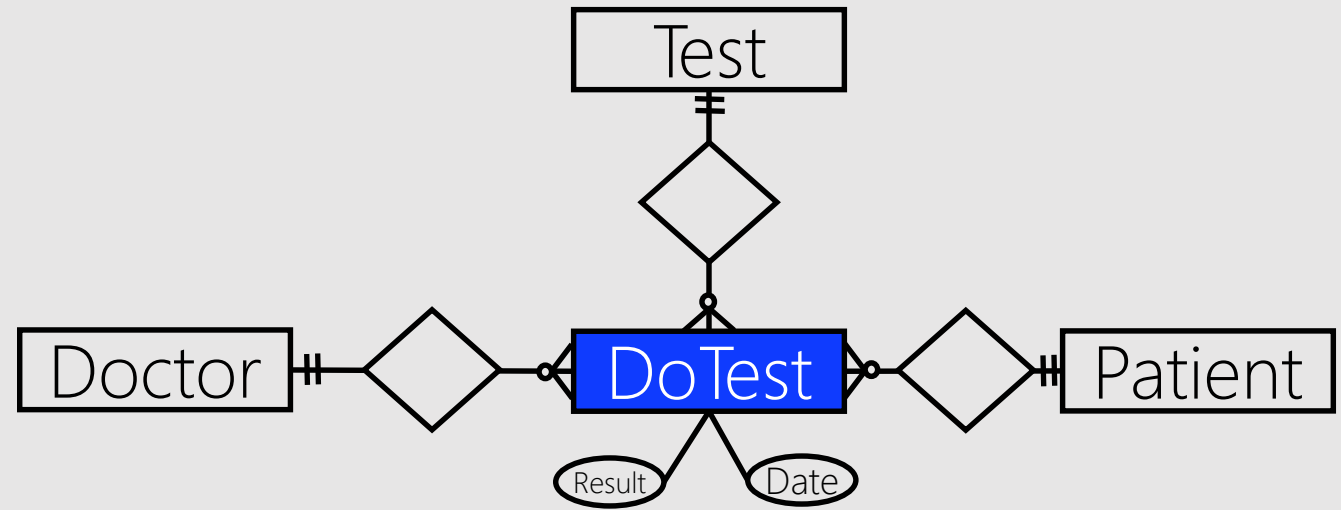
p1

p2





R5: Test(Id, Name,
~~Result~~,
~~PatientId~~,
~~Date~~)



CK={Name} & Mandatory
~~FK={PatientId} & Mandatory~~

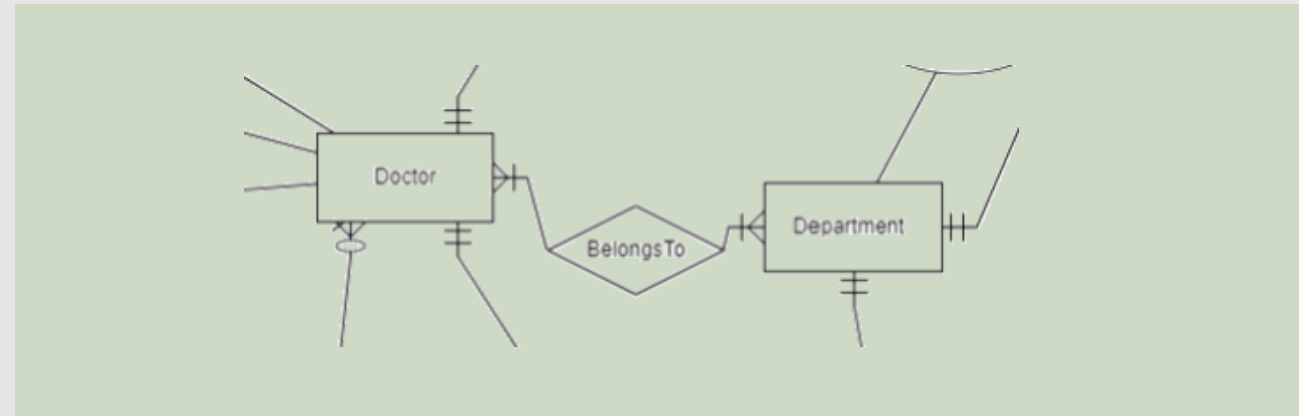
R11: DoTest(Id, DoctorId, PatientId, TestId, Result, Date)
FK1={PatientId} & Mandatory
FK2={DoctorId} & Mandatory
FK3={TestId} & Mandatory

R12: DoctorDepartment(Id, DoctorId, DepartmentId)

FK1={DoctorId}

FK2={DepartmentId}

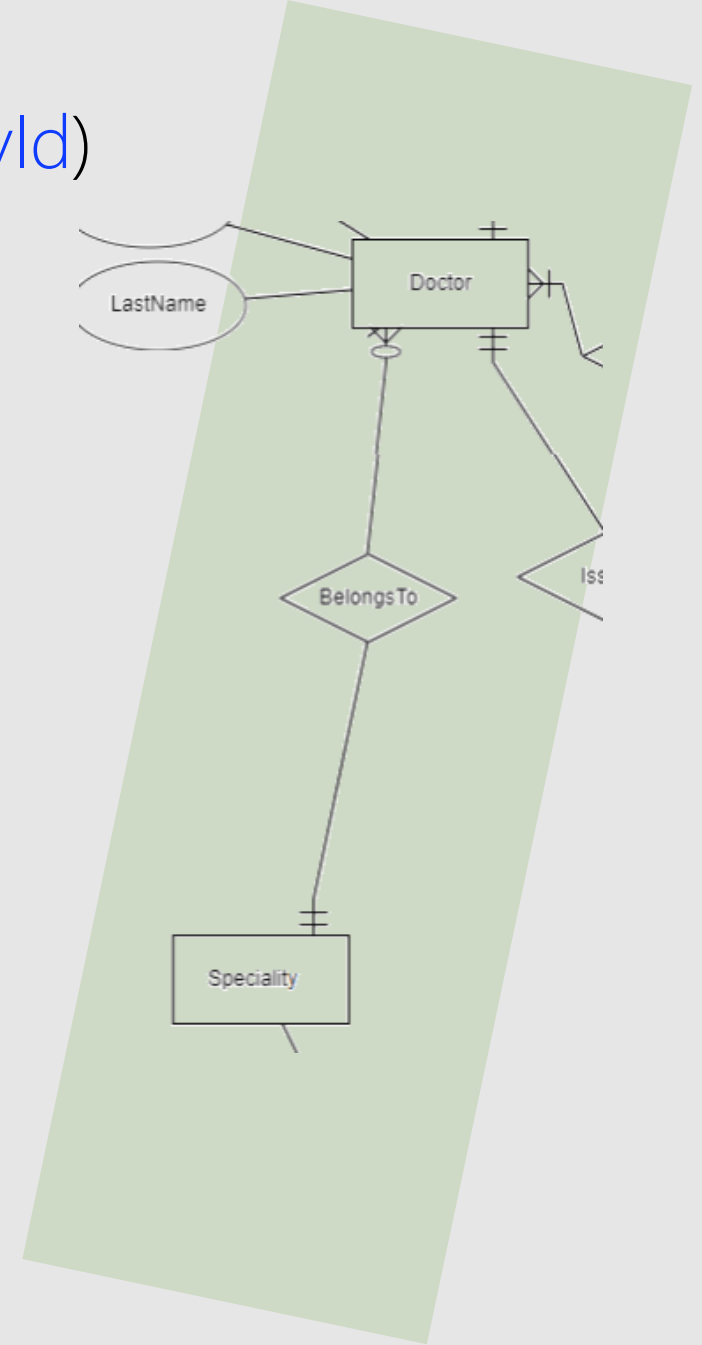
CK={DoctorId, DepartmentId}



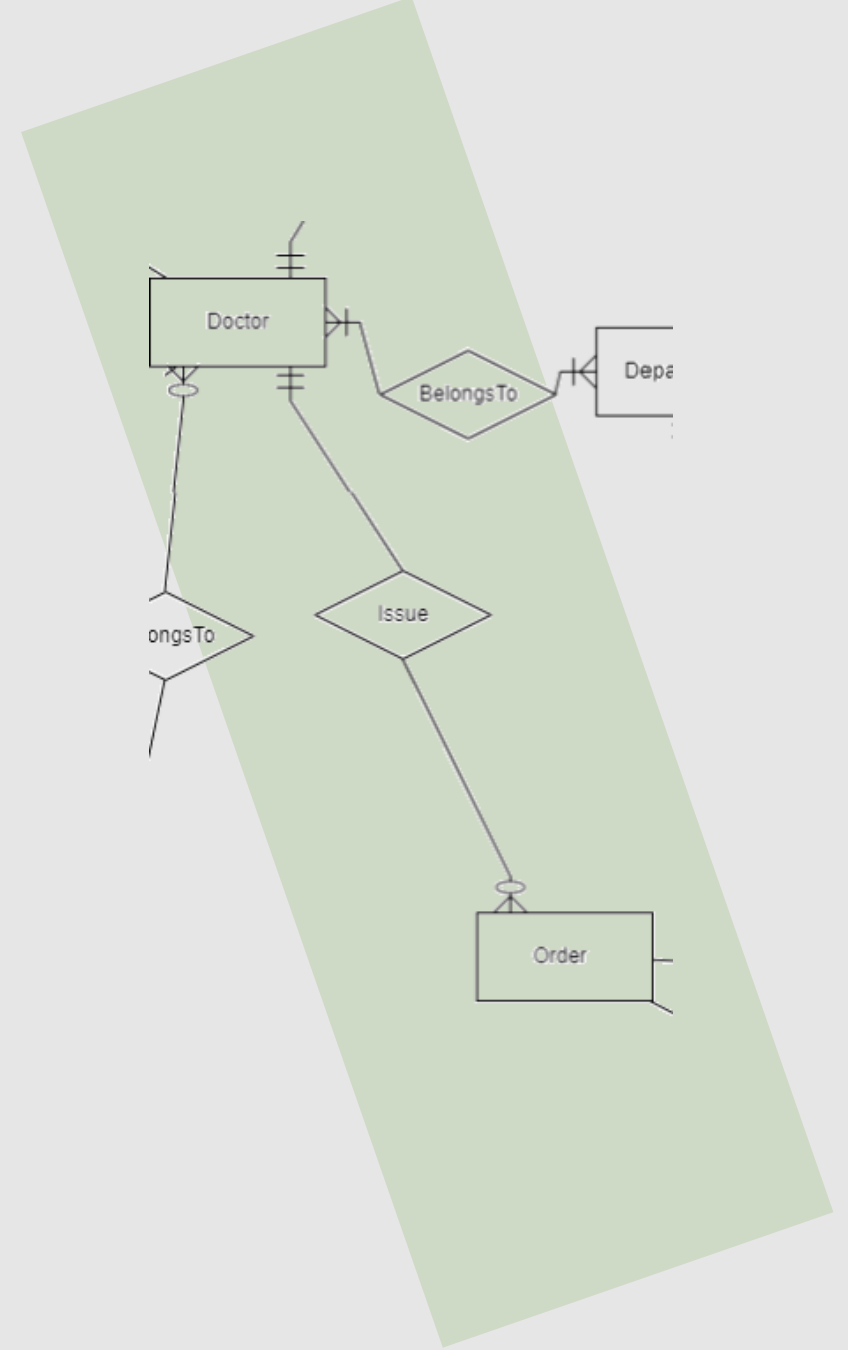
R2: Doctor(Id, MINC, FirstName, LastName, SpecialtyId)

CK={MINC} & Mandatory

FK={SpecialtyId} & Mandatory



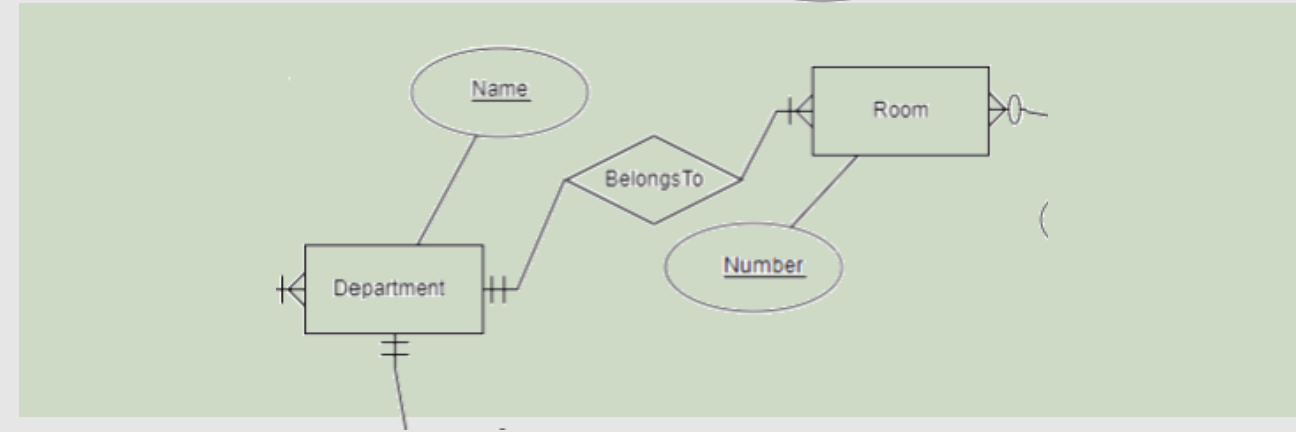
R6: Order(Id, Description, Date, DoctorId)
FK={DoctorId} & Mandatory



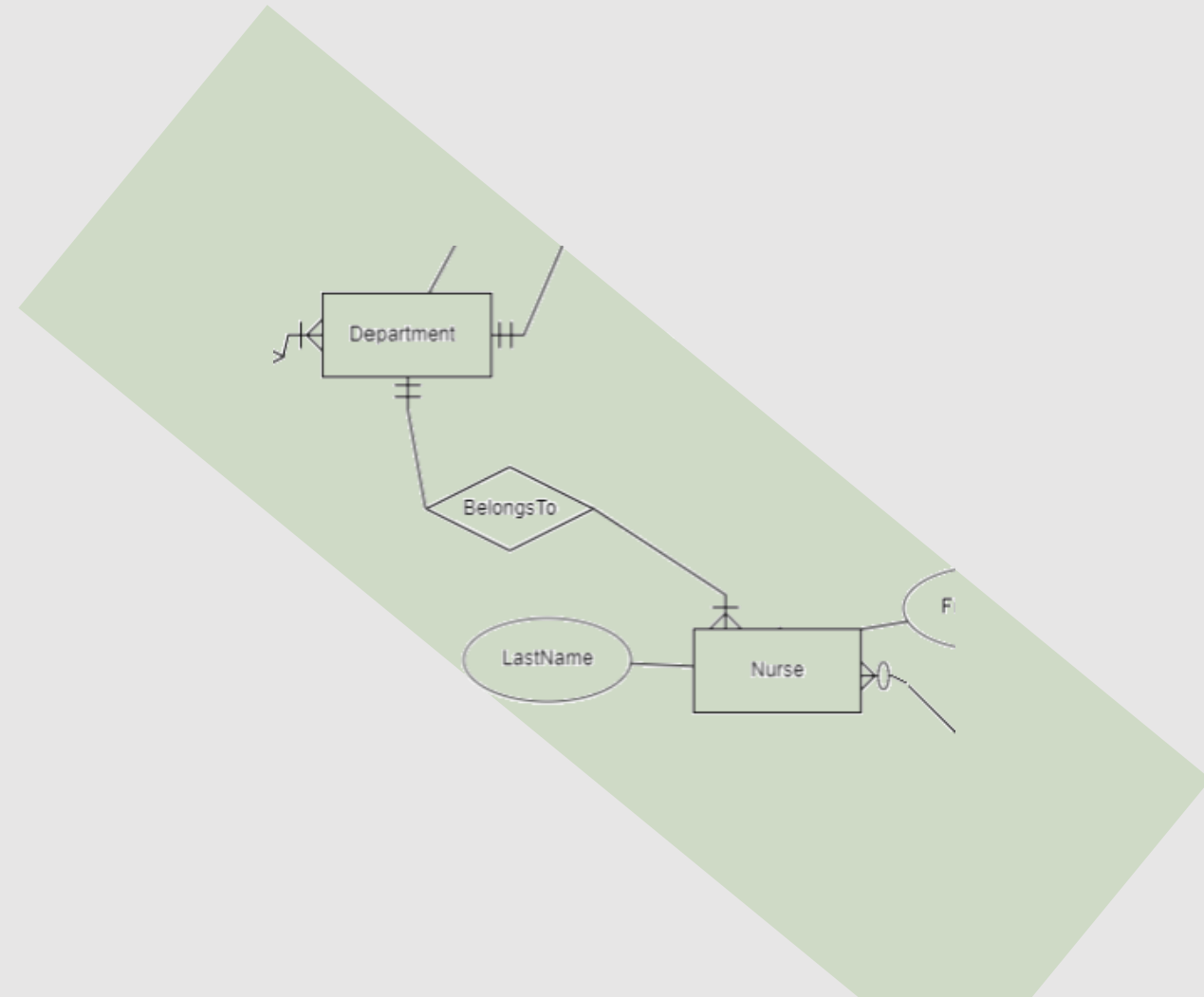
R3: Room(Id, Number, DepartmentId)

CK={Number} & Mandatory

FK={DepartmentId} & Mandatory



R4: Nurse(Id, FirstName, LastName, DepartmentId)
FK={DepartmentId} & Mandatory



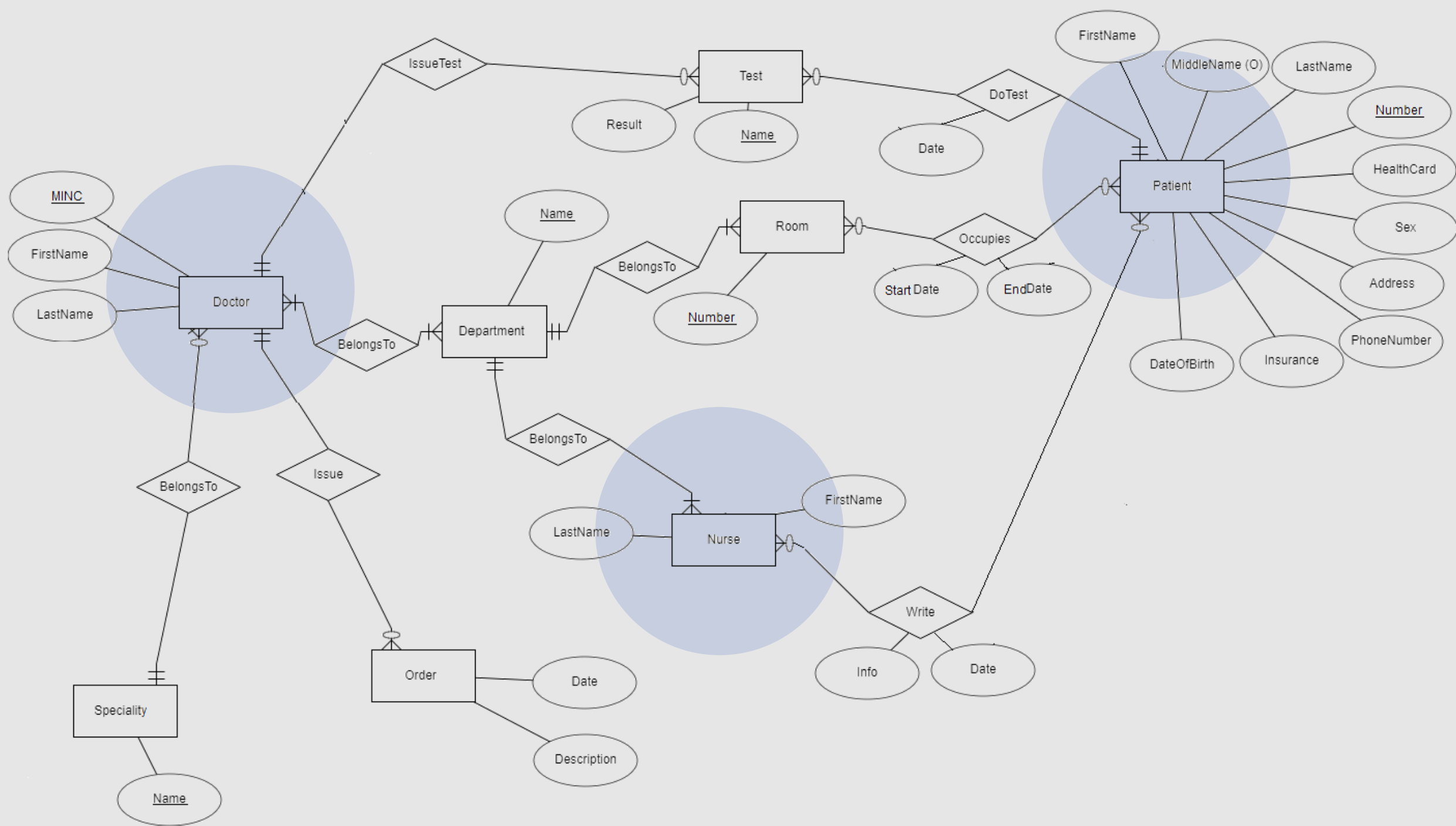
R1: Patient(Id, Number, FirstName, MiddleName, LastName, Sex, DateOfBirth, Address, Phone, HealthCardNo, InsuranceName), CK={Number} & Mandatory
R2: Doctor(Id, MINC, FirstName, LastName, SpecialtyId), CK={MINC} & Mandatory, FK={SpecialtyId} & Mandatory
R3: Room(Id, Number, DepartmentId), CK={Number} & Mandatory, FK={DepartmentId} & Mandatory
R4: Nurse(Id, FirstName, LastName, DepartmentId), FK={DepartmentId} & Mandatory
R5: Test(Id, Name), CK={Name} & Mandatory
R6: Order(Id, Description, Date, DoctorId), FK={DoctorId} & Mandatory
R7: Specialty(Id, Name), CK={Name} & Mandatory
R8: Department(Id, Name), CK={Name} & Mandatory
R9: PatientRoom(Id, PatientId, RoomId, StartDate, EndDate), FK1={PatientId}, FK2={RoomId}, CK={PatientId, RoomId, StartDate}
R10: PatientNurse(Id, PatientId, NurselId, Date, Info), FK1={PatientId}, FK2={NurselId}, CK={PatientId, NurselId, Date}
R11: DoTest(Id, DoctorId, PatientId, TestId, Result, Date), FK1={PatientId} & Mandatory, FK2={DoctorId} & Mandatory, FK3={PatientId} & Mandatory, CK={DoctorId, PatientId, TestId, Date}
R12: DoctorDepartment(Id, DoctorId, DepartmentId), FK1={DoctorId}, FK2={DepartmentId}, CK={DoctorId, DepartmentId}

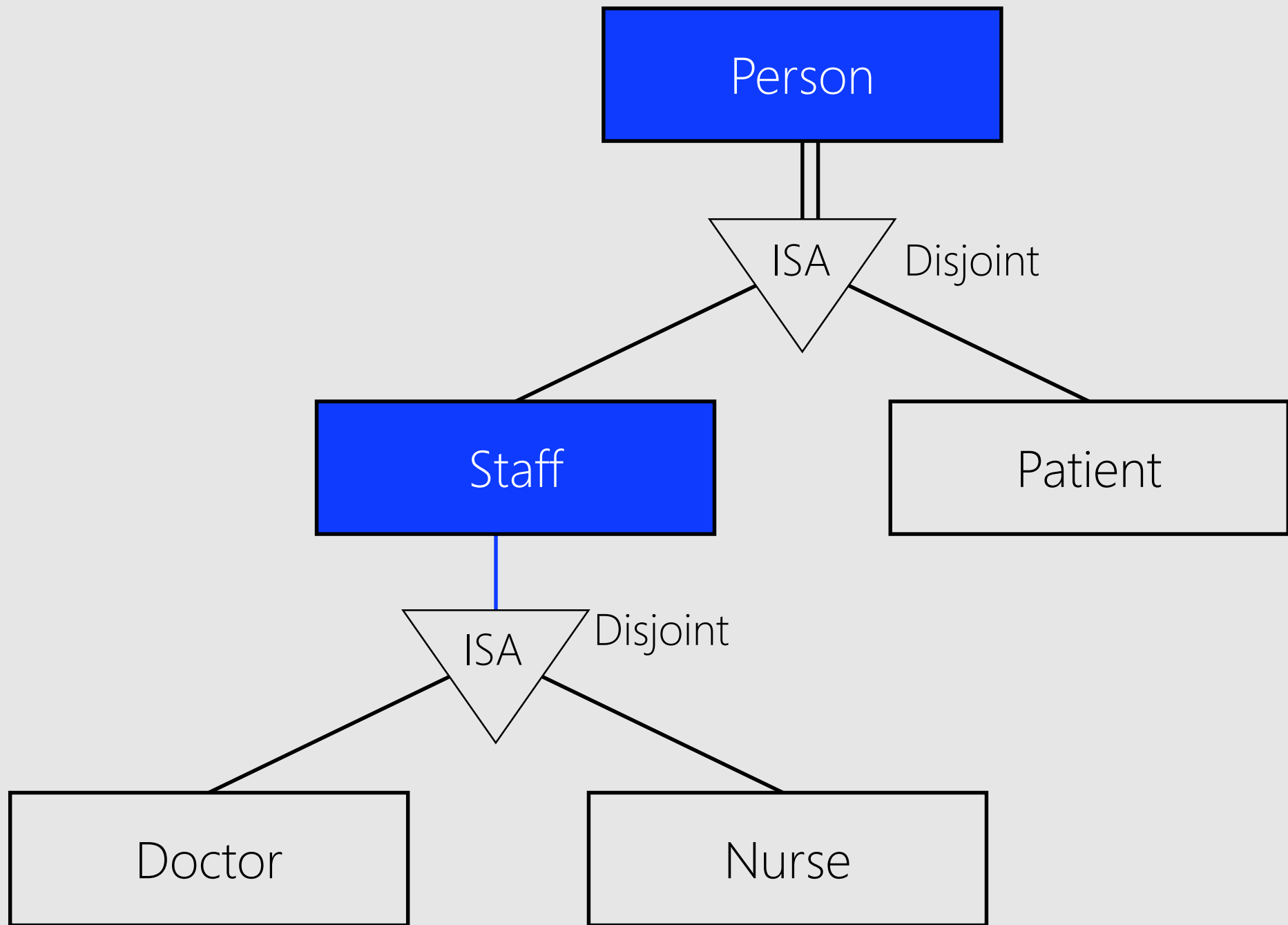


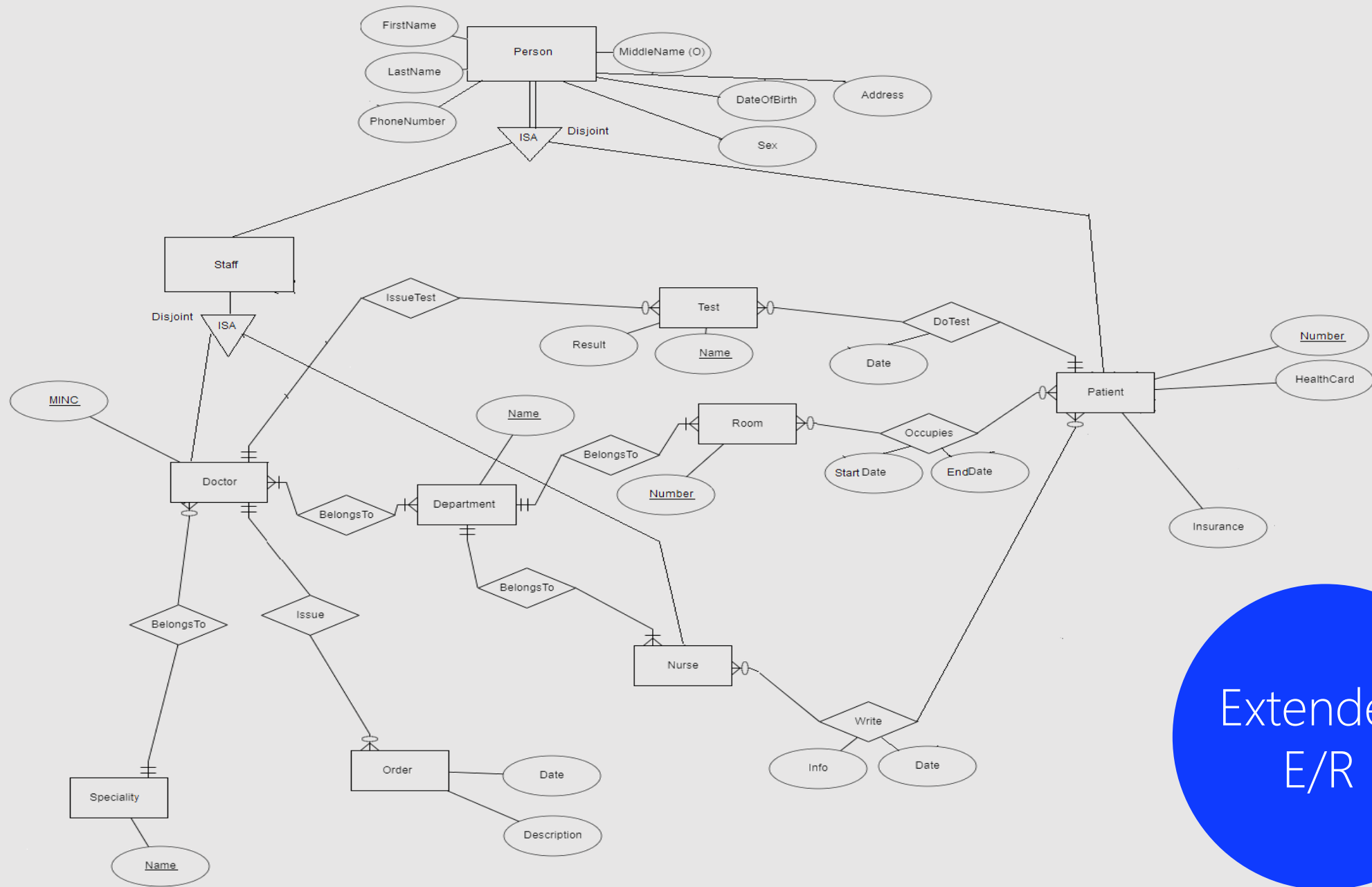
Relational

Hospital × IS-A

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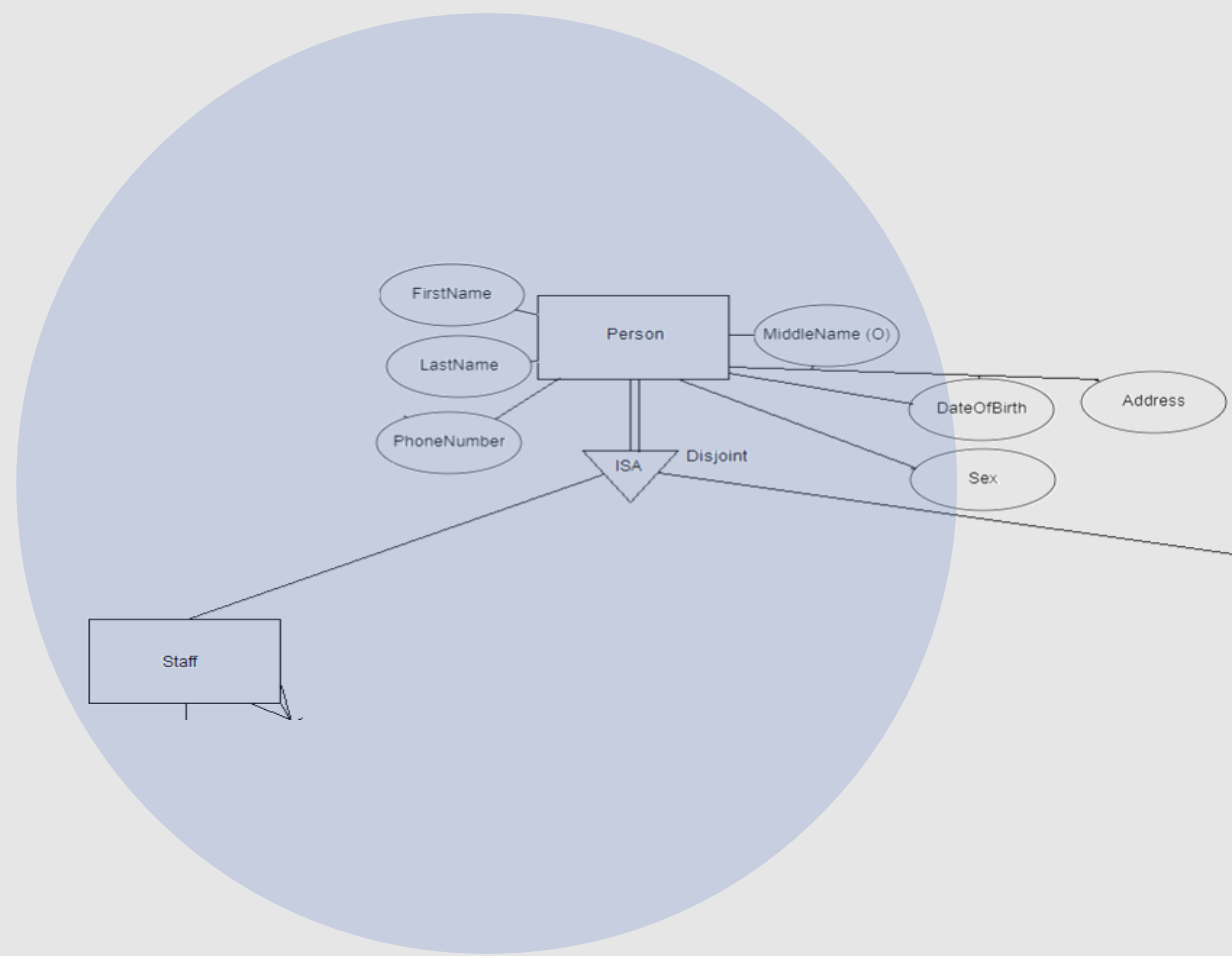


Extended
E/R

Hospital × IS-A Mapping

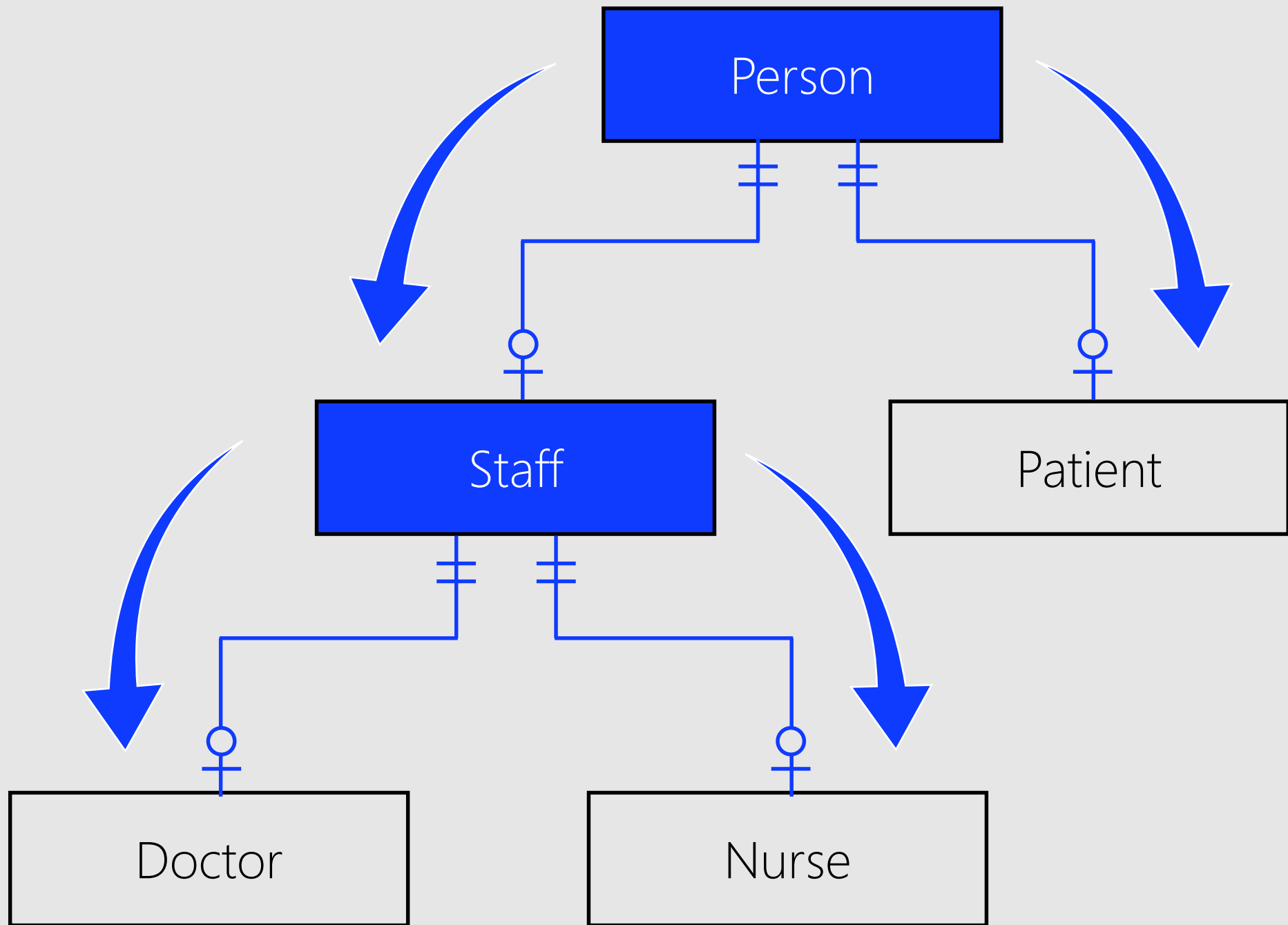
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R13: Person(Id,
 FirstName,
 MiddleName,
 LastName,
 Sex,
 DateOfBirth,
 Address,
 Phone)



R14: Staff(Id)

R1: Patient(Id, Number, HealthCardNo, InsuranceName), CK={Number} & Mandatory
R2: Doctor(Id, MINC, SpecialtyId), CK={MINC} & Mandatory, FK={SpecialtyId} & Mandatory
R4: Nurse(Id, DepartmentId), FK={DepartmentId} & Mandatory



R13: Person(Id, FirstName, MiddleName, LastName, Sex, DateOfBirth, Address, Phone)

R14: Staff(Id , PersonId)

FK={PersonId}, CK2={PersonId} & Mandatory

R1: Patient(Id, Number, HealthCardNo, InsuranceName, PersonId)

CK1={Number} & Mandatory

FK={PersonId}, CK2={PersonId} & Mandatory

R2: Doctor(Id, MINC, SpecialtyId, StaffId),

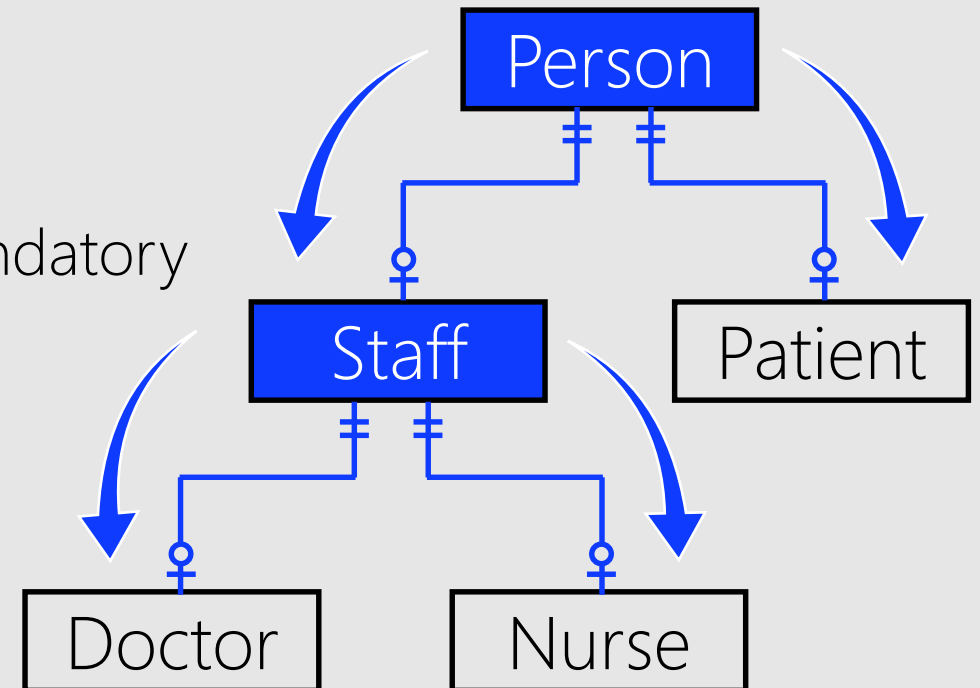
CK1={MINC} & Mandatory, FK1={SpecialtyId} & Mandatory

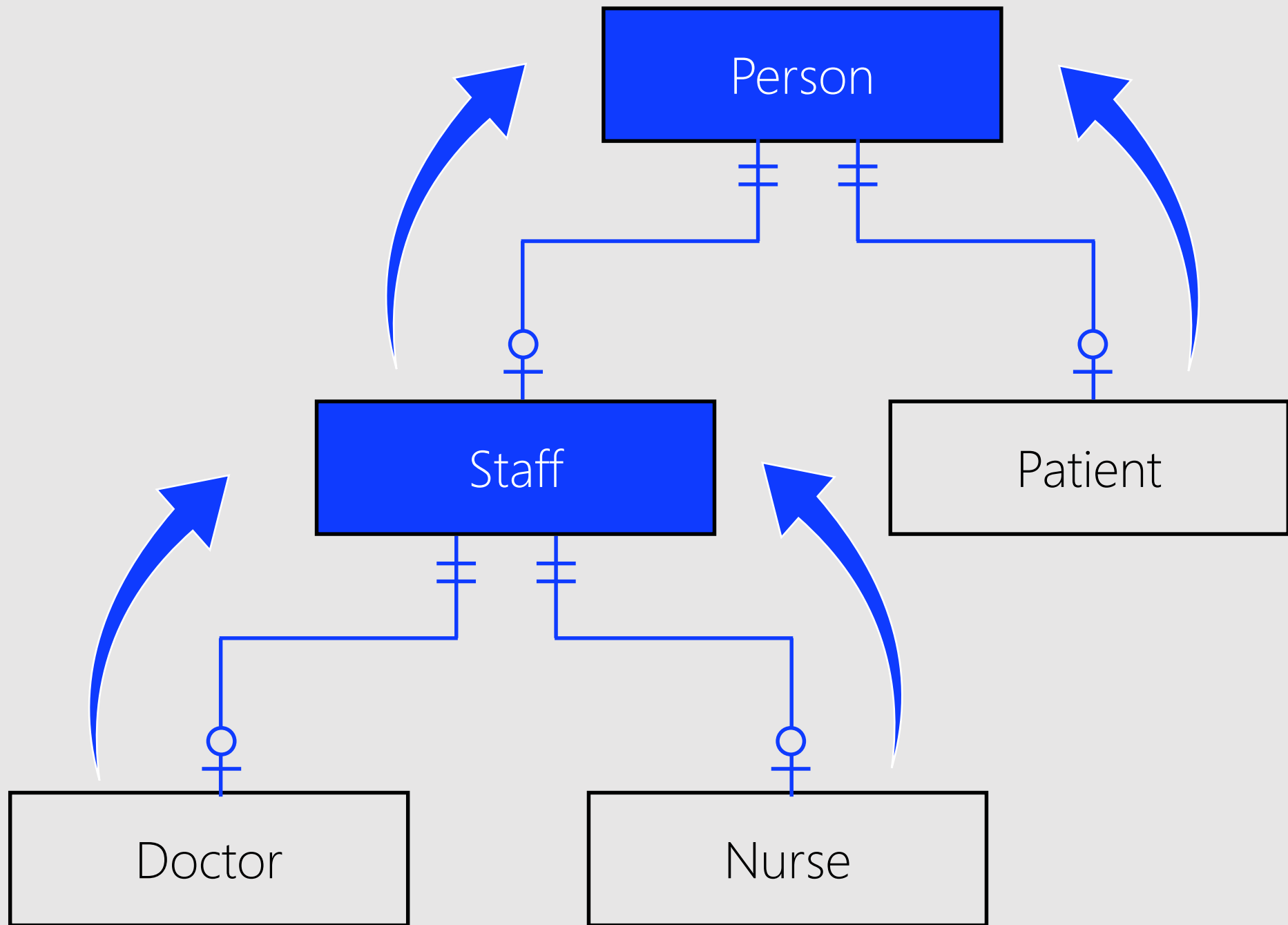
FK2={StaffId}, CK2={StaffId} & Mandatory

R4: Nurse(Id, DepartmentId, StaffId)

FK1={DepartmentId} & Mandatory

FK2={StaffId}, CK={StaffId} & Mandatory





R13: Person(Id, FirstName, MiddleName, LastName, Sex, DateOfBirth,
Address,
Phone,
StaffId,
PatientId)

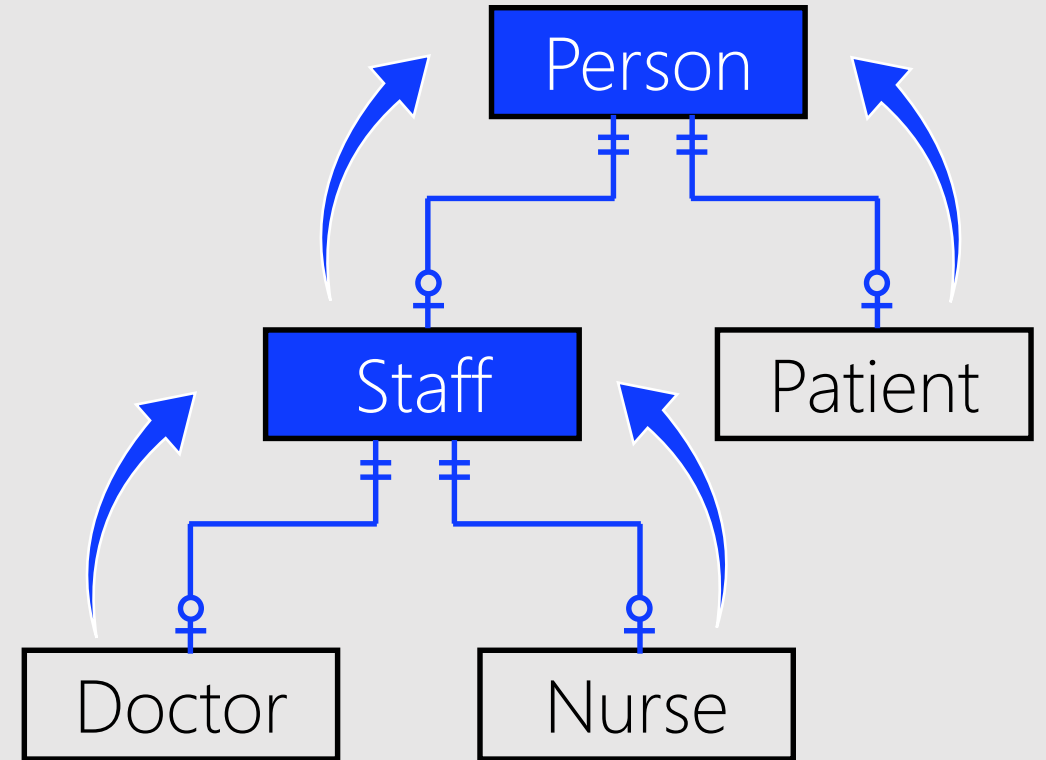
FK1={StaffId}, CK1={StaffId}

FK2={PatientId}, CK2={PatientId}

R14: Staff(Id, DoctorId, NurseId)

FK1={DoctorId}, CK1={DoctorId}

FK2={NurseId}, CK2={NurseId}



Must be optional. Cannot be Mandatory