**Justification for Normalized Relational Schemas**

Converting between the ER model we created in part two of this project and the relational model was simple enough. We converted every entity and relationship (connections) from the ER model into its own relation. We did not include any of our relationships inside of other tables, as this would have created many unwanted null values. Essentially, we followed the conversion process discussed in-class.

Below, we show that every table is in at least Boyce-Codd Normal Form (BCNF)

(I.e. in 3rd normal form, no transitive or partial dependencies; for any dependency A → B, A should be a super-key).

**R1)** (Employee) Relation 1 contains our employee information. Each employee is identified by their employee ID (employeeID) number. All other attributes are dependent on the ID, and therefore the left-hand side of our functional dependency (employeeID → employeeName, salary) is a super-key, which does indeed satisfy BCNF

**R2)** (Patient) Relation 2 contains the patient information. Each patient is identified by their unique patient ID (patientID) number. All other attributes are dependent on the ID, and therefore the left-hand side of our functional dependency (patientID → patientName, age, weight, inHomeCare, primaryPhysician) is a super-key, which satisfies BCNF.

**R3)** (Appointment) Relation 3 contains all information relating to an appointment. Each appointment is identified by its appointmentID. All other attributes are dependent on the key and therefore the left-hand side of our functional dependency (appointmentID → location, ddate, ttime, attended, satisfactionLevel) is the super-key, with no transitive or partial dependencies, satisfying BCNF.

**R4)** (Department) Relation 4 contains all information relating to a certain department. Each department is identified by its department ID (deptID) number. All other attributes are dependent on the ID, and therefore the left-hand side of our functional dependency (deptID → deptName) is a super-key, satisfying BCNF.

**R5)** (Vehicle) Relation 5 contains information relating to vehicles the hospital/department owns. Each vehicle is identified by a unique VIN number. All other attributes are dependent on this key, and therefore the left-hand side of our functional dependency (VIN → vehicleType) is a super-key, satisfying BCNF.

**R6)** (Ailment) Relation 6 contains information relating to an ailment. Each ailment is identified by a unique ailment name (ailmentName). All other attributes are dependent on this key, and therefore the left-hand side of our functional dependency (ailmentName → ailDescription) is a super-key, satisfying BCNF.

**R7)** (Medicine) Relation 7 contains information relating to a medicine. Each medicine is identified by a unique medicine ID (medID). All other attributes are dependent on this key, and therefore the left-hand side of our functional dependency (medID → medName, medCost, quantity, dosage) is a super-key, satisfying BCNF.

**R8)** (doctorIsA) Relation 8 contains information relating to doctors. The doctor entity is a child-entity of employee and inherits attributes from employee. Each doctor is uniquely identified by a employee ID (employeeID). All other attributes are dependent on this key, and therefore the left-hand side of our functional dependency (employeeID → employeeName, salary, specialty) is a super-key, satisfying BCNF.

**R9)** (nurseIsA) Relation 9 contains information relating to nurses. The nurse entity is a child-entity of employee and inherits attributes from employee. Each nurse is uniquely identified by an employee ID (employeeID). All other attributes are dependent on this key, and therefore the left-hand side of our functional dependency (employeeID → employeeName, salary, license) is a super-key, satisfying BCNF.

**R10)** (attends) Relation 10 contains information relating to attendance. Each attends relation is identified by a unique employee ID and appointmentID. All other attributes are dependent on the keys, and therefore the left-hand side of our functional dependency (employeeID, appointmentID → location, ttime, ddate) are super-keys, with no transitive or partial dependencies, satisfying BCNF.

**R11)** (tying everything together) Relation 11 contains information to gather the above relations together. The appointmentID can be used to uniquely identify every attribute of the tuple, since each event will only have unique numbers and can tie all information together accurately. Therefore, the left-hand side of our functional dependency (appointmentID → employeeID, patientID, deptID, VIN, ailmentName, medID, doctor, nurse) is a super-key, satisfying BCNF.