**3. 1 Make a list of all entities and their associated attributes**

In analyzing the cross reference table and the data dictionary of the Medical Clinic Wellness Group we have found a list of important entities within the clinic. Some of the entities identified are the patients, medical personnel, and administrative staff. Furthermore, within the clinic we determined that there are many moving parts within the day to day operations of the clinic itself, this will have to be its own entity within.

In the creation of entities come with their own attributes. The attributes provide data based on a single fact of the entity. For example the entity “patient” will have some of the attributes “patientLastName”, “patientFirstName”, “PatientDOB.” As stated all these attributes fall under the single entity of “patient”. With that we have created the following list of entities:

* Patient
* ProfesionalStaff
* Non-professionalStaff
* Operations
* Insurance
* Bills
* Treatment
* Schedule

The clinic’s workforce is split in two major categories. One is the medical staff and the other is the administrative staff. This in turn creates two entities that fall under medical and administrative staff. Based on the cross reference table and data dictionary the candidates attributes tied to the entity **professionalStaff** are the following:

practitionerFirstName, practitionerLastName, proStaffID, proStaffTitle, practitionerPhoneNumber, practitionerStamp, nurseFirstName, NurselastName, nurseSigniture, proStaffSigniture.

Within medical staff the attributes are geared toward the doctors and nurses of the clinic while other roles such as pharmacist or lab technician will be identified by the employee ID which has a unique key to distinguish medical from admin.

The assumed attributes for the nonProfessionalStaff are the following:

nonProfessionalStaffID, nonProfessionalSigniture, nonProfessionalFirstName, nonProfessionalLastName, nonProfessionalTitle

**Schedule**

The Schedule entity represents both Daily Master and Weekly Coverage Schedules, which are permanently edited by Administrator.

Potential attributes (Weekly Coverage) :staffID, staffWorkingTimeMonday, staffWorkingTimeTuesday, staffWorkingTimeWednesday, staffWorkingTimeThursday, staffWorkingTimeFriday, staffWorkingTimeSaturday

For Weekly Coverage staffID is the primary key here, so every working time is defined for specific staff members. It has no unique attributes, so it is going to be just an output screen, which uses appointmentID, which can give access for all other data, such as staffName, staffNumber etc.

**Patient**

Potential attributes of a patient are:

patientResponsibility, patientAge, patientAllergies, patientCheckIn, patientCheckOut, patientDOB, patientFirstName, patientID, patientLastName, patientName, patientPhoneNumber, patientPostalCode, patientCreditCardNumber, patientsPhoneNumber, patientStreet, patientType, patientSocialSecurityNumber, patientTaxIDNumber

**Treatment:**

Prescription, diagnostic tests

**Insurance**

amountPaid, amountDue, patientFirstName, patientLastName, sumInsured, policyNumber, purchaseDate, policyNumber, physiciansFaxNumber, physicianOrderingTest, physicianSignature, physicianStamp, primaryPhysician, patientPhoneNumber, patientPostalCode, patientsCreditcardnumber, patientsPhoneNumber, patientStreet, physiciansFaxNumber, physicianSignature, physicianStamp, primaryPhysician, taxIdentificationNumber(SSN).

**Bill**

billID#, description, statementDate, amountPaid, amountDue, dueDate, dueNow, patientsCreditcardnumber, expirationDate, visa, mastercard, otherCard, provider, case, description, description/note, charges, credit, cvsCode, totalOutstanding, estimatedInsuranceResponsibility, patientResponsibility

**Operations**

Possible attributes of Operations include:

Date, medicalRecordNumber, patientID, patientFirstName, patientLastName, patientDOB, operationPerformed, surgeon, attendingNurse, notes, roomID#, sexOfNewborn, weightOfNewborn, typeOfDelivery, midwife, followUpAppointments, height, IVsites, painLevel, patientAllergies, pulseRate, reasonForStay, recoveryPlan, respirationRate, timeIn, timeOut, weight

We can create a composite attribute patientName using patientFirstName and patientLastName. Calculated or ephemeral data include date, weightOfNewborn, height, painLevel, pulseRate, respirationRate.

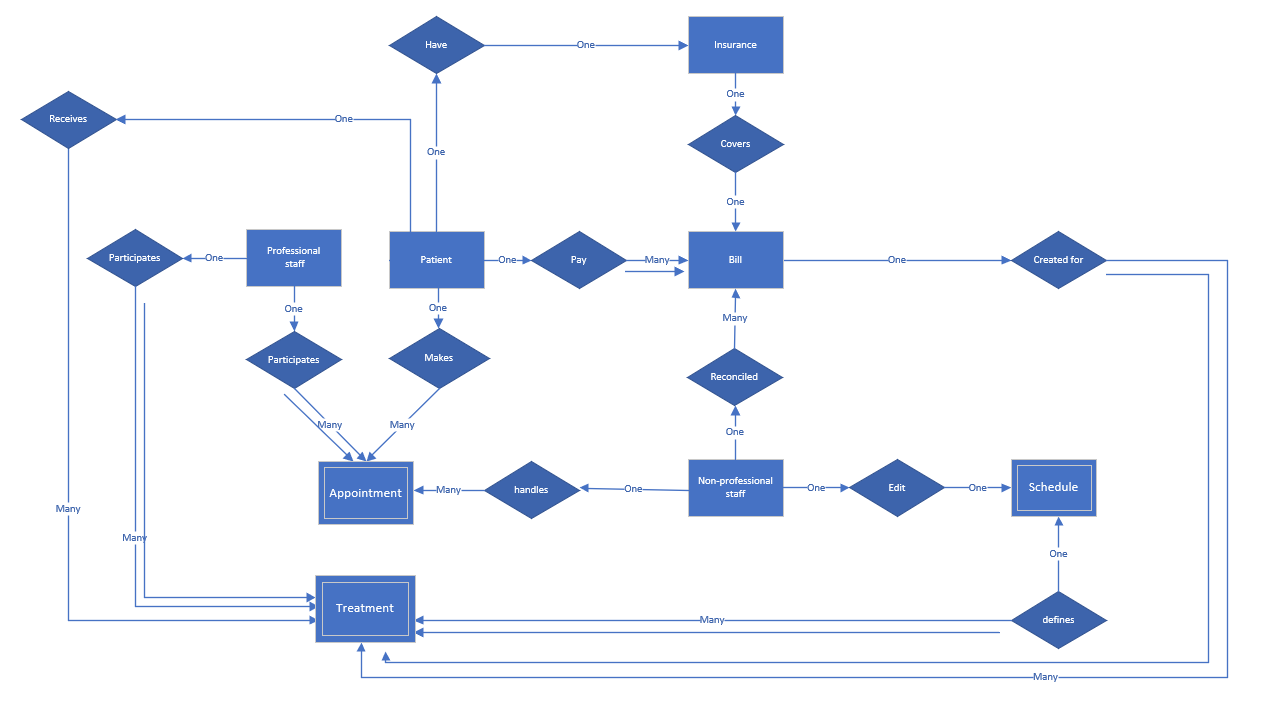
We can exclude patientFirstName, patientLastName, and patientDOB since they are attributes under the Patient entity.

The attributes for the Operations entity are Date, medicalRecordNumber, patientID, patientFirstName, patientLastName, patientDOB, operationPerformed, surgeon, attendingNurse, notes, roomID#, sexOfNewborn, weightOfNewborn, typeOfDelivery, midwife, followUpAppointments, height, IVsites, painLevel, patientAllergies, pulseRate, reasonForStay, recoveryPlan, respirationRate, timeIn, timeOut, weight. Medical Record Number is the key in this entity since it uniquely identifies an operation and/or birth.

**3.2 Make a list of relationships to be represented and any descriptive attributes for them**

* **Receives** - patient is related to treatment that is being received
* **Participates** - defines the correlation between one entity and the other, for example the entity medical staff is linked to the entity appointment and treatments.
* **Makes** - is the linked action between the patient and scheduled or walk in appointments to
* **Handles** - is the relationship between the admin staff and the appointments that are scheduled
* **Pay -** shows the relationship between the act of paying for the attribute of “bill” for services and treatment provided
* **Have** - related to the insured status of patients
* **Edit** - admin staff creates and makes changes to medical staff based on the appointments
* **Reconciled** - bridges the receivement of payment whether a month to month basis or paid in full collected by the bookkeeper within the adminStaff
* **Covers** - relationship between how much of the medical bill is covered by the insurance and how much the client will have to pay
* **Created for** - link the relationship between the the treatment and a breakdown of the cost of treatment
* **Defines** - the link between the schedule and when treatment will be conducted

**Step 3.3 - Draw an E-R diagram to represent the enterprise**. Be sure to identify relationship participation and cardinality constraints, any weak entity sets, and role names, if needed.



Picture 1 - The E-R diagram for the Clinic.

The E-R diagram is shown in *ER diagram Clinic Team 10.vsdx* file as well as on picture 1 below.

We will describe the diagram starting with the Patient Entity. A patient is able to make an appointment to seek care from a professional staff, so we created the Makes Relationship and the Appointment Entity. Appointment is a weak entity because it uses data from Patient and Professional Staff. We assign patientID as the superkey for the Patient entity since this attribute uniquely identifies the patient. The relationship between Patient and Appointment is one-to-many since a patient can make multiple appointments. There is partial participation between the Patient and Make relationship because the patient may cancel the appointment or not show up to the appointment.

Next we add the Professional Staff entity. We assign staffID as the superkey for the Professional Staff entity since this attribute uniquely identifies the professional staff. Professional staff are assigned and required to attend the appointment, so there is total participation between Professional Staff and the Participate relationship. Additionally, it is one-to-many because one professional staff is able to provide care to multiple patients in the clinic.

The patient may have only one insurance, so in the Have Relationship there is a one-to-one relationship with the Insurance entity. There is partial participation between the Patient entity and the Have relationship since the patient may not have insurance. The Covers relationship connects the Insurance entity and the Bill entity. The Covers relationship Insurance may cover the patient’s bill, so the Covers Relationship was created to connect the Insurance entity and Bill entity. This relationship is one-to-one since only one insurance company is responsible for paying the bill. There is partial participation between Insurance and the Covers relationship since. insurance may only cover part of the payment, so the patient may have an out of pocket cost. The Pay Relationship is one-to-many (one client can pay many bills) and total participation.

The bills are created for the treatment by Created For Relationship. The treatment is a weak entity, which brings data from different sources. It is one-to-many with total participation because one bill can be created for many treatments.

The non-professional staff can handle appointments. reconcile bills and edit schedules. For all of them, it is partial participation and one-to-many for Handles and Reconciled Relationships and one-to-one for Edit Relationships.

Schedule defines the treatment, so the Defines Relationship is one-to-many with total participation. Speaking about Patient, they receive the treatment, so their relationship is one-to-many with partial participation, whereas the medical staff must be in treatment, so it is one-to-many with total participation.

3.4

**accident** type of accident recorded

**address** the location of patient's residence

**amex** credit card company listed for a patient using an AmEx card

**amountPaid** total amount paid by patient or insured

**amountPaid** total amount paid thus far

**amountDue** total outstanding amount due

**appointment** reason for patient visit

**appointmentDate** the date of the appointment, format MM/DD/YYYY

**appointmentID** unique identificator for appointments. Table contains patientID, staffID, **appointmentDate** the given date the patient is expected to be at the clinic

**appointmentTime** the given time the patient is expected to be at the clinic

**attendingNurse** the attending nurse are placed in operation rooms, delivery rooms, or recovery rooms for patients who are recovering after surgery/operation; they assist in operations and/or deliveries, they monitor postoperative vital signs, assess levels of consciousness, and carefully observe patients for any adverse effects of a surgery

**attendingPractioner** the practitioner assigned to the patient who is responsible for the care of a patient in the recovery room; the practitioner also prescribes medication and/or pain relievers and provides follow-up care

**billID#** number of the monthly bill

**bloodPressure** the current blood pressure of the patient, which is the measurement of the force that moves blood through the circulatory system; a normal reading is 120/80 mmHg; the attending nurse will check the blood pressure every 2-4 hours

**bloodType** type of blood patient has

**BMI** the body mass index is the mass divided by the square of the body height; this is a measure of body fat based on height and weight of adult patients

**case** reason of service provided

**charges** amount charged by physician

**coInsurance** a percentage to pay of total insurance

**condition** patient's health state

**copayment** amount to pay after you’ve met deductible

**credit** amount provided on credit

**csvCode** security code on the card

**dateOfTreatment** the date the patient underwent treatment, format MM/DD/YYYY

**dateIn** the date the patient was admitted

**dateOfReport** date of the medical report, format 24hr hh:mm

**dateOut** the date the patient is released

**deductible** amount to pay before insurance plan starts

**description** type of receipt to patient

**description/note** physician's narrative regarding patient's health

**diagnosis** the identification an illness or other problem by examination of the symptoms from a medical doctor

**directions** complete directions of use of the drug

**discover** credit card company listed for a patient using a Discover card

**drugName** name of the prescribed drug to the patient

**dueNow** amount expected to be paid by end of the month

**dueDate** date current monthly payment is due

**email** clinic's email

**emergencyDay** the day of week when the staff worker is on emergency number

**employeeFirstName** the first legal name of the employee

**employeeID#** unique identification number each employee will have, medical and admin

**employeeLastName** the last family name of the employee

**employeeTitle** the role the employee is in the clinic (nurse, doctor, receptionist)

**estimatedInsuranceResponsibility** insurance provider's share of outstanding amount

**exam** type of examination conducted on patient

**expirationDate** credit card's expiration date

**flexibleSpendingAmount** employer pays you for this account

**followUpAppointments** follow up appointments after being discharged from the recovery room based on diagnosis and condition

**formulary** list of medicines your insurance covers

**genericMedicines** medicines with same ingredients but far less expensive **highDedictibleHealthPlan** a plan with higher deductibles

**healthSavingsAccount** Personal savings account used for healthcare

**height** the height of the patient expressed in the imperial unit

**HMO** health maintenance organization

**ICD-9Code** the International Classification of Diseases, 9th Revision

**illness** a disease or period of sickness diagnosed by physician

**in-Network** providers who are part of your insurance network

**information** information related to patient's condition

**injury** type of injury treated by physician

**inPatientcare** care that requires a hospital stay and continuous supervision by a healthcare provider

**insuredFirstname** first/legal name of the insured

**insuredLastname** last name of the insured

**IVSites** peripheral IVs are cannula/catheter inserted into a small peripheral vein to allow the flow of medications, fluids and/or blood products while recovering; common places where an IV site is located are on the hand, wrist, forearm, foot, or leg

mail clinic's mail address

**mastercard** credit card company listed for a patient using a Mastercard

**medicaid** Medicaid provides free or low-cost health insurance to certain groups Network The doctors, hospitals, and suppliers your health insurer has contracted with to deliver healthcare service

**medicalRecordNumber** a unique identification number that locates a specific operation or birth

**midwife** health professional who cares for mothers and newborns around childbirth

**notes** observations and/or remarks noted during an operation or a birth

**operationPerformed** the type of operation performed on the patient by the doctor

**operationType** type of operation that patient will undergo or underwent

**organDonor** whether or not the patient is an organ donor

**otherCard** credit card company not listed within the options

**outOfNetwork** care providers who are not a part of your insurance network outPatientCare Care that does not require an overnight stay in the hospital

**painLevel** the current pain level a patient is experiencing; based on a scale from 1 to 10 with 10 being at its worst

**patientResponsibility** patient's share of outstanding amount

**patientAge** age of patient expressed in years

**patientAllergies** list of allergies patients has, for example medications, plants, or foods

**patientCheckIn** time patient checks in

**patientCheckOut** time patient checks out

**patientDOB** the date of birth of the patient expressed in MM/DD/YYYY

**patientFirstName** the legal first name of the patient

**patientID** the given identification number of the patient created by the clinic

**patientLastName** the last legal name of the patient

**patientName** the given name of the patient

**patientPhoneNumber** the telephone number of the patient

**patientPostalCode** postal code in which patient resides

**patientsCreditCardNumber** patient's number of credit card

**patientsPhoneNumber** patient's mobile contact information

**patientStreet** number and street name of patient residence

**patientType** the medical classification of the patient (emergency, urgent, elective, routine care, expecting mother, etc)

**patientSocialSecurityNumber** the unique number used to track the income and determine state funded benefits

**patientTaxIDNumber** in lieu of social security number for non citizens

**paymentAddress** the address to which to send payments

**payment** patient's payment plan

**pharmacistsName** name of pharmacists who delivers medicines to patient PPO Stands for “preferred provider organization” and is a type of health insurance plan

**phlebotomists** the person who draws the blood for the test

**physicianFirstname** first/legal name of the examining physician

**physicianLastName** last name of the examining physician

**physicianOrderingTest** name of the physician who ordered the laboratory test

**physiciansFaxNumber** physician's fax number

**physicianSignature** physician's signature on the statement for the insurance provider

**physiciansPhoneNumber** physician's mobile number of contact

**physicianStamp** physician's stamp on the statement for the insurance provider

**policyNumber** type of policy of the insurance provider

**primaryPhysician** patient's physician

**pulseRate** the current pulse rate of the patient; the attending nurse will monitor the pulse rate every 2-4 hours

**purchaseDate** date the service was provided, format MM/DD/YYYY

**reasonForStay** description of the purpose of the patient's stay in the recovery room

recommendation physician's recommendation to improve patient's condition

**recoveryPlan** a plan written by the attending practitioners of instructions a patient should follow after being discharged from the recovery room

**respirationRate** the respiration rate of the patient, which is measured by the number of breaths taken per minute; the attending nurse will check the respiration rate every 4 hours.

**roomID#** unique identification number given to exam room, OR, delivery, and recovery

**roomNumber** the number of the room the operation/delivery took place

**RxNumber** the registration number printed on the receipt

**sexOfNewBorn** the sex assigned to newborn once born

**signature** patient's signature on monthly bill

**specialty** physician's field of expertise

**staffWorkingTimeFriday** the time when the staff works on Friday

**staffWorkingTimeMonday** the time when the staff works on Monday

**staffWorkingTimeSaturday** the time when the staff works on Saturday

**staffWorkingTimeThursday** the time when the staff works on Thursday

**staffWorkingTimeTuesday** the time when the staff works on Tuesday

**staffWorkingTimeWednesday** the time when the staff works on Wednesday

**statementDate** date the clinic's monthly statement was issued

**sumInsured** total coverage of the insurance

**surgeon** the name of the surgeon in the format

**surgeonID** unique identifiers given to surgeons

**symptoms** symptoms noted by the examining physician

**taxIdentificationNumber(SSN)** physician's tax code

**temperature** the current temperature of the patient measured in Fahrenheit; the attending nurse will check temperature every 2-4 hours

**testOrdered** laboratory test ordered by doctor

**testResult** result of the test measured in appropriate units based on testOrdered

**timeIn** the time the patient was admitted

**timeOfReport** time of medical report

**timeOut** the time the patient is released

**totalPrice** total price of the medication

**tripCanceled** if the patient was in no state to travel, was the trip canceled?

**typeOfDelivery** the type of method used to deliver a newborn; this includes vaginal birth, natural birth, scheduled Cesarean, unplanned Cesarean, vaginal birth after C-Section (VBAC), or scheduled induction

**unableToTravel** the patient was unable to travel

**underlyingMedicalConditions** a medical condition or disease that interferes with daily life or activities and requires continuous medical attention or medical care that lasts for longer than one year

**visa** credit card company listed for a patient using a Visa card

**walkIn** for patients that did not have an appointment and walked into the clinic

**weight** the weight of the patient, expressed in the imperial unit

**weightOfNewborn** the weight of the newborn expressed in the imperial unit