Assumptions:

1. couple & pregnancy
   a. a couple must be involved in at least one pregnancy
   b. a pregnancy cannot exist without being associated with a couple
   c. the number of pregnancies is tracked on each couple, not on each mother
2. baby & pregnancy
   a. a baby must be associated with exactly one pregnancy
   b. a pregnancy can be associated with 0 to many babies
   c. since it is possible to not have any specific info related to the baby at a very early stage of a pregnancy (even the number of babies cannot be determined for sure until 10 weeks), a pregnancy can exist without an association with a baby until there is one with some valid information for sure
   d. the number of babies associated with a pregnancy can be determined by querying all babies related to a pregnancy
3. mother & couple
   a. a couple must have exactly one mother
   b. a mother must be involved in at least one couple
4. father & couple
   a. a couple does not necessarily need a father (single mother)
   b. a couple can have at most one father
   c. a father must be involved in at least one couple
5. midwife & health care institution
   a. a midwife works for exactly one health care institution
   b. a health care institution can have 0 to many midwives
6. midwife & pregnancy
   a. a midwife can be associated with 0 to many pregnancies
   b. a pregnancy can be associated with 0 to 2 midwives (a pregnancy does not have a relation with any midwife until one is assigned)
   c. a midwife associated with a pregnancy is considered to be either the primary midwife and the backup midwife
   d. a midwife is associated with a specific pregnancy rather than a couple because it is possible for a midwife to be assigned to the same couple multiple times for multiple pregnancies
7. institution & info session
   a. an info session must be associated with exactly 1 institution (an institution will first decide to host an info session and can then have a midwife assigned at a later point)
   b. an institution can host 0 to many info sessions
8. midwife & info session
   a. an info session can exist without being associated with a midwife, an info session is held by exactly one midwife
   b. a midwife can hold 0 to many info sessions
9. couple & info session
   a. a couple can register for 0 to many info sessions

     b.   a couple can attend or not attend any info sessions which they registered for

     c.   after attending an info session, a couple may get assigned a midwife after expressing their interest (e.g. via telephone) but the details are not kept track as such information is omitted (as per instruction)

     d.   an info session can have 0 to many couples registered

10. couple & health care institution

     a.   a couple can receive 0 to 1 invitation for an info session by each health institution and can receive multiple invitations from different health institutions

         i.   once they decide to register, the couple will then choose which session they want to register for

         ii.   the same couple will not receive a new invitation for subsequent pregnancies but still can register for one

     b.   a health care institution can invite 0 to many couples to attend an info session

         i.   a health institution will not invite a couple who has been invited, however, couples can still register to attend info sessions again voluntarily any time or for any further pregnancy (e.g. by contacting any health care institution themselves)

11. midwife & pregnancy & appointment

     a.   an appointment must be associated with exactly one midwife and exactly one pregnancy

     b.   a midwife can be associated with 0 to many appointments

     c.   a pregnancy can be associated with 0 to many appointments

12. appointment & note

     a.   an appointment can have 0 to many notes

     b.   a note must be associated with exactly 1 appointment

     c.   a note can be taken anytime once an appointment is booked (adding a note to an appointment beforehand or later on is possible)

13. appointment & test

     a.   an appointment can have 0 to many tests

     b.   a test must be prescribed by exactly 1 appointment, a test cannot be prescribed without a relation to an appointment, however, it does not need to be prescribed at the same time as the appointment

14. midwife & test

     a.   a test must be prescribed by exactly one midwife, the midwife associated is tracked from the appointment associated with the test

     b.   a midwife can prescribe 0 to many tests associated with 1 appointment

15. test & mother/ baby

     a.   a test must be associated with exactly one mother or baby

     b.   the relationship between a test and a pregnancy can be tracked

         i.   if the test is for the baby, the baby is associated with exactly 1 pregnancy

         ii.   if the test is for the mother, the midwife is only associated with 1 pregnancy for a specific mother at the time the test is prescribed

     c.   a mother can be associated with 0 to many tests

     d.   a baby can be associated with 0 to many tests

16. test & technician
    a. a test has a relationship with a technician only once the technician conducts the test and in that case, the test is conducted by exactly one technician
    b. a technician can have conducted 0 to many tests
17. father
    a. a father has an artificial id as they can be identified uniquely as an individual but there is no unique required information about a father stored in the system
18. pregnancy
    a. the number of pregnancies a couple had can be tracked by querying all previous pregnancies related to a couple by comparing a time to the birth time frame of a pregnancy
19. institution
    a. a health care institution may have multiple emails in reality and this might cause trouble if email is chosen as the key, thus, an artificial key is assigned for each institution
    b. a health care institution must be either a community clinic or a birthing center, no other type modelled
20. lab
    a. the lab where a test is conducted is not tracked by the system (out of the scope)
21. birth location
    a. birth is given at home or at a birthing center
    b. a pregnancy can have exactly one birth location (one home or one birthing center)
    c. if the pregnancy is delivered at a birthing center, then the address of the birthing center is considered to be the actual location of birth
    d. if the pregnancy is not delivered at a birthing center, then the address of mother is considered to be the actual location of birth (birth location is home)
    e. even if a pregnancy is assigned with a midwife who works at a community clinic, the birth of the baby can still be given at any birthing center if desired
    f. even if a pregnancy is assigned with a midwife who works at a birthing center, the birth of the baby can still be given at another birthing center if desired

Restrictions:
1. The model cannot ensure that a midwife is not associated with multiple info sessions with the same date and time. This must be ensured during the development of the application.
2. A midwife can only book appointments and prescribe tests for couples which have the midwife assigned to. This cannot be strictly prevented by the model but should be enforced during the development of the application.
3. A midwife should no longer be able to book appointments or prescribe tests for a couple involved in a pregnancy after a certain time frame post giving birth. This is meant to prevent situations such as a couple having appointments with a midwife they got assigned to for a previous pregnancy as they should be seeing a newly assigned

midwife (can be the same midwife but must be assigned agained) for a new pregnancy. This should be ensured during the development of the application.
4. A test can only be prescribed to either the mother or the baby, not both. This must be ensured during the development of the application.
5. The midwife assigned to be the host of an info session must be one who works for the institution. This must be ensured during the development of the application.
6. There can be at most 2 midwives assigned for a pregnancy and the first one assigned must be the primary midwife and the second one must be the backup midwife. This must be ensured during the development of the application.
7. An info session will not take place until a midwife is assigned to host it. However, couples are allowed to register for the session given it exists and is scheduled at a certain time. The administrator of the system should make sure that a midwife is assigned before the start of the info session or the session must be cancelled (cannot happen without a midwife).
8. The test date of a test cannot be earlier than the prescription date and the exam date also cannot be earlier than the test date. This must be ensured during the development of the application.

Relational Translation:
Mothers(ramq, name, tel, email, DOB, bloodType, address, profession)
Fathers(fid, ramq, name, tel, email, DOB, bloodType, address, profession)
Couples(cid, ramq, fid)
foreign key ramq references Mothers
foreign key fid references Fathers

Pregnancies(cid, birthTimeFrame, expectationOne, expectationTwo, finalExpectation, hcid)
foreign key cid references Couples
foreign key hcid references HCInstitutions

Invitations(cid, hcid)
foreign key cid references Couples
foreign key hcid references HCInstitutions

Registrations(cid, isid, attended)
foreign key cid references Couples
foreign key isid references InfoSessions

Babies(bid, cid, birthTimeFrame, name, gender, bloodType, DOB, birthTime)
foreign key cid, birthTimeFrame references Pregnancies

MidwifeAssignments(cid, birthTimeFrame, pid, type)
foreign key cid, birthTimeFrame references Pregnancies
foreign key pid references Midwives

Appointments(aid, cid, birthTimeFrame, pid, date, time)
foreign key cid, birthTimeFrame references Pregnancies
foreign key pid references Midwives

InfoSessions(isid, hcid, pid, date, time, language)
foreign key hcid references HCInstitutions
foreign key pid references Midwives

Midwives(pid, hcid, name, tel, email)
foreign key hcid references HCInstitutions

HCInstitutions(hcid, name, tel, email, address, website)

CommunityClinics(hcid)

BirthingCenters(hcid)

Notes(nid, aid, date, time)
foreign key aid references Appointments

Technicians(techid, name, tel)
Tests(tid, ramq, bid, aid, techid, type, prescriptionDate, testDate, examDate, result)
foreign key ramq references Mothers
foreign key bid references Babies
foreign key aid references Appointments
foreign key techid references Technicians

Aspects of ER model not captured (should be ensured during the development of the application):
1. The participation constraint of Mothers in the relationship with Couples cannot be reflected by the model.
2. The participation constraint of Fathers in the relationship with Couples cannot be reflected by the model.
3. The participation constraint of Couples in the relationship with Pregnancies cannot be reflected by the model.
4. The participation constraint of Midwives in the relationship with HCInstitutions cannot be reflected by the model.
5. The participation constraint of InfoSessions in the relationship with HCInstitutions cannot be reflected by the model.
6. The participation constraint of Tests in the relationship with Mothers or Babies cannot be reflected by the model.
7. The participation constraint of Tests in the relationship with Appointments cannot be reflected by the model.

8. The participation constraint of Notes in the relationship with Appointments cannot be reflected by the model.
9. The participation constraint of Appointments in the relationship with Pregnancies and Midwives cannot be reflected by the model.
10. The participation constraint of InfoSessions in the relationship with HCInstitutions cannot be reflected by the model.
11. The non-overlapping and covering properties of the ISA hierarchy for health care institutions cannot be reflected by the model.

restrictions of ER model in context of relational translation:
1. For one of the restrictions described above, a test can only be prescribed to either the mother or the baby, not both. In particular, one of ramp and bid of Tests must be null while the other has a valid value.
2. The type attribute in MidwifeAssignments indicates whether the midwife assigned is a primary one or a backup. There can be at most 1 primary midwife and 1 backup midwife for a pregnancy and a backup midwife cannot exist unless there is already a primary midwife.