

COMP421 Project 2

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1 Relational Model

1.1 Assumptions

1. Only couples with a pregnancy will register in the system.
2. A midwife can host one or multiple info sessions, or does not hold any info session at all.
3. A midwife is employed by one and only one institute.
4. The primary and backup midwife of a pregnancy do not necessarily need to work in the same institute.
5. An institute may have no midwife associated with it.
6. Some lab technicians may have done no tests.
7. An information session is hosted by one and only one midwife.
8. Every pregnancy has one primary midwife and one backup midwife, and they should be different.
9. Every baby belongs to exactly one pregnancy, but every pregnancy could have one or multiple babies.
10. If a pregnancy is recorded in the system, then the corresponding baby information should also be recorded in the system after the baby is born.
11. Every pregnancy has only one location of birth and one due date.

1.2 Restrictions

1. Primary midwife and backup midwife of a couple should be different.
2. The system should at least record the following information of a biological father: name, date of birth, phone number and profession. Other attributes are optional, but if provided, the system should still store them.
3. For the Institution entity set, all information except the website attribute is mandatory.

4. Only mothers and babies are qualified to have tests.

More restrictions are in the section Pending constraints below.

1.3 Relational Translation

1. Mother(hcardid, name, email, phone, birthday, address, profession, birthframe, mbloodtype)
2. Father(fatherid, fname, femail, fphone, fhcardid, fbirthday, faddress, fprofession, fbloodtype)
3. Couple(coupleid, isInterested, hcardid, fatherid) hcardid ref Mother, fathered ref Father
4. Institute(iemail, iname, iphone, iaddress, website)
5. CommClinic(iemail) iemail ref Institute
6. BirthCenter(iemail) iemail ref Institute
7. Midwife(pracid, mname, mphone, workplace, memail, iemail) iemail foreign key referencing relation Institution
8. InfoSession(sessionid, sdate, stime, language, pracid) pracid ref Midwife
9. invited(coupleid, sessionid, attend) sessionid ref InfoSession
10. Pregnancy(coupleid, numpreg, numbabies, expdued, estdued, ishomebirth, ppracid, bpracid, iemail) coupleid ref Couple, ppracid ref Midwife, bpracid ref Midwife, iemail ref BirthCenter
11. Baby(babyid, bname, gender, bbloodtype, birthdate, birthtime, coupleid, numpreg) (coupleid, numpreg) ref Pregnancy
12. Technician(techid, tname, tphone)
13. Test(testid, ttype, presdate, sampledate, labdate, result, pracid, coupleid, numpreg, babyid, techid) pracid ref Midwife, (coupleid, numpreg) ref Pregnancy, babyid ref Baby, techid ref Technician
14. Appointment(aptmtid, adate, atime, coupleid, numpreg, pracid) (coupleid, numpreg) ref Pregnancy, pracid ref Midwife
15. Observation(noteid, odate, otime, content, aptmtid) aptmtid ref Appointment
16. DueDate(duedateid, usounddate, lmpdate, finaldate, aptmtid) aptmtid ref Appointment

2 Pending constraints

1. Primary midwife and backup midwife associated with the same pregnancy should be different.
2. A midwife cannot host 2 or more information sessions at the same time.
3. A midwife cannot have 2 or more appointments at the same time.
4. The time of the observation (note) related to an appointment should be later than the time of appointment.
5. Only couples who got invited and attend an information session and later on show interests to the program can be assigned a midwife.
6. A test should be related to one of the entity in the Pregnancy entity set or one of the entity in the Baby entity set, not both of them and not entities in any other entity sets.
7. The result of the test should be uploaded by the technician who does the actual lab work.
8. A pregnancy cannot be marked as home birth and at the same time involves in a relationship with a birthing center.
9. The midwife setting appointment with a pregnancy should be one of the midwives (primary or backup) associated with the pregnancy.

3 SQL Queries

Question 5(a)

The SQL query to extract the needed data in 5(a) is:

```
WITH getvalid(apdate, aptime, coupleid) AS
(
    SELECT CAST(a.adate AS DATE), a.atime, p.coupleid
    FROM Appointment a, Midwife m, Pregnancy p
    WHERE a.pracid = m.pracid AND
          a.coupleid = p.coupleid AND a.numpreg = p.numpreg AND
          m.mname = 'Marion Girard' AND
          a.adate >= '2022-03-21 00:00:00' AND
          a.adate <= '2022-03-25 00:00:00'
)
SELECT getvalid.apdate, getvalid.aptime, m.hcardid, m.name, m.phone
FROM getvalid, Mother m, Couple c
WHERE m.hcardid = c.hcardid AND getvalid.coupleid = c.coupleid
;
```

The output of executing the SQL statement above is:

```
db2 => connect to cs421;

Database Connection Information

Database server      = DB2/LINUXX8664 11.5.4.0
SQL authorization ID = YLIU335
Local database alias = CS421

db2 => WITH getvalid(apdate, aptime, coupleid) AS
(
    SELECT CAST(a.adate AS DATE), a.atime, p.coupleid
    FROM Appointment a, Midwife m, Pregnancy p
    WHERE a.pracid = m.pracid AND
          a.coupleid = p.coupleid AND a.numreg = p.numreg AND
          m.mname = 'Marion Girard' AND
          a.adate >= '2022-03-21 00:00:00' AND
          a.adate <= '2022-03-25 00:00:00'
)
SELECT getvalid.apdate, getvalid.aptime, m.hcardid, m.name, m.phone
FROM getvalid, Mother m, Couple c
WHERE m.hcardid = c.hcardid AND getvalid.coupleid = c.coupleid
;db2 (cont.) => db2 (cont.) =>
APDATE      APTIME      HCARDID      NAME                  PHONE
-----      -----      -----      -----
03/21/2022 10:00      87911049 Victoria Gutierrez      (250)530-7907
03/21/2022 11:00      47078624 Anastasia Jerome      (867)934-5925

2 record(s) selected.

db2 => 
```

Question 5(b)

The SQL query to extract the needed data in 5(b) is:

```
SELECT CAST(t.labdate AS DATE) test_date, t.result
FROM
(
    SELECT p.coupleid, p.numreg
    FROM Pregnancy p, Couple c, Mother m
    WHERE m.name = 'Victoria Gutierrez' AND
          c.hcardid = m.hcardid AND
          p.coupleid = c.coupleid AND
          p.numreg = 2
)spemom, Test t
WHERE t.coupleid = spemom.coupleid AND
      t.numreg = spemom.numreg AND
      t.ttype = 'Blood iron'
; 
```

The output of executing the SQL statement above is:

```

db2 => connect to cs421;

      Database Connection Information

Database server      = DB2/LINUXX8664 11.5.4.0
SQL authorization ID = YLIU335
Local database alias = CS421

db2 => SELECT CAST(t.labdate AS DATE) test_date, t.result
FROM
(
    SELECT p.coupleid, p.num preg
    FROM Pregnancy p, Couple c, Mother m
    WHERE m.name = 'Victoria Gutierrez' AND
          c.hcardid = m.hcardid AND
          p.coupleid = c.coupleid AND
          p.num preg = 2
)spemom, Test t
WHERE t.coupleid = spemom.coupleid AND
      t.num preg = spemom.num preg AND
      t.ttype = 'Blood iron'
;db2 (cont.) => db2 (cont.) => db2 (cont.) => db2 (cont.) => db2 (cont.) =>
=> db2 (cont.) =>
TEST_DATE      RESULT
-----
12/18/2021 Slightly higher
01/21/2022 Normal

2 record(s) selected.

db2 =>

```

Question 5(c)

The SQL query to extract the needed data in 5(c) is:

```

WITH validp(coupleid, num preg) AS
(
    SELECT p.coupleid, p.num preg
    FROM Pregnancy p, Appointment a, DueDate d, Couple c, Mother m
    WHERE d.apptmid = a.apptmid AND
          a.coupleid = p.coupleid AND a.num preg = p.num preg AND
          p.coupleid = c.coupleid AND c.hcardid = m.hcardid AND
          (CAST(d.finaldate AS DATE) BETWEEN
           '07/01/2022' AND '07/31/2022' OR
           m.birthframe = '2022-07')
)
SELECT i.iname, COUNT(mid.pracid) AS num_of_pregnancy
FROM validp, Pregnancy preg, Midwife mid, Institute i
WHERE validp.coupleid = preg.coupleid AND
      validp.num preg = preg.num preg AND
      preg.ppracid = mid.pracid AND mid.workplace = i.iname
GROUP BY i.iname
UNION
SELECT i.iname, 0 AS num_of_pregnancy
FROM validp, Pregnancy preg, Midwife mid, Institute i
WHERE i.iname NOT IN (SELECT i.iname
                      FROM validp, Pregnancy preg, Midwife mid,
                           Institute i
                     WHERE validp.coupleid = preg.coupleid AND
                           validp.num preg = preg.num preg AND
                           preg.ppracid = mid.pracid AND
                           mid.workplace = i.iname)

```

;

The output of executing the SQL statement above is:

Question 5(d)

The SQL query to extract the needed data in 5(d) is:

```

SELECT m.hcardid, m.name, m.phone
FROM Mother m, Midwife mid, Couple c, Pregnancy p
WHERE m.hcardid = c.hcardid AND c.coupleid = p.coupleid AND
      ((p.ppracid = mid.pracid AND mid.workplace = 'Lac-Saint-Louis') OR
       (p.bpracid = mid.pracid AND mid.workplace = 'Lac-Saint-Louis'))
AND m.birthframe > SUBSTR(CURRENT DATE, 1, 7)
;

```

The output of executing the SQL statement above is:

```
|db2 => connect to cs421;

Database Connection Information

Database server      = DB2/LINUXX8664 11.5.4.0
SQL authorization ID = YLIU335
Local database alias = CS421

db2 => SELECT m.hcardid, m.name, m.phone
FROM Mother m, Midwife mid, Couple c, Pregnancy p
WHERE m.hcardid = c.hcardid AND c.coupleid = p.coupleid AND
      ((p.ppracid = mid.pracid AND mid.workplace = 'Lac-Saint-Louis') OR
       (p.bpracid = mid.pracid AND mid.workplace = 'Lac-Saint-Louis'))
      AND m.birthframe > SUBSTR(CURRENT DATE, 1, 7)
;db2 (cont.) => db2 (cont.) => db2 (cont.) => db2 (cont.) => db2 (cont.) =>
HCARDID      NAME                      PHONE
-----+-----+-----+-----+-----+-----+
87911049    Victoria Gutierrez        (250)530-7907
65108765    Muriel Garfield          (613)305-2502
76394639    Min Garrido             (819)254-8302

3 record(s) selected.

db2 =>
```

Question 5(e)

The SQL query to extract the needed data in 5(d) is:

```
SELECT UNIQUE m.hcardid, m.name
FROM Mother m, Couple c, Pregnancy p
WHERE m.hcardid = c.hcardid AND c.coupleid = p.coupleid AND
      p.numbabies > 1
;
```

The output of executing the SQL statement above is:

```
db2 => connect to cs421;

Database Connection Information

Database server      = DB2/LINUXX8664 11.5.4.0
SQL authorization ID = YLIU335
Local database alias = CS421

db2 => SELECT UNIQUE m.hcardid, m.name
FROM Mother m, Couple c, Pregnancy p
WHERE m.hcardid = c.hcardid AND c.coupleid = p.coupleid AND
      p.numbabies > 1
;db2 (cont.) => db2 (cont.) => db2 (cont.) =>
HCARDID      NAME
-----
87911049  Victoria Gutierrez
47078624  Anastasia Jerome

2 record(s) selected.

db2 =>
```

4 Midwife information

4.1 View definition SQL

```
CREATE VIEW midwifeinfo (pracID, Midwife_Name, Midwife_Phone,
                           Midwife_Email, Midwife_Workplace, Inst_Address)
AS SELECT m.pracid, m.mname, m.mphone,
          m.memail, i.iname, i.iaddress
     FROM Midwife m, Institute i
    WHERE m.workplace = i.iname
;
```

4.2 Screenshot of view creation

```
db2 => connect to cs421;

Database Connection Information

Database server      = DB2/LINUXX8664 11.5.4.0
SQL authorization ID = YLIU335
Local database alias = CS421

db2 => CREATE VIEW midwifeinfo (pracID, Midwife_Name, Midwife_Phone,
                           Midwife_Email, Midwife_Workplace, Inst_Address)
AS SELECT m.pracid, m.mname, m.mphone,
          m.memail, i.iname, i.iaddress
     FROM Midwife m, Institute i
    WHERE m.workplace = i.iname
;db2 (cont.) => db2 (cont.) => db2 (cont.) => db2 (cont.) => db2 (cont.) =>
DB20000I  The SQL command completed successfully.
db2 =>
```

4.3 Screenshot of selection

```
db2 => SELECT * FROM midwifeinfo LIMIT 5;
| PRACID      MIDWIFE_NAME          MIDWIFE_PHONE        MIDWIFE_EMAIL           INST_ADDRESS |
|-----+-----+-----+-----+-----|
| m48579    Tatiana Tipton        (705)602-6356   tatiana.tipton@mgh.ca  1650 Av. Cedar |
| m29084    Marion Girard         (905)380-5721   marion.girard@chum.com  1051 Rue Sanguinet |
| m90335    Valarie Carpenter     (519)922-3576   valarie.carpenter@mgh.ca 1650 Av. Cedar |
| m90247    Thelma Edwards        (250)562-3508   thelma.edwards@lslhosp.com 3175 Chem. de la Côte-S |
| ainte-Catherine
| m28495    Lora Ingham          (250)787-8333   lora.ingham@chum.com   1051 Rue Sanguinet |
|-----+-----+-----+-----+-----|
5 record(s) selected.
db2 =>
```

4.4 Screenshot of restricted selection

```
db2 => SELECT * FROM midwifeinfo WHERE midwife_workplace = 'Lac-Saint-Louis' LIMIT 5;
| PRACID      MIDWIFE_NAME          MIDWIFE_PHONE        MIDWIFE_EMAIL           INST_ADDRESS |
|-----+-----+-----+-----+-----|
| m90247    Thelma Edwards        (250)562-3508   thelma.edwards@lslhosp.com 3175 Chem. de la Côte-S |
| ainte-Catherine
|-----+-----+-----+-----+-----|
1 record(s) selected.
db2 =>
```

4.5 Inserting new record into view

```
db2 => INSERT INTO midwifeinfo VALUES ('m54287','Regina Tomblinson','(604)419-3287','regina.tomblinson@lslhosp.com','3175 Chem. d
e la Côte-Sainte-Catherine');
DB21034E The command was processed as an SQL statement because it was not a
valid Command Line Processor command. During SQL processing it returned:
SQL0117N The number of values assigned is not the same as the number of
specified or implied columns or variables. SQLSTATE=42802
db2 =>
```

The insertion operation fails because inserting into a view is essentially equal to inserting data into corresponding tables that the attributes in the view belong to (in our case, inserting record into *midwifeinfo* is the same as inserting data into *Midwife* and *Institution*). But since the view only extract part of the attributes, then when we insert new record into view, some attributes have missing values (NULL), which is fine if the CHECK of the corresponding attributes are not NOT NULL, but it will cause problem if the insert statement misses values for some attributes that should be NOT NULL. For example, here we declare that the attribute 'memail' in *Midwife* and the attribute 'iphone' in *Institute* should be NOT NULL, but the insert statement does not contain any value for these two attributes, thus the insert query fails.

5 Check constraints

```
db2 => ALTER TABLE Test
db2 (cont.) => ADD CONSTRAINT labdate CHECK (labdate >= presdate);
DB20000I  The SQL command completed successfully.
db2 => INSERT INTO Test VALUES ('t143895','Blood iron','2022-02-01 00:00:00','2022-02-02 00:00:00','2022-01-30 00:00:00','Normal'
,'m90247','c3742815',3,NULL,'t102937');
DB21034E  The command was processed as an SQL statement because it was not a
valid Command Line Processor command.  During SQL processing it returned:
SQL0545N  The requested operation is not allowed because a row does not
satisfy the check constraint "YLIU335.TEST.LABDATE".  SQLSTATE=23513
db2 =>
```