

Hi Management team,

It's very nice hearing from you. I'm happy I can help with the hospital database design and maybe potentially help people to make better choice when then need medical services at this special time.

I created diagram of database and the documentation of tables. All the queries and the according results are attached also. I will only provide the answers for your question list as below and you can always refer to attachments for details.

1. What are the full addresses of the top5 hospitals in MI?

Hospital_name	Full_address
MCLAREN - NORTHERN MICHIGAN	416 CONNABLE AVE, PETOSKEY, EMMET,MI, 49770
ST JOSEPH MERCY CHELSEA	775 S MAIN ST, CHELSEA, WASHTENAW,MI, 48118
HOLLAND COMMUNITY HOSPITAL	602 MICHIGAN AVE, HOLLAND, OTTAWA,MI, 49423
SPECTRUM HEALTH UNITED HOSPITAL	615 S BOWER STREET, GREENVILLE, MONTCALM,MI 48838
OAKLAWN HOSPITAL	200 N MADISON, MARSHALL, CALHOUN,MI 49068

2. List the hospitals in Michigan whose criteria comparisons are all above or the same as the national average.

There are 26 hospitals in Michigan whose criteria comparisons are all above or the same as the national average:

Hospital_Name
SPECTRUM HEALTH LUDINGTON HOSPITAL
ST JOHN RIVER DISTRICT HOSPITAL
BRONSON SOUTH HAVEN HOSPITAL
SPECTRUM HEALTH UNITED HOSPITAL
SPECTRUM HEALTH ZEELAND COMMUNITY HOSPITAL
HOLLAND COMMUNITY HOSPITAL
NORTH OTTAWA COMMUNITY HEALTH SYSTEM
OAKLAWN HOSPITAL
SAINT MARY'S HEALTH CARE
OTSEGO MEMORIAL HOSPITAL
SAINT JOSEPH MERCY LIVINGSTON HOSPITAL
COMMUNITY HEALTH CENTER OF BRANCH COUNTY
HILLSDALE HOSPITAL
UP HEALTH SYSTEM PORTAGE
MUNSON HEALTHCARE GRAYLING HOSPITAL
STURGIS HOSPITAL
DICKINSON COUNTY MEMORIAL HOSPITAL
PROMEDICA BIXBY HOSPITAL
CHIPPEWA COUNTY WAR MEMORIAL HOSPITAL
MCLAREN CENTRAL MICHIGAN
ST JOSEPH MERCY CHELSEA
MIDMICHIGAN MEDICAL CENTER-MIDLAND
SPECTRUM HEALTH BIG RAPIDS HOSPITAL
MCLAREN - NORTHERN MICHIGAN
WEST SHORE MEDICAL CENTER
MIDMICHIGAN MEDICAL CENTER-GRATIOT

3. For each overall rating group, how likely does a hospital have the 7 criteria all above or the same as the national average?

For example, if a hospital's overall rating is 1, it's impossible that it has good performance in all 7 criteria, whereas if a hospital's overall rating is 5, then it's almost half chance that this hospital has above or same as average performance in 7 criteria.

Overall_Rating	Likelihood
NULL	0.0000
1	0.0000
2	0.0044
3	0.1147
4	0.3142
5	0.5244

4. Which state has most hospitals whose overall rating is higher than the average overall ratings?

Texas has most hospitals whose overall rating is higher than the average overall ratings.

5. What's the criteria that comprises most hospitals above national average rating?

Patient experience national comparison has most hospitals above national average rating.

6. Is it generally true that the overall ratings of hospitals who have both emergency service and efficient use of EHR is higher than those who don't have?

No, it's not. The overall ratings of hospitals who has both emergency service and efficient use of EHR is 3.0529 while the hospitals who doesn't have emergency service and efficient use of EHR has higher overall ratings, 3.2584.

This is because hospitals who meets both criteria are 98% of total hospitals. The bad performance can be explained by the principle of regression toward mediocrity.

7. How many missing values of each criteria are there?

Safety of care national comparison has most missing values (2168) and Readmission national comparison has least missing values (1017).

Criteria_Name	Missing_Number
Effectiveness of care national comparison	1202
Efficient use of medical imaging national comparison	2033
Mortality national comparison	1352
Patient experience national comparison	1369
Readmission national comparison	1017
Safety of care national comparison	2168

8. Which type of ownership of hospitals has the highest overall rating?

Hospitals that with Physician ownership has the highest overall rating.

9. How likely is a hospital which has above-national-average Patient experience also has above-national-average Effectiveness of care?

If a hospital has above-national-average patient experience, it will 4.86% likely to have above-national-average effectiveness of care.

10. Are hospitals with Emergency Services generally more likely to have Mortality national comparison ratings better than the national average?

Yes. Hospitals with Emergency Services are 8.74% likely to have Mortality national comparison ratings better than the national average while hospitals without Emergency Services only have 2.22% chance.

Please see the 3 attached files for more information and let me know if you have any questions.

Best,
Database team

Query List

0. Choose the database used.

```
use HospitalInfo;
```

1. What are the full addresses of the top5 hospitals in MI?

```
select
    h.Hospital_Name, CONCAT(h.Address, ', ', c1.CityName, ', ', c2.CountyName,
    ', ', s.StateName, ' ', h.ZIP_Code) as Full_Address
from
    Hospitals h
    join
        City c1
        on h.City = c1.CityId
    join
        County c2
        on c1.CountyId = c2.CountyId
    join
        State s
        on c2.StateId = s.StateId
where
    s.StateName = 'MI'
order by
    h.Overall_Rating desc limit 5;
```

```
+-----+-----+
-----+
| Hospital_Name                | Full_Address
|
+-----+-----+
-----+
| MCLAREN - NORTHERN MICHIGAN  | 416 CONNABLE AVE, PETOSKEY, EMMET, MI
49770 |
| ST JOSEPH MERCY CHELSEA      | 775 S MAIN ST, CHELSEA, WASHTENAW, MI
48118 |
| HOLLAND COMMUNITY HOSPITAL   | 602 MICHIGAN AVE, HOLLAND, OTTAWA, MI
49423 |
| SPECTRUM HEALTH UNITED HOSPITAL | 615 S BOWER STREET, GREENVILLE, MONTCALM,
MI 48838 |
| OAKLAWN HOSPITAL             | 200 N MADISON, MARSHALL, CALHOUN, MI
49068 |
+-----+-----+
-----+
5 rows in set (0.04 sec)
```

2. List the hospitals in Michigan whose criteria comparisons are all above or the same as the national average.

```
select
  h.Hospital_Name
from
  Hospitals h
  join
    Rating_Records r1
    on h.Hospital_Id = r1.Hospital_Id
  join
    Ratings r2
    on r1.Rating_Id = r2.Rating_Id
  join
    City c1
    on h.City = c1.CityId
  join
    County c2
    on c1.CountyId = c2.CountyId
  join
    State s
    on c2.StateId = s.StateId
where
  s.StateName = 'MI'
  and r2.Rating_Name in
  (
    'Above the national average',
    'Same as the national average'
  )
group by
  h.Hospital_Id
having
  count(1) =
  (
    select
      count(*) as c
    from
      Criteria_Info
  )
;
```

```
+-----+
| Hospital_Name |
+-----+
| SPECTRUM HEALTH LUDINGTON HOSPITAL |
| ST JOHN RIVER DISTRICT HOSPITAL |
| BRONSON SOUTH HAVEN HOSPITAL |
| SPECTRUM HEALTH UNITED HOSPITAL |
```

SPECTRUM HEALTH ZEELAND COMMUNITY HOSPITAL
HOLLAND COMMUNITY HOSPITAL
NORTH OTTAWA COMMUNITY HEALTH SYSTEM
OAKLAWN HOSPITAL
SAINT MARY'S HEALTH CARE
OTSEGO MEMORIAL HOSPITAL
SAINT JOSEPH MERCY LIVINGSTON HOSPITAL
COMMUNITY HEALTH CENTER OF BRANCH COUNTY
HILLSDALE HOSPITAL
UP HEALTH SYSTEM PORTAGE
MUNSON HEALTHCARE GRAYLING HOSPITAL
STURGIS HOSPITAL
DICKINSON COUNTY MEMORIAL HOSPITAL
PROMEDICA BIXBY HOSPITAL
CHIPPEWA COUNTY WAR MEMORIAL HOSPITAL
MCLAREN CENTRAL MICHIGAN
ST JOSEPH MERCY CHELSEA
MIDMICHIGAN MEDICAL CENTER-MIDLAND
SPECTRUM HEALTH BIG RAPIDS HOSPITAL
MCLAREN - NORTHERN MICHIGAN
WEST SHORE MEDICAL CENTER
MIDMICHIGAN MEDICAL CENTER-GRATIOT

+-----+

26 rows in set (0.03 sec)

3. For each overall rating group, how likely does a hospital have the 7 criteria all above or the same as the national average?

```

select
  h.Overall_Rating,
  count(if(h.Hospital_Id in
    (
      select distinct
        h.Hospital_Id
      from
        Hospitals h
      join
        Rating_Records r1
        on h.Hospital_Id = r1.Hospital_Id
      join
        Ratings r2
        on r1.Rating_Id = r2.Rating_Id
      where
        r2.Rating_Name in
        (
          'Above the national average',
          'Same as the national average'
        )
    )
  )

```

```

    )
    group by
        h.Hospital_Id
    having
        count(1) =
            (
                select
                    count(1)
                from
                    Criteria_Info
            )
    )
, 1, NULL)) / count(1) as Likelihood
from
    Hospitals h
group by
    h.Overall_Rating
order by
    h.Overall_Rating;

```

```

+-----+-----+
| Overall_Rating | Likelihood |
+-----+-----+
|          NULL |    0.0000 |
|             1 |    0.0000 |
|             2 |    0.0044 |
|             3 |    0.1147 |
|             4 |    0.3142 |
|             5 |    0.5244 |
+-----+-----+
6 rows in set (0.06 sec)

```

4. Which state has most hospitals whose overall rating is higher than the average overall ratings?

```

select
    s.StateName
from
    Hospitals h
    join
        City c1
        on h.City = c1.CityId
    join
        County c2
        on c1.CountyId = c2.CountyId
    join
        State s

```

```

        on c2.StateId = s.StateId
where
    h.Overall_Rating > (
        select
            avg(Overall_Rating)
        from
            Hospitals)
    group by
        s.StateId
    order by
        count(1) desc limit 1;

```

```

+-----+
| StateName |
+-----+
| TX        |
+-----+
1 row in set (0.02 sec)

```

5. What's the criteria that comprises most hospitals above national average rating?

```

select
    cr.Criteria_Name
from
    Hospitals h
    join
        Rating_Records r1
        on h.Hospital_Id = r1.Hospital_Id
    join
        Ratings r2
        on r1.Rating_Id = r2.Rating_Id
    join
        Criteria_Info cr
        on r1.Criteria_Id = cr.Criteria_Id
where
    r2.Rating_Name = 'Above the national average'
group by
    r1.Criteria_Id
order by
    count(1) desc limit 1;

```

```

+-----+
| Criteria_Name |
+-----+
| Patient experience national comparison |
+-----+
1 row in set (0.04 sec)

```


6. Is it generally true that the overall ratings of hospitals who have both emergency service and efficient use of EHR is higher than those who don't have?

```
select
(h.Emergency_Services = 1
 and h.Efficient_EHR = 1) as
Have_Both_Emergency_Services_and_Efficient_EHR,
avg(h.Overall_Rating) as Average_Overall_Rating
from
Hospitals h
group by
(h.Emergency_Services = 1
 and h.Efficient_EHR = 1);
```

```
+-----+-----+
| Have_Both_Emergency_Services_and_Efficient_EHR | Average_Overall_Rating |
+-----+-----+
| 1 | 3.0529 |
| 0 | 3.2584 |
| NULL | 3.2778 |
+-----+-----+
3 rows in set (0.03 sec)
```

7. How many missing values of each criteria are there?

```
select
cr.Criteria_Name,
(
(
select
count(1)
from
Hospitals) - count(1)
)
as Missing_Number
from
Hospitals h
join
Rating_Records r1
on h.Hospital_Id = r1.Hospital_Id
join
Ratings r2
on r1.Rating_Id = r2.Rating_Id
join
Criteria_Info cr
on r1.Criteria_Id = cr.Criteria_Id
```

```
group by
    r1.Criteria_Id;
```

```
+-----+-----+
| Criteria_Name | Missing_Number |
+-----+-----+
| Effectiveness of care national comparison | 1202 |
| Efficient use of medical imaging national comparison | 2033 |
| Mortality national comparison | 1352 |
| Patient experience national comparison | 1369 |
| Readmission national comparison | 1017 |
| Safety of care national comparison | 2168 |
| Timeliness of care national comparison | 1266 |
+-----+-----+
7 rows in set (0.15 sec)
```

8. Which type of ownership of hospitals has the highest overall rating?

```
select
    o.OwnershipType
from
    Hospitals h
    join
        Hospital_Ownership o
        on h.Ownership = o.OwnershipId
group by
    h.Ownership
order by
    avg(h.Overall_Rating) desc limit 1;
```

```
+-----+
| OwnershipType |
+-----+
| Physician |
+-----+
```

9. How likely is a hospital which has above-national-average Patient experience also has above-national-average Effectiveness of care?

```
select
    count(if(r2.Rating_Name = 'Above the national average'
        and cr.Criteria_Name = 'Effectiveness of care national comparison', 1,
        NULL)) / count(distinct(h.Hospital_Id)) as Likelihood
from
    Hospitals h
    join
```

```

        Rating_Records r1
        on h.Hospital_Id = r1.Hospital_Id
join
        Ratings r2
        on r1.Rating_Id = r2.Rating_Id
join
        Criteria_Info cr
        on r1.Criteria_Id = cr.Criteria_Id
where
    h.Hospital_Id in
    (
        select distinct
            h.Hospital_Id
        from
            Hospitals h
            join
                Rating_Records r1
                on h.Hospital_Id = r1.Hospital_Id
            join
                Ratings r2
                on r1.Rating_Id = r2.Rating_Id
            join
                Criteria_Info cr
                on r1.Criteria_Id = cr.Criteria_Id
        where
            r2.Rating_Name = 'Above the national average'
            and cr.Criteria_Name = 'Patient experience national comparison'
    )
;

+-----+
| Likelihood |
+-----+
|    0.0486 |
+-----+
1 row in set (0.05 sec)

```

10. Are hospitals with Emergency Services generally more likely to have Mortality national comparison ratings better than the national average?

```

select
    Emergency_Services,
    count(if(r2.Rating_Name = 'Above the national average'
        and cr.Criteria_Name = 'Mortality national comparison', 1, NULL)) /
    count(distinct(h.Hospital_Id)) as 'Likelihood to have Mortality national
comparison ratings better than the national average'
from

```

```

Hospitals h
left join
  Rating_Records r1
  on h.Hospital_Id = r1.Hospital_Id
left join
  Ratings r2
  on r1.Rating_Id = r2.Rating_Id
left join
  Criteria_Info cr
  on r1.Criteria_Id = cr.Criteria_Id
group by
  Emergency_Services;

```

```

+-----+-----+
| Emergency_Services | Likelihood to have Mortality national comparison
ratings better than the national average |
+-----+-----+
|          0 |
0.0222 |
|          1 |
0.0874 |
+-----+-----+
2 rows in set (0.08 sec)

```