

# ADM-6287-BI VISUALIZATION PROJECT

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**Q1. Rationale: Why did you design the dashboard the way you did? Consider your use of line versus bar graphs, scatter plots, infographics, and the sequence of the graphics displayed etc. We are looking for a clear rationale that considers the data available, the type of content and the user population (which in this case, would be managers using the dashboard to make decisions).**

**Answer:** In our visualization project, the story has 5 dashboards which are calls to action.

1. **Resource allocation:** In this dashboard, we have identified 3 useful insights from the given data.
  - Count of specific diagnosis and physicians available to treat it.
  - Variation in the encounter count according to days in a week
  - Variation in patient encounters count with respect to public holidays.
  - Good resource allocation is essential to effective hospital management, the dashboard gives a clear picture of where the hospital should assign its resources for effective management.
  - Count of specific diagnosis and physicians available to treat it – In this we have compared the count of encounters of top 10 problems that were diagnosed and number of doctors that were available to treat that problem. Bar graphs are used for this visualization because two different quantities were being compared.
  - Variation in the encounter count per days in a week – This visualization gives the idea that on which day the hospital experiences maximum number of encounters. As per the given data we found that on Monday and Saturday the hospital usually has maximum number of encounters.
  - Variation in patient encounters count with respect to public holidays – In this visualization we tried to find the holidays on which the hospital experienced maximum encounters. Highlight table is used for this visualization because it is helpful in reducing the time to insight.

The above-mentioned visualizations give a clear indication of where to focus more and where to allocate more resources.

## **2. Service Distribution:**

- The dashboard “Service distribution” depicts the kind of services provided in different institutes of hospital and highlights the areas where these services are preferred/required. The hospital can put this knowledge into action as part of their target market strategy or for organising health campaigns in specific areas.

- As we wanted to differentiate the services based on their area therefore symbol map is used for this interpretation. It efficiently illustrates the difference in areas and data is also associated with a specific location.

**3. Services:** From this dashboard, we are answering three questions which will help the hospital to improve its services and determine comparative effectiveness of each procedure adopted in the hospital to cure a specific problem/diagnosis.

- The first visualization helps us determine the average length of stay of the patient if he/she is treated using a specific procedure. Since we have considered average it gives an overall view of the entire data set. The use of bar graph here helps us see key values at glance and permits a visual check of accuracy.
- Procedures adopted for each service – In this visualization we tried to find that what procedure is used most number of times for a specific service. Highlight tables clearly demonstrate this data.
- In the third visualization, we tried to find the most efficient procedure out of multiple procedures used to treat a specific diagnosed case. Using bar graphs and specific color coding we were able to analyze the efficient and inefficient procedures.

#### **4. Area and encounter details:**

- In this dashboard, the first visualization briefs us about the maximum number of encounters with respect to city. Bar graphs are used for this because they are efficient for comparing purpose.
- In the second visualization, we tried to find the number of repeated visits from each area. Latitudes and longitudes of patient's households were used to count the revisits from the same place. Use of symbol maps here clearly shows distributed and comparative densities. Considering the concentration of dots its is visually easy to compare the distribution. We considered the households with 3 or more visits so that the map looks more defined and clear.
- Using the above visualization, the managers can answer the questions they are seeking for individual patients. Targeted diagnosis and treatments will lead to increase in good outcomes and fewer resources used, including the doctors time.

#### **5. Economic status of patients**

- This dashboard helps us find relation between patient's economic status and the hospital encounters
- The 1<sup>st</sup> visualization gives the encounter counts of patients from different FSA's. Filled map is used for creating this visualization because its can effectively be used

to report area values. It also helps us compare how one area is different from another.

- In 2<sup>nd</sup> visualizations we tried to find relation between dwelling value and the number of hospital encounters. The use of symbol map here clearly shows distributive and comparative densities. In this visualization, we can infer that, more the dwelling value is, the less the health encounters were from that area.

**Q2. Interpretation. Putting yourself in the manager's role, what insights do you draw from the dashboard? Did any of your design choices help in generating these insights?**

**Answer:** The dashboards have been designed to give insights into different information that can help the hospital to utilize its resources on different time of the year, optimize the procedures followed for different diagnoses, manage the services being offered by different institutions of the hospital, reach out to people for health campaigns based on economic status and encounter history.

As a manager, I can draw several insights from the dashboards provided in this project which include the following:

1. **Available Resources vs Encounter Count:** This worksheet was created to give insight into the statistical data for the previous two years which compares the number of patients getting admitted into the hospital and the physicians available to serve the customers monthly as per the date on which patient was admitted (Discharge Date-Length of Stay). The inferences that can be obtained from this worksheet are:
  - The number of available physicians has been in line with the encounters increasing/decreasing from March 2009-July 2009.
  - August 2009-March 2010 has been a period in which the encounters have decreased but the available physicians have been in more number.
  - The start of the next fiscal year i.e April 2010, the encounters have been increasing but the hospital was not able to arrange physician's availability accordingly.
  - It also gives an action plan for future that in a peak period i.e start of a fiscal period, the hospital authorities can get in touch with more contractual physicians as the requirements pop up and hospital physicians are not available.
  - During the slow period of the hospital, the authorities can get in touch with the physicians to organize health campaigns to educate people.
2. **Resource allocation based on diagnosis, public holidays and days in week:** This dashboard aims at giving insights about the encounter trend in the last 2 years based on holidays, weekdays/weekends and highlights the most diagnosed problems and physician availability to offer service for that diagnose. Following insights were obtained from this dashboard:

- Maximum number of diagnosed problem was “**2ND-DEG PERIN LACER DUR DELIV**” which has been diagnosed exactly 731 times and second being “**1ST-DEG PERIN LACER DUR DELIV**” which was diagnosed 540 times.
  - The number of physicians available that offer services for those most diagnosed problems listed above are **22** and **23** respectively.
  - It also gives us a hint that more physicians who operate these diagnoses are needed at the hospital in future.
  - Most of the encounters occurred on **Saturday (618)** and **Monday (612)** which could help the hospital arrange the resources such as physicians, nursing staff, equipment etc. accordingly.
  - Out of all the holidays, **Good Friday (19)** and **Remembrance Day (15)**, has been the busiest holidays for the past two years. Staff scheduling, physician availability and other resource management can be adjusted in the future according to this statistical data.
3. **Service distribution:** The service distribution dashboard provides insights into the services provided by the hospital with respect to its institution and the area of the customers. Following insights can be gained from this dashboard:
- Out of the three services provided in the hospital, “**OBS DELIVERED**” has been mostly opted/needed (**3132 times**) for the patient out of total 4090 cases which is more than 75% of all the cases. This can help in resource management, better training, reaching out to the potential customers with the service offers etc.
  - “**OBS POSTPARTUM**” is the least acquired/needed service in both the institutes and in total as well.
  - All the “**OBS DELIVERED**” services are offered only at institute 2 whereas majority of “**OBS ANTEPARTUM**” services are offered or opted in institute 1.
  - Almost all the patients have received the “**OBS DELIVERED**” service (orange clusters all over the map) but very specific number of customers (blue clusters) have opted/needed “**OBS ANTEPARTUM**”.
  - It opens a question that why the area specific customers (mostly centered in some FSA’s of Toronto) need or opt for “**OBS ANTEPARTUM**” service and opens an opportunity to organize health campaigns in these areas to reach out people.
4. **Services:** The Service dashboard gives insights of what different procedures has been used for different services being offered and different diagnosed problems and also highlights the average time for which the patient had to stay in the hospital as per the procedure. It gives us the following insights:
- In general, the **Laproscopy (1 day)** procedure has the shortest average length of stay while **Culdoscopy (16.5 days)** has the highest length of stay.
  - Allocate more resources (beds, equipment etc.) to frequently occurred diagnose and more frequently opted services.
  - “**Delivery NEC**” has been the most opted procedure (2490 times) by the physicians for the most offered service “**OBS DELIVERED**” (from previous step) which is around 80%

of all the procedures opted while offering this service. This figure can be helpful for me as a manager as it gives an idea of what is being done majority of the times, which can be used for hiring more physicians/nursing staff proficient in this procedure, train new hired physicians for these processes, buy more equipment or machinery required for this procedure as it will be followed more number of times with the increasing encounters in hospital.

- For a same diagnosed problem, which procedures took more time and which ones were more efficient for the same procedure can be inferred from the average length of stay according to different procedures followed for the same diagnosed problem. For example, for **“PREMATURE SEP OF PLACENTA”, “CULDOSCOPY” (24 days)** had the longest length of stay out of all procedures for this problem whereas **“UNQUALIFIED FETAL MONITORING”** has the shortest stay (2 days).

5. **Information of patients based on area:** Patients information for the encounters based on different areas from this dashboard provides inferences about which area has more number of hospital encounters and which households has more number of revisits. Specifically, following inferences were obtained from this dashboard:

- **Toronto** has the maximum number of encounters (1868) which can be a deciding factor for the location for the new branch of the hospital or marketing target area.
- **East York** having minimum number of encounters (51) gives an idea that people of this area consult some other hospital due to some reason. This reason could be looked for and improvements could be made in our hospitals if any flaw is found in that respect.
- The number of revisits in the symbol maps helps to find which household has more number of revisits and hence the reason of revisits could be figured out further which can be helpful for medical research purposes and even area specific problem might appear if there are more revisits from an area. For example, maximum number of revisits were from a household in Toronto which equals **24**.

6. **Economic status of patient:** This dashboard gives us insight of how economic status of the resident affects his/her health. More the number of encounters considered to be an issue with health. It provides information on the basis of area codes of different cities. Following inferences are made from this dashboard:

- Based on dwelling values of all areas (FSA), the maximum encounters occurred in **M6N** (130 encounters) which falls in **Toronto**.
- This M6N area has a dwelling value of **\$292,253** which is far below the average dwelling value (**\$387,459.9166**), which indicates that people living in areas with lower dwelling values have to experience hospital encounters more often.
- This information could be studied and used to find the health problems in the areas with low dwelling value and provide more vaccination facilities and health campaigning in those areas to spread awareness.

- Areas with the higher dwelling value has lower encounter counts implying better health conditions in that area. For example, **M4N** in **Toronto** has only **10** encounters but has a whopping **dwelling value** of **\$1,122,807**.