1. Overview. (This is a couple of paragraphs - no more - that summarizes the content of the report. It must be comprehensible to someone who has not read the rest of the report.)

2. Introduction. (The scope of the project, setting the scene for the remainder of the report.) This should include: a. Scope:What is the general scope of the project? E.g. “This project is designed to help people understand issues of how access to drinking water affects health in different parts of the world”. b. Users/Audience: Who is the audience or stakeholders? This will help in determining how appropriate the data tools are. For example, if your visualization is aimed at helping policy makers determine how health spending and infrastructure relates, then you will be working with different data and reports than if you are providing visualization tools for engineers who need cost projections and distance metrics to determine best approaches.

3. Problem/Domain Questions. What are the specific questions your audience can ask of the tool you have begun to build? That defines what your design choices are. For example, a specific question related to water access might be: a. “How does access to drinking water differ in countries, and is there a relation to specific health markers (infant mortality, disease, etc)”? b. has access to drinking water changed over the last time periods? c. Does access to drinking water depend on income ? Etc.

4. Data. Describe your data . This includes: a. Sources (datasets, host organizations) b. Dimensions you are using ,and types of these dimensions c. Any “cleaning” or other manipulations you have made. You will almost certainly have selected only a subset of the available data, and perhaps you have combined data from two different sources to show wha the visual analytics WOULD support if you had the right data. Remember that the data do not have to be COMPELTELY REAL as long as they are representative, but you DO need to explain anywhere you have done this. For example: “Because we did not have location for emergency vehicles across BC, we substituted simulated locations using the centre of each community”.

5. Visualization design. Show your system of visualizations. Describe the interactions. Justify your design choices (NOT proves, but choice of visual feature and idiom). a. How do they relate to your problem questions? E.g., we used a line graph to enable users to see patterns over time. b. How do they work together? E.g. the user can slide a control over the line graph to see individual snapshots of data in connected views, such as bar graphs for comparison or scatter plots for correlation.

6. Further work. a. What did you intend to do, but did not manage to complete? A description can at least tell us what your design was meant to achieve. b. What didn’t work? Having made and implemented a design choice, what was not successful about it? What would you do differently? How did you find this out? c. What would you do in the next version? How could your work could be continued or developed? Be imaginative but realistic.

7. Conclusions. (This is similar to the abstract. The difference is that you should assume here that the reader of the conclusions has read the rest of the report.)

8. References and appendices.

* Summary: - Think about the use of space, more specifically how you're distributing the texts and tabs in your main vis. - Remember that every vis starts with a question, so you have to think about what is your question - Think about your audience, what is the first thing the hospital manager needs to see? Current bed status and where are the gaps? - Don't overcomplicate your project!
* **12:28 PM**

The focus is not on the real data analysis, the VA system needs to support the discovery of patterns, you're the designer, not the analyst!

For those of you who have NOT attended classes where we went over the project scope, please remember:

The focus of the project is not to analyse the data sets.**THE FOCUS OF THE PROJECT IS TO DEVELOP A VISUAL ANALYTICS TOOL THAT CAN HELP PEOPLE ANALYSE THE DAT**A. You are not domain experts, so your skills in analysing the data are less applicable.

Of course you need to understand how people think analytically to develop support, and you need to start with the kinds of questions your system should support and allow. But i am not looking for a summary analysis of the data using the system.  I am looking for a visual analytics design that will justify the choice of interactive visualizations and combinations that help analysts explore those questions. This is a critical difference. Insights that you glean from the use of this system are interesting and enrich the potential promise of the tool, but  are not the all.

That is why identifying your audience is so important. It will change the way in which you choose and structure the visualizations and define the questions.

Data resources:

1. <https://www.cihi.ca/en/discharge-abstract-database-metadata>
2. <https://www.cihi.ca/sites/default/files/document/dad-data-elements-2018-en-web.pdf>
3. Discharge Abstract Database metadata (DAD) from Canadian Institute of Health Information.
4. <https://www.tableau.com/learn/webinars/tableau-mapping-healthcare>

**Overview**

Availability of beds in a hospital is a key measure to maximise patient care and effective cost management. One of the major problems many hospitals face today is the inefficient management of beds or the inefficient bed tracking systems that are available. Hospital beds left unoccupied as a result of waiting for the staff members to service the beds and to get it ready for the next patient is a significant cost to the Health Industry. The *Bed Turnaround Time (BTAT)* in question extended from the time discharge instructions were given to the patient to the time a new patient arrives. Many people are involved in the process of discharging a patient and preparing the bed for the next admitted patient. However, most of the process is currently manual which involves physically checking the rooms to check the availability, assigning staff for servicing them based on the status, etc.

We wanted to improve the bed turnaround time through Visualization of various measures like bed cleaning statuses and priorities in cleaning according to admission requirements. And to explore other measures like occupancy rate and waiting time that might influence bed turnaround time. The dashboard design will address most of the requirements by Bed coordinators, Unit Managers and House-keeping Supervisors through status graphs and charts in managing the patient flow efficiently. It will also allow the users to interactively explore various measures and dimensions through filters and selection and will aid in locating the bottlenecks in the operation and will direct to improve the process.

**Introduction**

The goal of this project is to optimise the Bed Turnaround process through visualization of resources in an efficient way, and to look out for any trends in the dataset with regards to patient discharges and admissions, with an ultimate aim of improving the Bed Turnaround Time. We aim to improve communication among departments and staff members to ensure the patient flow process is efficient and fast, and thereby reduce the Bed Turnaround Time.

Our Visualisation dashboard will be useful both to the Healthcare staffs and the other stakeholders like House-keeping supervisors and Hospital Managers.

**Users:**   
Primary: Unit Managers, Central Bed Coordinators   
Secondary: Hospital Managers , House-keeping Service Managers

We wanted our dashboard to answer some of the questions that will be required by the users in optimising their day-to-day operations.

* Research Questions:
  + What’s the occupancy rate in each Units? How’s it influencing the admissions and discharges?
  + What’s the Bed Turnaround rate by Unit? Where are the delays?
  + What’s the current status of beds in each unit? Where to deploy the house-keeping staffs?
  + What’s the Admissions, Discharges and Transfer trends over the months? And How’s it helpful in planning the bed capacity?

**Data:**

For our design, we are assuming a fictitous hospital with 5 units.

(General – 1N, Surgical – 1S,Intensive Care Unit - 1W,Special Care Unit- SCU, Maternity -BP) and each units have specific number of beds.

Bed Turnaround Time (BTAT) metrics are provided by Fraser health. But the data is modified to suit the hospital units and beds that’s been used.

Other data like admissions, transfers are simulated using metrics from Canadian Institute of Health Information(CIHI) Discharge and Admission Dataset (DAD).

Since getting real samples of hospital data is challenging due to confidentiality and sensitivity, we used online tool <https://mockaroo.com/> to generate data from the known metrics. Some of the datasets that are simulated for the dashboard design are

* Patient log with details such as admission, Transfer details and discharge datetime. (data is generated for May 2019-June 2019)
* Bed Turnaround time across units.
* Occupancy rate for each of the units.

Dimensions:

Units : 1N,1S,1W, SCU, BP

BedNum : 101,102,103….SCU1,SCU2,…,BP201,BP202..

PatientID

AdmitDateTime

DischargeDateTime

TransferDateTime

Measures:

TurnaroundTime

We used Excel sheets and Tableau Prep builder to join datasets like Units, Bed numbers with Patient log to create a complete dataset.

**Visualization design:**

The Hospital Bed Management dashboard is divided into 3 sections:

Left Section: provides the current Admissions, Discharges and Transfer numbers by Unit and the trends seen over the past 2 months.

Middle Section: Lists out the BTAT statistics by Unit , by hour and over the past months.

Right Section: Gives the overview of Bed occupancy rates across Units and displays the bed status for each of the beds.

Design Choices:

* Screen displays are made easy to understand so that information such as statuses and alerts is quickly identifiable. (non-tech staffs)
* Use of familiar charts(BARs, line)that’s been used in the current hospital culture.
* Bed status color follows traffic signal light color (Red-Dirty, Amber-Cleaning, Green-clean&Ready)
* Height of Bar chart reflects the quantity of the categories.
* Use of filters makes it easy to see the status by Units .which will be helpful for Unit Managers.
* Brushing with dates makes it easy to concentrate on specific date range.
* Size of the (dots) in BTAT by hour chart indicate the turnaround time. Bigger the size, higher the turnaround time. This will be helpful in spotting the delay quickly and explore the reasons causing the delay.

Interactions:

1. Filters: by Unit
2. Selection: Date picker, brushing
3. Slider: Hour slider
4. Zomm Area (Admissions, Discharges,Transfers trend)
5. Tooltips to annotate and highlight bed status and to show quantities.

**Limitations:**

* Since the data is simulated using random methods, patterns and trends might not reflect the original status, but is used to see the relative trends.
* Availability of limited dataset, hence other explorations like impact of wait time on bed turnaround could not be implemented.

**Future Work:**

Though we could provide the interactions through filters and selection, we wanted to provide the user to compare between different charts by providing different views on clicking on the individual units.

Also, would like to integrate the original hospital layout as SVG file and provide the bed status

Provide other metrics like potential anticipated discharges and transfer status across units which will be helpful in bed capacity planning.

**Evaluation:**

Since our project aims to improve the process around bed management,

**Formative design** evaluation

* will include understanding the **current process** of bed management through **closed group** meeting with Stakeholders involved like central Bed Coordinator (Access Coordinator), Unit Managers, Nurses etc.,
* If available, Analyzing the **communication logs** between units, or field observations if permitted.
* Taking samples of the metrics like bed turnaround for a period.

**Protype Testing**

* walkthrough the design with users.
* Monitor performance using prototype – improves process, reduces time taken for communication. (user satisfaction, ease of use)
* Compare the data collected with the original process, use statistics to prove results