PROJECT 14 - VHS Blood Bank - Blood Wastage Reduction and Blood Collection Schedule Optimization

BACKGROUND / ABSTRACT

Over the years, the VHS Blood Bank has widened its scope of activities by supplying quality and safe blood to outside hospitals as well. The Blood Bank also organises blood donation camps at various locations, which has greatly helped in meeting the continuous demand for quality blood from VHS and the other hospitals. The VHS Blood Bank has been the only transfusion service unit doing Rh typing for all donors and recipients from its very inception.

BUSINESS PROBLEM:

1. Reduce **wastage of blood units**
2. Help plan **Blood Donation Schedule** to improve blood availability and reduce wastage

EXPECTED PROJECT OUTCOME:

1. Provide **Demand Forecasting** for different types of blood units for the next year
2. Create **optimised plan** for Blood Donation camp schedule

APPROACH:

DATA COLLECTION:

1. **Historical Supply Data**: In order to provide demand forecasting it is important to understand the demand for different blood types and their demand historically. Typically we need multi year data to understand the seasonality of demand for different blood unit types. In case this is not available, data set 4 can be used as a proxy if this data is made available to us.
2. **Historical Data for unmet / unfulfilled Demand**: In order to do a proper forecasting, it is important to understand at what times VHS was unable to provide what type of units to patients. This helps with proper forecasting of different blood unit types
3. **Blood unit type and disease matching information**: To match demand of specific blood unit types to seasonal disease information
4. **Disease seasonal / periodicity information**
5. Stock / Storage capacity in VHS to come up with optimised blood storage plan
6. Other nice to have data points:

    - Close by Blood Bank Information
    - Important Dates around which Blood collection spikes: This information is visible from the provided data however the spikes need to be explained to actually use this information for forecasting and planning (Birthdays and important events)
    - Population Index and expected growth
    - Disease forecastings for future periods (Government reports)

PROJECT EXECUTION / DELIVERY STAGES / PLANNED DATES:

We expect most of the necessary data will be provided by VHS. We will collect data which may help with the project if it is available freely on internet.

1. Exploratory data analysis to understand data and demand behavior. Understand all data points provided. Analysis of factors / features to understand their contribution to demand cycles. **Details in EDA Section** **<< - We are here>> <<- Expected End Date : 21-Feb>>**
2. Develop Hypothesis and perform the tests **<< - Expected End Date : 21-Feb >>**
3. Develop Linear Model to understand the effect of different factors on demand, wastage and blood collection **<<15-Mar>>**
4. Tune / improve forecasting model by developing new features, developing non-linear model like GBM / Neural Nets **<<31-Mar>>**
5. Develop and deploy models to forecast how much blood units can be collected from each camps **<<7-Apr>>**
6. Use Linear Programming / Dynamic Programming to come up with optimized blood unit inventory and design routine for blood donation camps **<<30-Apr>>**

WHAT HAVE WE DONE SO FAR

1. EDA and data explanation
2. Meeting with guide
3. Meeting with VHS to better understand process and explain approach
4. Tried to collect data from online and other Blood Banks (**We have till date not been able to collect suplemental / additional data**)

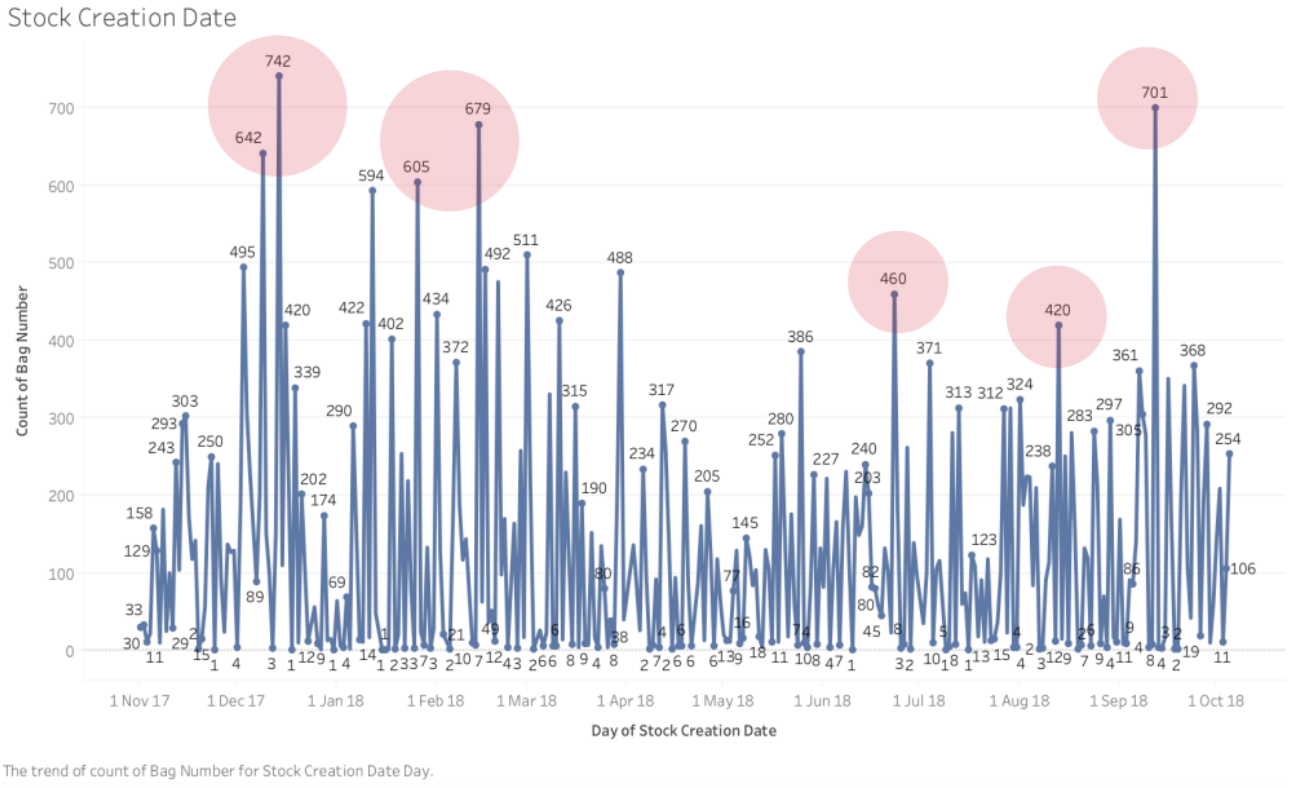
OUR UNDERSTANDING FROM DISCUSSIONS WITH VHS

- VHS would like to understand how we can enhance and optimize the blood collection process for the blood bank
- Design a sustainable and long term model which enables them to take business decisions around the blood bank operations and how they can stay ahead in a highly competitive and demanding environment

KEY EDA / ANALYSIS FINDINGS

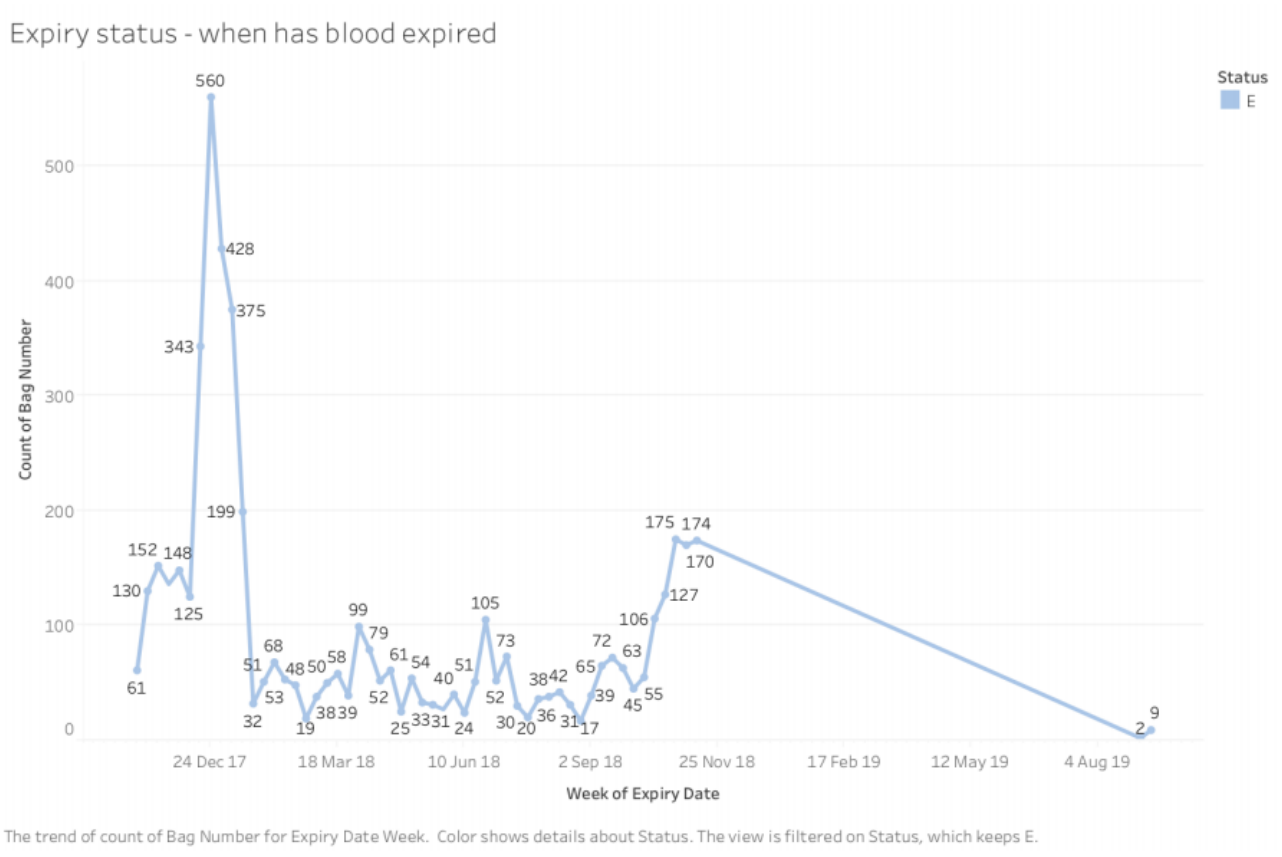
Spikes in Blood Collection due to important events / festivals

Creation date



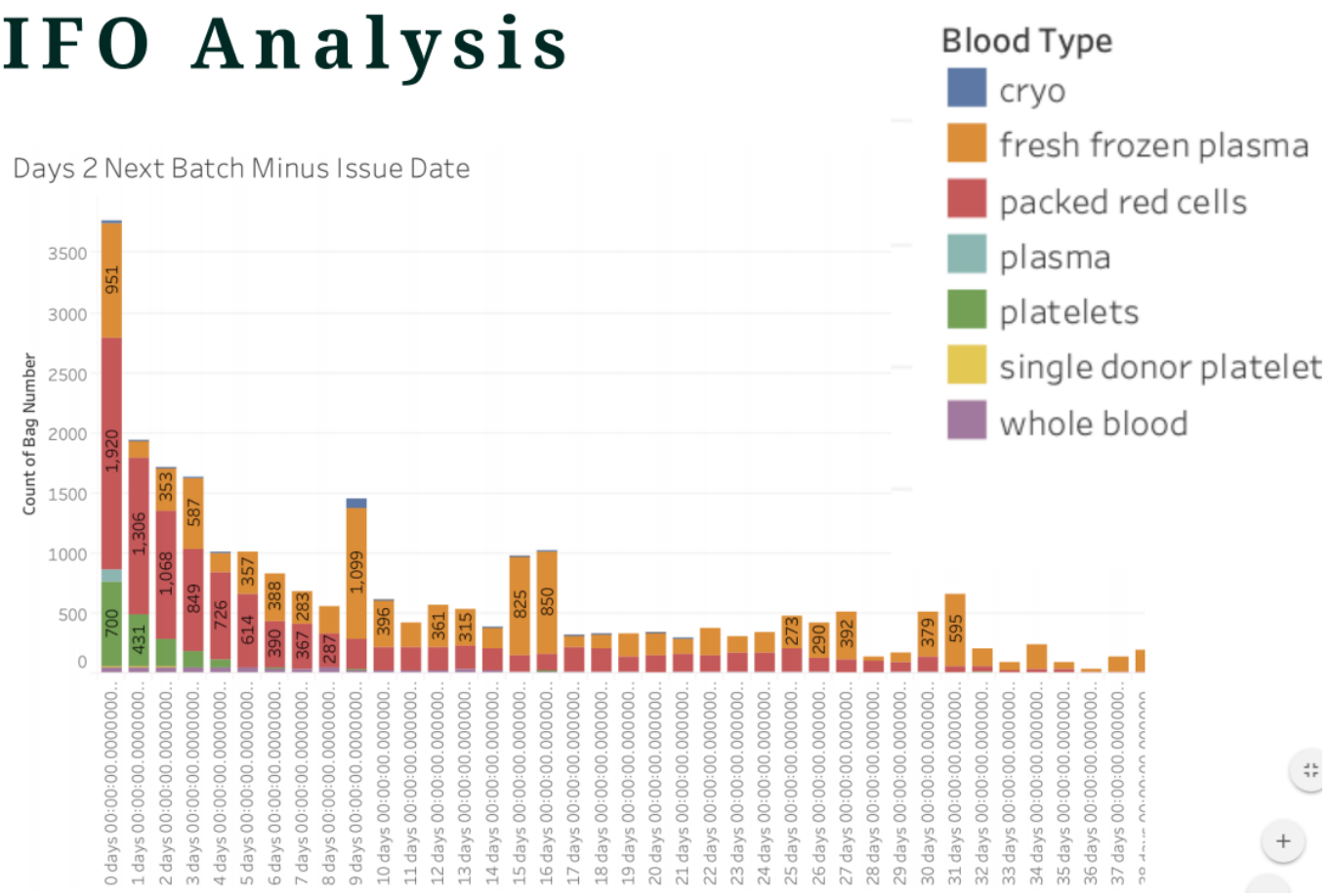
Over 5000 units of blood expired in a period of 1 year.

Spikes in Wastage follows the collection spikes



FIFO model for blood collection and issuance is not being strictly adhered to as a process

FIFO Analysis

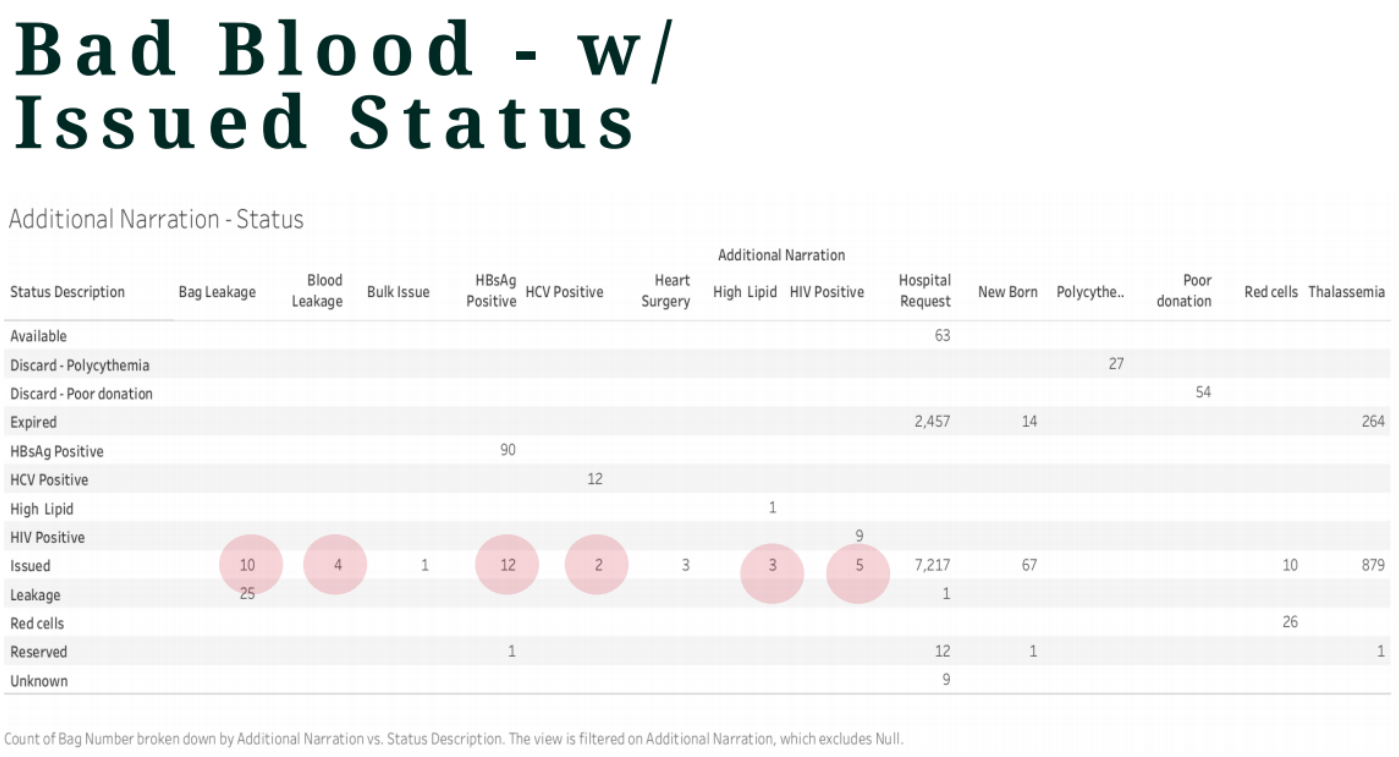


Not Adhering to FIFO leads to wastage of Blood (from visual inspection, hypothesis test not yet performed)

- 1 Not Expired
- 0 Expired

Blood_Classification_Clean	bin	
cryo	0	1
	1	6
fresh frozen plasma	1	18
packed red cells	0	70
	1	2199
platelets	0	341
	1	1733
single donor platelet	0	13
	1	17
whole blood	0	5
	1	170

Bad Blood (contaminated blood) is being issued by VHS



ISSUES / BLOCKERS / FORESEEN CHALLENGES

1. Unavailability of historical data (more than few months): Why is this a challenge? It is difficult to understand disease and demand seasonality with out 2 full cycles. If this data is not available it will be very difficult to do proper demand forecasting.
2. Unavailability of Disease Seasonal Data: In absense of proper historical data we can use this data for understanding disease seasonality. However till date we have not been able to collect this data from external sources (information not readily available on WWW). Data is not provided by VHS
3. Blood unit type and disease matching information: Data needs to be collected from VHS
4. No unmet demand data available

We see possible challenges with accurate demand forecasting and making significant progress as per the plan **PLAN** without availablity of appropriate data

PROJECT SPONSOR: VHS Hospital, Chennal

DATE: Jan-30-2019 **REPORTED BY**: Sumil Seth **GUIDE'S NAME**: Shailaja Groover

DATA STATUS: Not received. Only indicative

REPORTING TO GUIDE: YES **NO.OF SESSIONS WITH THE GUIDE**: 1

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