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# VCU Senior Design Expo: Massey Cancer Center Patient Flow Model

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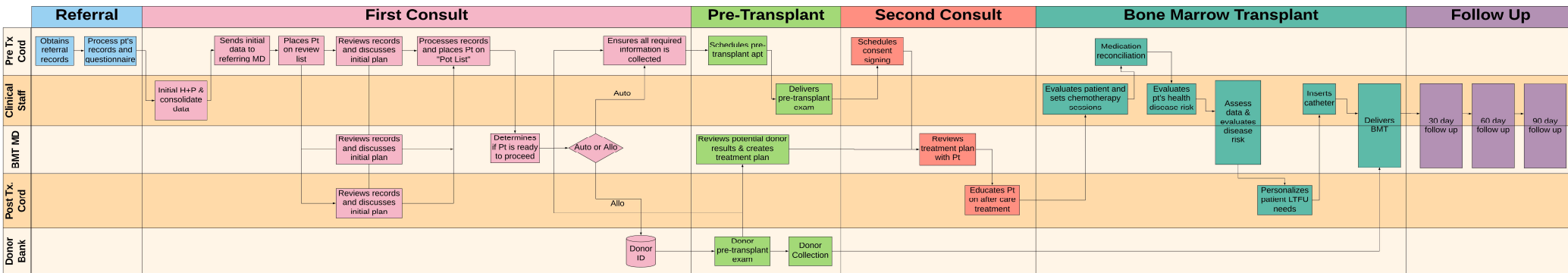
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# Bone Marrow Transplant Forecast Model

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Engineering Undergraduate Students : Anwulika Molokwu, Rafael Parayaoan, Madeline Surratt, Samantha Zhao



## Objective

- Map out the bone marrow transplant (BMT) process and resource requirements
- Determine BMT staff workflow for auto & allo transplants
- Analyze historical data and estimate patient volume within various clinical phases of the BMT process

## Process

### Engineering Team:

- Sorted through preliminary BMT process data
- Synthesized preliminary information, staffing protocols, and process documentations
- Conducted system analysis and created a process map for the business team to build a computerized prediction model

### Business Team:

- Requested data from the Massey Cancer Core Informatics Center and the Center for International Blood and Marrow Transplant Research (CIBMTR)
- Leveraged system dynamics modeling with Cerner electronic healthcare data to calibrate a predictive model
- Tools used: SAS Enterprise Miner, Tableau, R Studio and Microsoft Excel

Population Growth & Referral Location

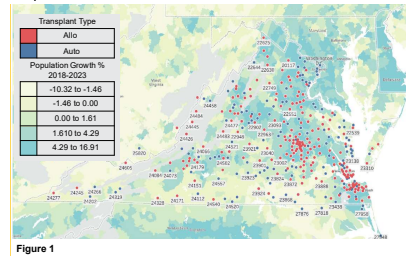


Figure 1

Forecasted Patient Volume (2018)

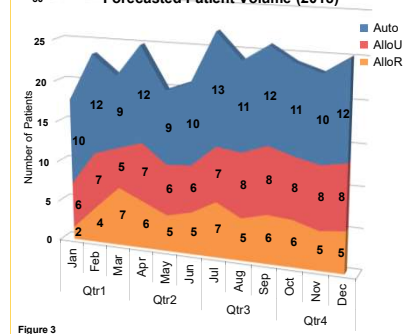


Figure 3

Cycle Times by Transplant Type

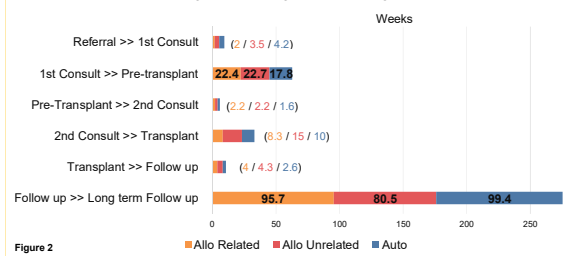


Figure 2

User Input Automatically populates based on user input & calculated cycle times

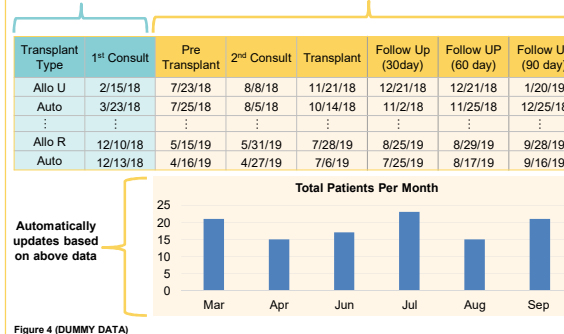


Figure 4 (DUMMY DATA)

## Results

- Patient volume mainly originates from areas with high population growth (Figure 1) - contrary to our hypothesis that patient volume stems from areas with older population
- In the BMT process, the largest time delay for patients is scheduling the pre-transplant appointment
- The transition between 1st consult and pre-transplant appointment is prone to bottlenecks (Figure 2)
- Clinical staff can expect a 2018 patient volume from lower band of 158 to upper band of 262 (120 Auto, 79 Allo Unrelated, & 63 Allo Related)
- Clinical staff can use model's dashboard to predict future staffing levels based on consult dates (Figure 4)

## Future Work

- Fine tune the model with nonlinear time series forecasting to increase accuracy
- Integrate the model into the clinical staff's evaluation/scheduling database
- Stratify cycle times based on diagnosis, insurance type and age to improve cycle time and patient load calculations
- Investigate cost for each process step and develop a forecasted expense report

## Special Thanks:

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