

CIS II Project Plan  
Group 16  
Antibiotic Ninja

### **Summary**

The goal of this project is to create a web application that can be used by clinicians at Johns Hopkins Bayview Medical Center in order to provide antibiotic recommendations for patients affected by common infections.

### **Team**

Students: Allie Sanzi and Katie Hochberg

Mentors: Jennifer Townsend, Gorkem Sevinc, and Michael Cohen

### **Background, Specific Aims, and Significance**

Centers for Disease Control and Prevention estimates that “up to 50% of all the antibiotics prescribed for people are not needed or are not optimally effective as prescribed.” This overuse of antibiotics is a dangerous issue facing healthcare in the United States and other countries around the world. It leads to antibiotic resistance, meaning that the usual treatments for infections are no longer effective, and alternative treatments must be used. These alternative treatments are more expensive, less effective, and/or result in a greater cost to the patient. To improve the accuracy of antibiotic prescription, Antibiotic Ninja will assist healthcare providers by making an appropriate antibiotic recommendation for patients based on their history, vital signs, and lab results.

### **Technical Approach**

We are building a web application to give decision support to doctors when prescribing antibiotics. Our advisor, Dr. Jenny Townsend, has developed decision trees that healthcare providers follow when diagnosing a suspected infection patient. These decision trees will inform the underlying database structure and flow of our application. The web application will have an administrator portal, which will allow administrators to customize these decision trees, and a user portal, which will allow healthcare providers to enter patient health data as prompted and receive an antibiotic recommendation. The first thing we plan to do is explore the documentation of the external APIs that we will need to use. This will allow us to understand the interactions between our application and the external APIs so that we can create an effective design. We will continue by designing the schema for the database as well as the backend of the application. For the database, we will use a PostgreSQL database. For the rest of the stack, we will use Node.js, Express.js, and Angular.js. After creating a design for the backend, we will implement the backend of the application using iterative testing to ensure proper function. As we implement the backend, we will work with the team to turn the UI wireframes into a complete design. We will then build out the frontend of the application and create a clean user interface that is intuitive to use. If time permits, we will enhance the user interface and work with the team to begin the process of FDA approval for the decision trees.

## Deliverables

- Minimum:
  1. Documentation including use cases and exploration of external API's
  2. Backend design for database, admin portal, and user portal
- Expected:
  3. Backend implementation for database, admin portal, and user portal
  4. Frontend implementation for admin portal and user portal→ Minimum viable product for testing at Bayview Medical Center
- Maximum:
  5. User Interface enhancements
  6. Decision Tree FDA approval

## Dependencies

Dependency	Resolution Plan	Status
Obtain decision trees	Request from mentors	Resolved
Obtain initial user interface wireframes	Request from mentors	Resolved
Documentation for epic API	Explore online resources	In-progress
Software needed for backend	Download and/or install	Not started
External libraries for implementation	Get documentation and/or install	Not started

## Milestones and Status

Please see attached Gantt chart for start and end dates for specific tasks

1. Documentation
  - i. Compile use cases
  - ii. Explore external API's*Goal completion: March 5, 2017*
2. Backend Design
  - i. Design backend component: database
  - ii. Design backend component: admin portal
  - iii. Design backend component: user portal
  - iv. Iterate design with mentor feedback*Goal completion: March 6, 2017*
3. Backend Implementation
  - i. Implement backend component: database
  - ii. Implement backend component: admin portal
  - iii. Implement backend component: user portal
  - iv. Iterative testing and feedback modifications*Goal completion: April 4, 2017*

## **Milestones and Status continued**

4. Frontend Implementation
  - i. Implement frontend component: admin portal
  - ii. Implement frontend component: user portal
  - iii. Iterative testing and feedback modifications

*Goal completion: April 25, 2017*
5. Enhancing User Interface
  - i. Get feedback from end users
  - ii. Make improvements to UI

*Goal completion: May 9, 2017*
6. Decision Tree FDA Approval
  - i. Complete tasks from mentors for FDA approval process

*Goal completion: May 9, 2017*

## **Management Plan**

We plan to have a weekly meeting with our entire project team to brainstorm, design, and resolve conflicts. Every other week, we will give a demonstration of our progress to get feedback. Occasionally, we will work at the Technology Innovation Center to have better accessibility to the mentors when extra help is needed. We will also use pair programming for accuracy and efficiency.

## **Reading List**

1. CDC. Antibiotic Resistance Threats in the United States, 2013. Vol CS239559-B. Atlanta, GA 2013:114.
2. Pollack LA, Srinivasan A. Core elements of hospital antibiotic stewardship programs from the Centers for Disease Control and Prevention. Clin Infect Dis. 2014;59 Suppl 3:S97-100.
3. Magill SS, Edwards JR, Beldavs ZG, et al. Prevalence of antimicrobial use in US acute care hospitals, May-September 2011. JAMA. 2014;312(14):1438-1446.
4. Magill SS, Edwards JR, Bamberg W, et al. Multistate point-prevalence survey of healthcare-associated infections. N. Engl J Med. 2014;370(13):1198-1208.
5. Hecker MT, Aron DC, Patel NP, Lehmann MK, Donskey CJ. Unnecessary use of antimicrobials in hospitalized patients: current patterns of misuse with an emphasis on the antianaerobic spectrum of activity. Arch Intern Med. 2003;163(8):972-978.
6. Braykov NP, Morgan DJ, Schweizer ML, et al. Assessment of empirical antibiotic therapy optimisation in six hospitals: an observational cohort study. Lancet Infect Dis. 2014;14(12):1220-1227.
7. MacDougall C, Polk RE. Variability in rates of use of antibacterials among 130 US hospitals and risk-adjustment models for interhospital comparison. Infect Control Hosp Epidemiol. 2008;29(3):203-211.