JOHNS HOPKINS MEDICINE
JOHNS HOPKINS BAYVIEW MEDICAL CENTER

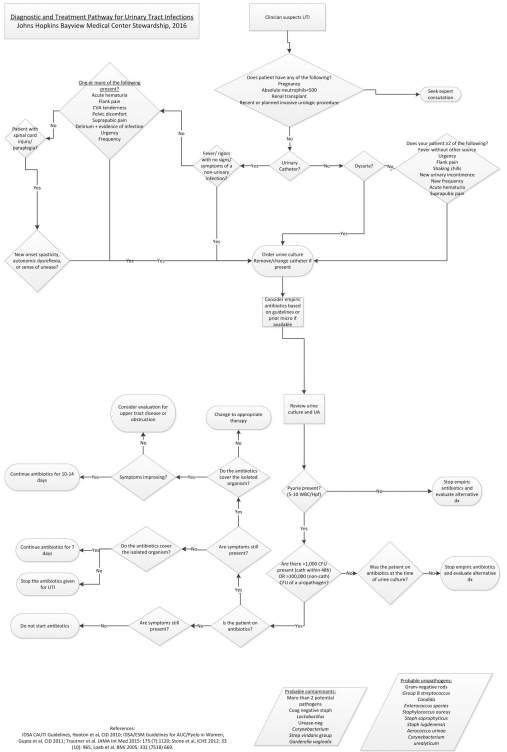
TECHNOLOGY INNOVATION CENTER

Antibiotic Ninja

Team: Allie Sanzi and Katie Hochberg
Mentors: Dr. Jennifer Townsend, Andrew Hinton, and Michael Cohen

Background and Significance

- Problem: Antibiotics are prescribed unnecessarily
  - Results in dangerous antibiotic resistance
  - Alternative treatments are needed
- Solution: Antibiotic Ninja
  - Tool for healthcare providers
  - Steps through patient exam and diagnosis
  - Generate antibiotic recommendation
- Non-technical Approach:
  - Create decision trees for each infection
  - Standardizes recommendations for each set of symptoms



CDC. Antibiotic Resistance Threats in the United States, 2013. Vol CS239559-B. Atlanta, GA2013:114.

Technical Approach: Application Overview

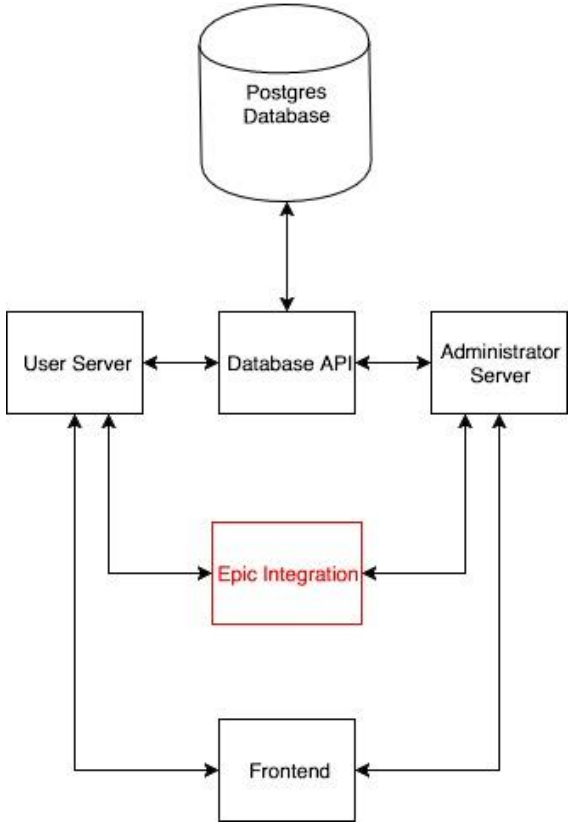
- Workflow

Step	Task
1	Administrators customize decision trees
2	User selects the type of infections (SSTI, UTI, Respiratory)
3	~~Application fetches patient information from EMR~~ User inputs EMR data
4	User inputs remaining information (i.e. other symptoms)
5	Application makes antibiotic recommendation
6	User inputs feedback about recommendation (i.e. agree/disagree, used/unused)

- Epic Integration Team dependency

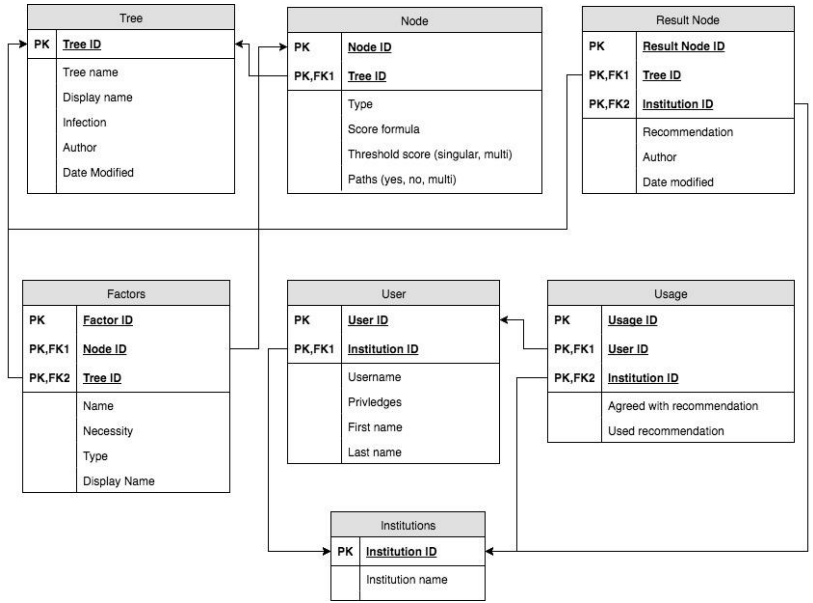
Backend Design

- Technical Components:
  - PostgreSQL database
  - API to query and manipulate database
  - Administrator portal
  - User portal
- Interaction with EPIC for EMR data
  - No longer part of MVP (minimum viable product)
  - Working with EPIC team to start the process for integration

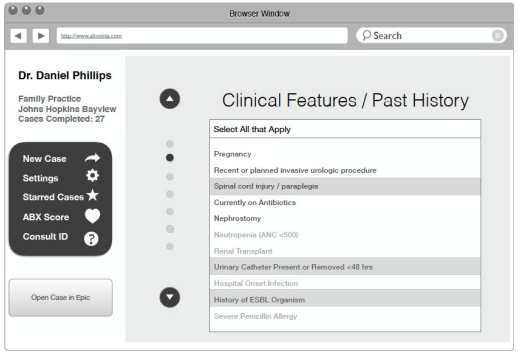


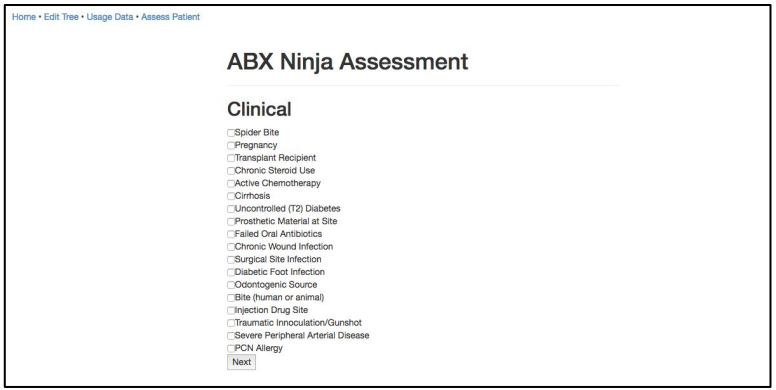
Progress Update: Backend Implementation

- Create and test database
  - RESTful API implemented
  - Additional queries as needed
- Administrator portal
  - Update recommendations
  - View usage data
- User portal
  - Input all symptoms, lab results, EMR data
  - In progress: algorithm to determine assessment and recommendation
- Iterative testing



Progress Update: Frontend Implementation

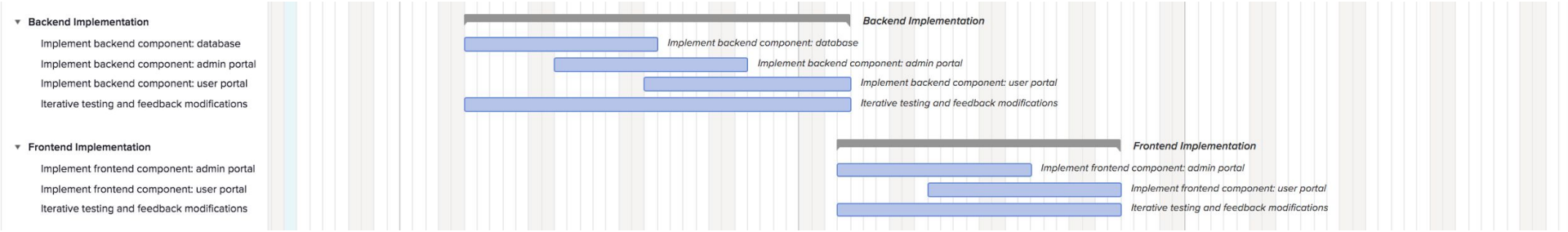


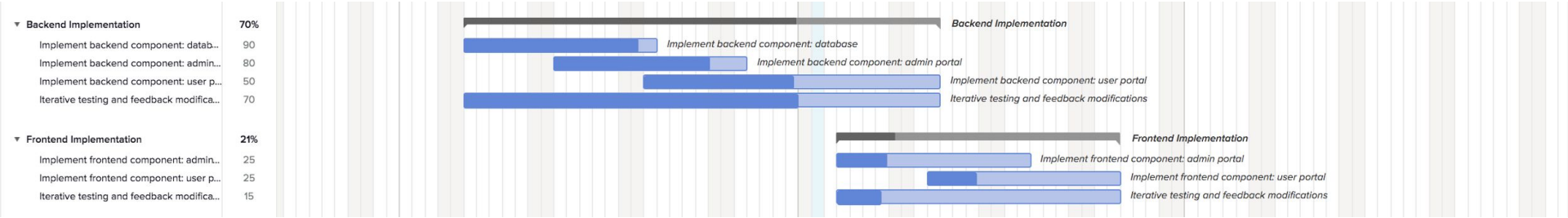


- Use designs and work with mentors
  - User portal interface is finalized
  - Currently working with mentors to get a finalized administrator portal design
- Progress update
  - Bare bones HTML implementation
  - Next week: enhancing HTML with CSS
- Mentor feedback
  - Continuous feedback during demos to improve UI

Updates to Schedule

- Backend Implementation
  - Started working on frontend earlier than anticipated in order to visualize backend progress
  - Extended backend timeline to account for this





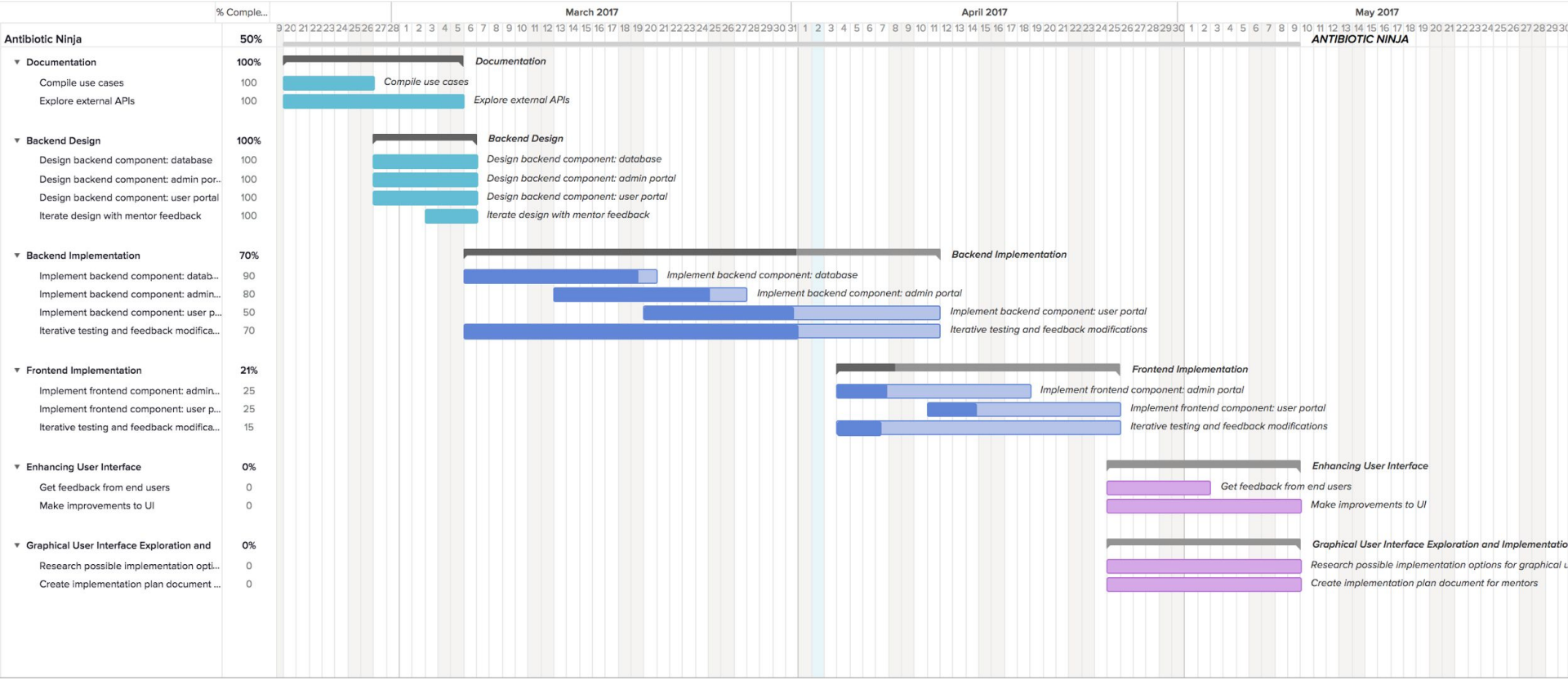
Deliverables

Deliverables		Deadline	Status
Minimum	Documentation including use cases and exploration of external API's	March 5	Complete
	Backend design for database, admin portal, and user portal	March 6	Complete
Expected	Backend implementation for database, admin portal, and user portal	April ~~4~~ 11	In-progress
	Frontend implementation for admin portal, and user portal	April 25	In-progress
	Minimum viable product for testing at Bayview Medical Center	April 25	In-progress
Maximum	User Interface enhancements	May 9	Not started
	~~Decision Tree FDA approval~~ Graphical User Interface exploration and implementation plan	May 9	Not started

Updated 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	Resolved
Software needed for backend	Download and/or install	Resolved
External libraries for implementation	Get documentation and/or install	Resolved
Finalized designs for admin portal UI	Iterating with mentors	In progress
JHU account authentication	Work with technical mentor	In progress
Hosting on external server	Work with technical mentor	Not started
Securing hostname for website	Follow up with Dr. Townsend	Not started
Reaching out to contacts for pilot testing group	Working with Dr. Townsend and Andrew	Not started

Schedule


% Comple...
March 2017
April 2017
May 2017
Antibiotic Ninja 50%
Documentation 100%
Compile use cases 100
Explore external APIs 100
Backend Design 100%
Design backend component: database 100
Design backend component: admin por.. 100
Design backend component: user portal 100
Iterate design with mentor feedback 100
Backend Implementation 70%
Implement backend component: datab... 90
Implement backend component: admin... 80
Implement backend component: user p... 50
Iterative testing and feedback modifica... 70
Frontend Implementation 21%
Implement frontend component: admin... 25
Implement frontend component: user p... 25
Iterative testing and feedback modifica... 15
Enhancing User Interface 0%
Get feedback from end users 0
Make improvements to UI 0
Graphical User Interface Exploration and 0%
Research possible implementation opti... 0
Create implementation plan document ... 0
ANTIBIOTIC NINJA
Documentation
Compile use cases
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Backend Design
Design backend component: database
Design backend component: admin portal
Design backend component: user portal
Iterate design with mentor feedback
Backend Implementation
Implement backend component: database
Implement backend component: admin portal
Implement backend component: user portal
Iterative testing and feedback modifications
Frontend Implementation
Implement frontend component: admin portal
Implement frontend component: user portal
Iterative testing and feedback modifications
Enhancing User Interface
Get feedback from end users
Make improvements to UI
Graphical User Interface Exploration and Implementatio
Research possible implementation options for graphical
Create implementation plan document for mentors

Reading List

1. CDC. Antibiotic Resistance Threats in the United States, 2013. Vol CS239559-B. Atlanta, GA2013:114.
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 health care-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.
8. http://hl7.org/fhir/index.html

Questions?