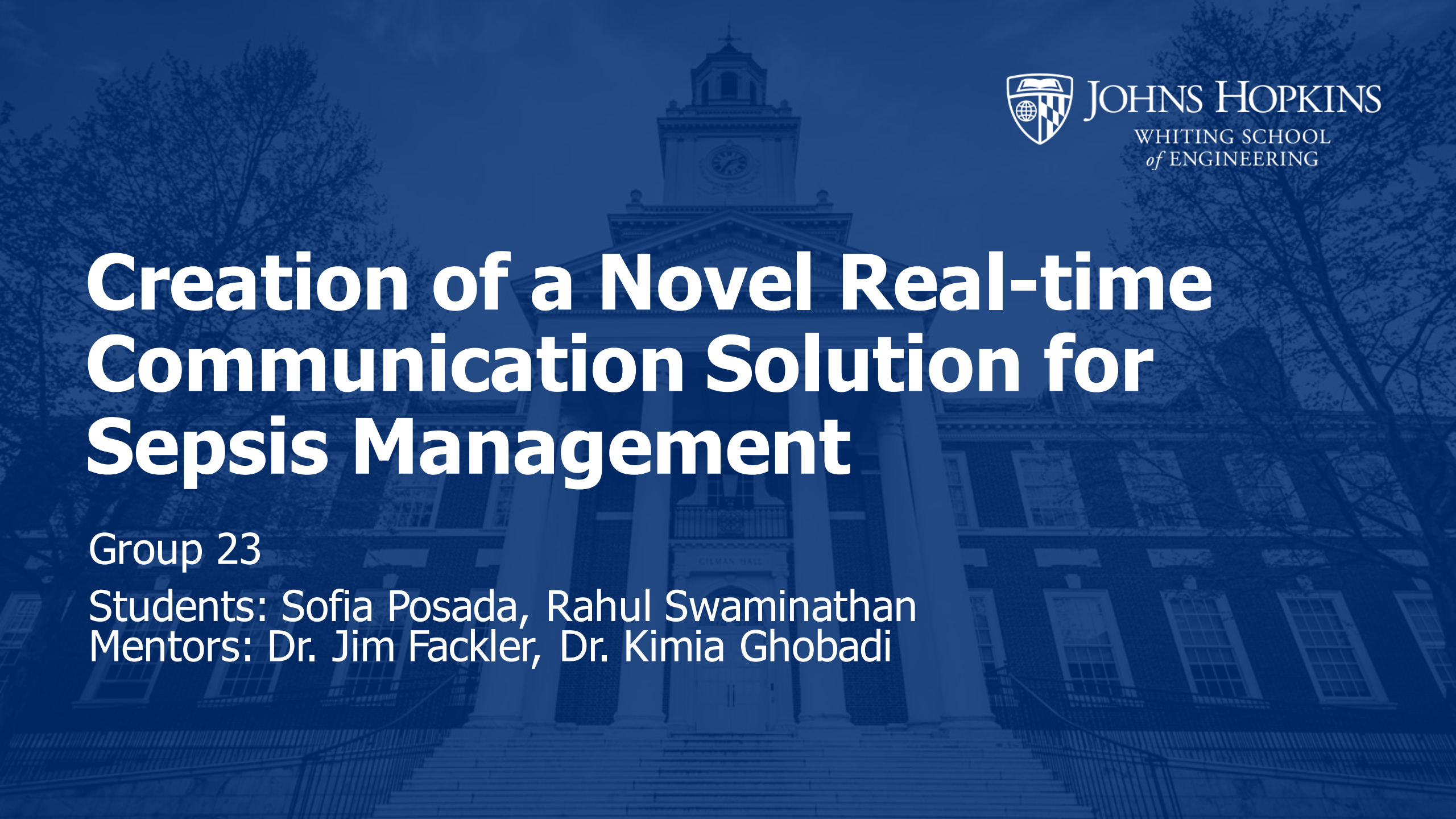


JOHNS HOPKINS
WHITING SCHOOL
of ENGINEERING

Creation of a Novel Real-time Communication Solution for Sepsis Management

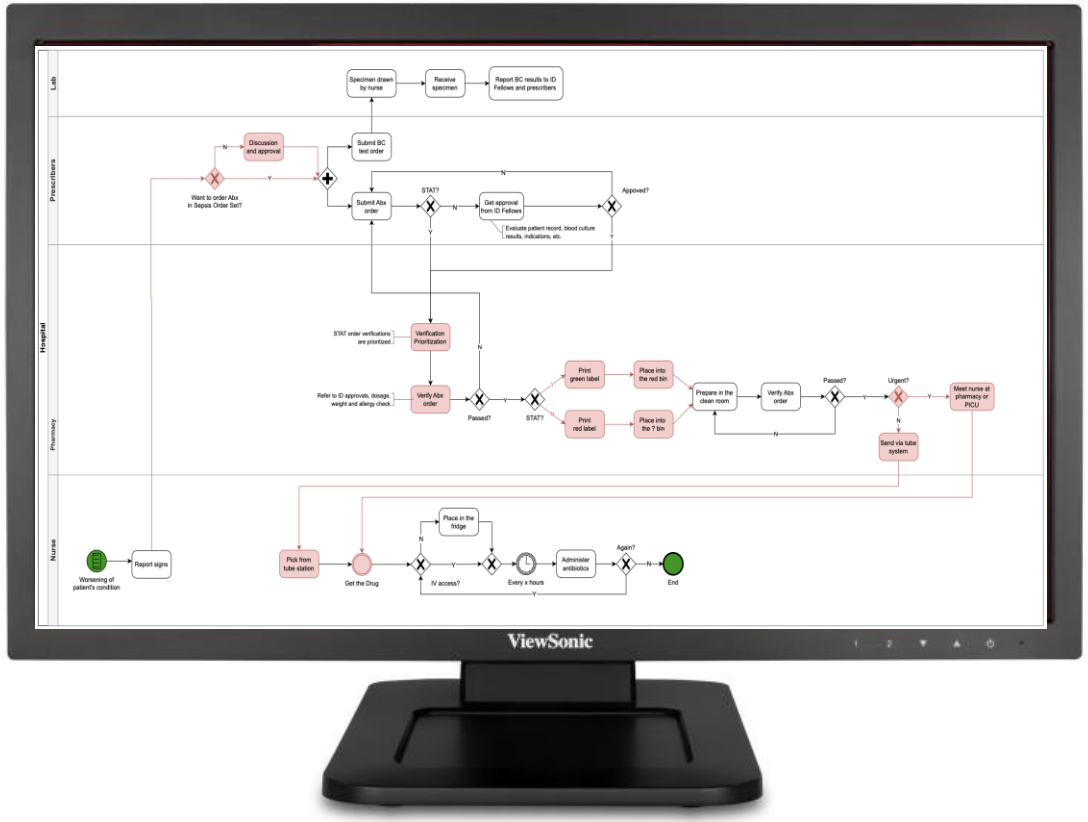
Group 23

Students: Sofia Posada, Rahul Swaminathan
Mentors: Dr. Jim Fackler, Dr. Kimia Ghobadi

Project Summary

- **Goal**: Create a platform for sepsis management to allow antibiotics to be delivered from the pharmacy to the patient in under one hour

- **Solution:**
  - Track antibiotics
  - Visualize process map
  - Alert relevant sepsis team members



Project Status

Minimum Deliverable	Associated Tasks/Milestones	Expected Date	Status
Finalized process map of sepsis management workflow (Sofia and Rahul)	Shadow Dr. Fackler in the PICU to observe the steps of antibiotic delivery during sepsis management	2/21	**Completed 2/21**
	Identify all team members involved in sepsis management at a role-level	3/2	**Completed 3/2**
	Conduct clinician/provider interviews to augment the existing process map and identify commonly used communication platforms	3/7	**Completed 3/9**
~~Complete dataset of timestamps and locations for antibiotic delivery~~	~~Place a locator tag inside the bag containing the antibiotics to track its location and time throughout the delivery process and fill in the gaps in the existing timestamp data (Sofia)~~	~~3/9~~	**Infeasible for now**
Short report of gap analysis showing where a communication solution is most needed	Analyze the ~~complete~~ **partial** timestamp data and see where the antibiotics are held up for the longest periods of time in order to cross-reference that with the process map to see where a solution would be most useful (Sofia and Rahul)	~~3/16~~ **4/10**	**Delayed due to IRB and change in data management staff**

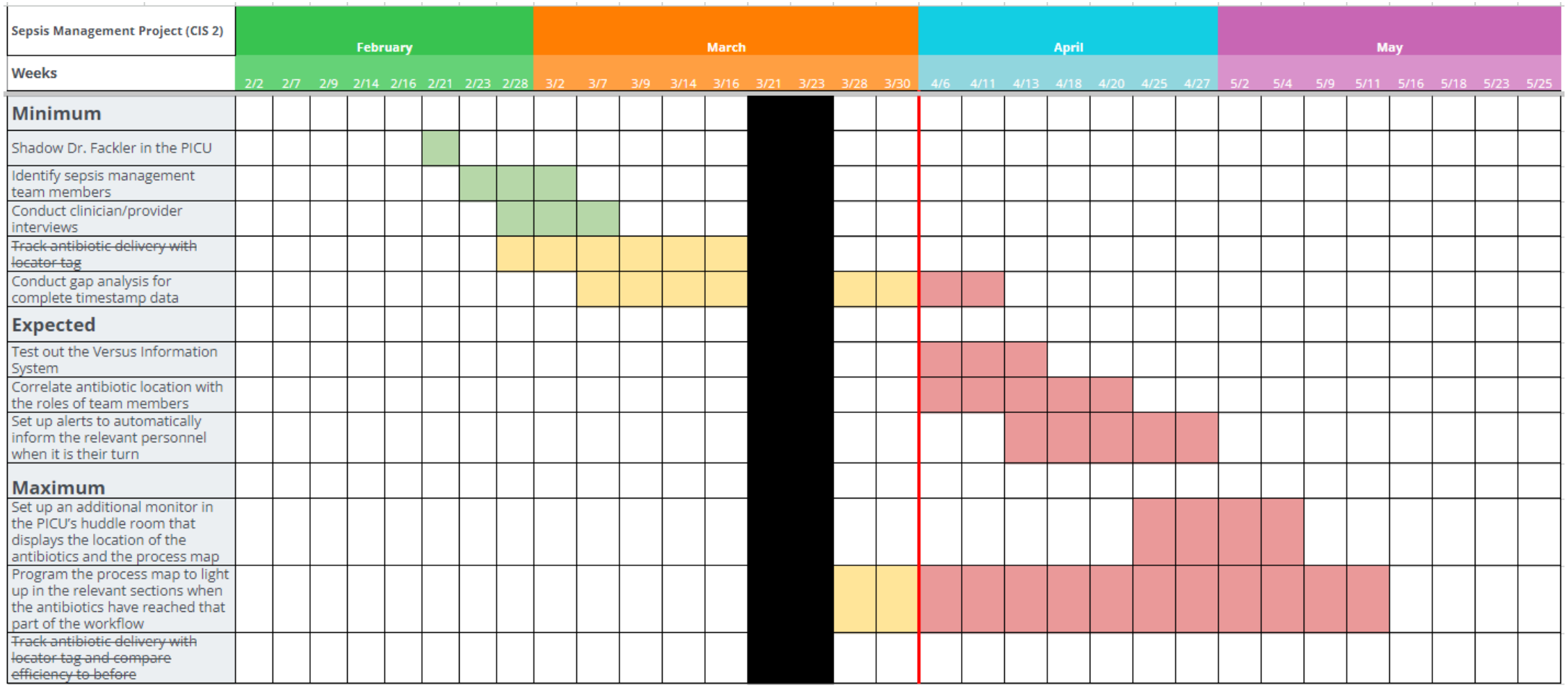
Project Status (continued)

Expected Deliverable	Associated Tasks/Milestones	Expected Date	Status
Physical prototype of communication solution that allows providers to visualize where the antibiotics are within the hospital	Test out the Versus Information System (VIS) to see if antibiotic location can be accurately and reliably tracked and exported outside of their software. **Use barcode scanning as a tracking alternative if this doesn't work.** (Sofia)	~~4/6~~ **4/14**	**Delayed – preemptively extended the deadline**
	Correlate antibiotic location with the roles of team members as described in the process map (Sofia)	4/20	**On track**
	Set up alerts to automatically inform the relevant personnel when it is their turn (Rahul)	4/27	**On track**

Project Status (continued)

Maximum Deliverable	Associated Tasks/Milestones	Expected Date	Status
Implemented prototype of communication solution that uses a monitor to display the location of the antibiotics and whose turn it is within the process map	Set up an additional monitor in the PICU's huddle room that displays the location of the antibiotics as well as the process map (Rahul)	5/4	**Not started**
	Program the process map to light up in the relevant sections when the antibiotics have reached that part of the workflow (Rahul)	5/11	**On track**
~~Dataset of timestamps and locations for antibiotic delivery after the solution is implemented~~	~~As done earlier, place a locator tag inside the bag containing the antibiotics to track its location and time throughout the delivery process in order to see how the efficiency of antibiotic delivery has changed as a result of the implemented solution (Sofia)~~	~~5/18~~	**Infeasible due to time restrictions**

Timeline

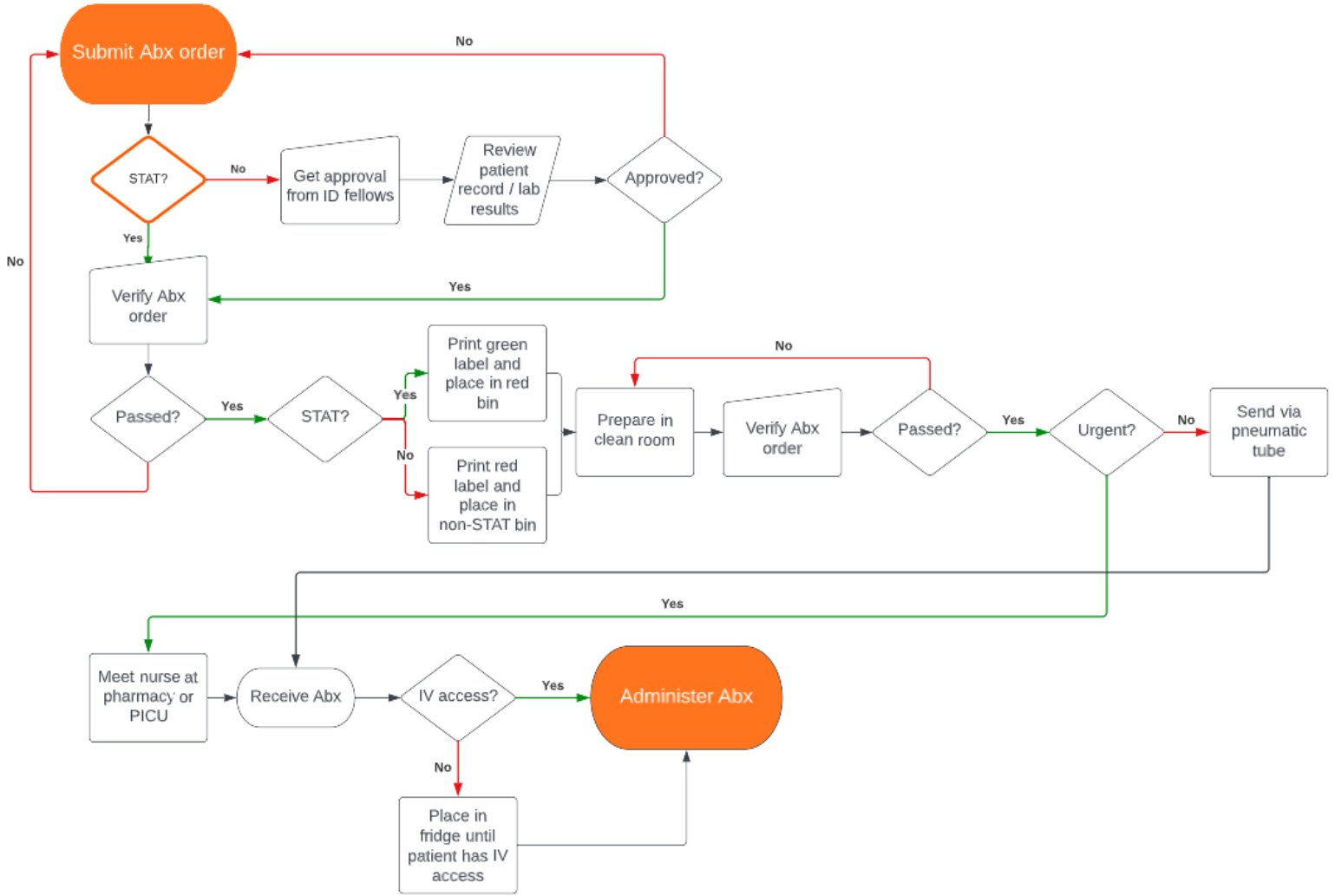

Sepsis Management Project (CIS 2)
February
March
April
May
Weeks
2/2 2/7 2/9 2/14 2/16 2/21 2/23 2/28 3/2 3/7 3/9 3/14 3/16 3/21 3/23 3/28 3/30 4/6 4/11 4/13 4/18 4/20 4/25 4/27 5/2 5/4 5/9 5/11 5/16 5/18 5/23 5/25
Minimum
Shadow Dr. Fackler in the PICU
Identify sepsis management team members
Conduct clinician/provider interviews
~~Track antibiotic delivery with locator tag~~
Conduct gap analysis for complete timestamp data
Expected
Test out the Versus Information System
Correlate antibiotic location with the roles of team members
Set up alerts to automatically inform the relevant personnel when it is their turn
Maximum
Set up an additional monitor in the PICU's huddle room that displays the location of the antibiotics and the process map
Program the process map to light up in the relevant sections when the antibiotics have reached that part of the workflow
~~Track antibiotic delivery with locator tag and compare efficiency to before~~

Current Work – Process Map

PICU Doctor

Pharmacy

PICU Nurse



Current Work – Tracking Documentation

- Original plan - Versus Information System (VIS) - not feasible
- "Implementation of a Web-based medication tracking system in a large academic medical center" (Calabrese and Williams, 2012)

Requirements (End-user needs):

- Antibiotic location should be accurately and reliably tracked.
- Allow sepsis team members to quickly identify the location of a specific antibiotic in case of an emergency.
- The system should provide a record of all interactions with the antibiotic to enable efficient tracking and monitoring.

System Design:

Inputs:

Barcode scanner
Database for storing data
Label printer for creating barcode stickers (pharmacy has this)

System:

1. When an antibiotic is passed in the pharmacy, a unique barcode sticker is generated and attached to the outside of the antibiotic packaging.
2. When a sepsis team member receives the antibiotic, they scan the barcode with a scanner app to record the timestamp and location associated with the interaction.
3. The system stores this data in a database for future reference.
4. When the antibiotic is moved to a new location or handed over to another team member, the process repeats

Outputs:

Location data for each interaction with the antibiotic
Timestamp data for each interaction with the antibiotic

Current Work – Design Documentation

Requirements (End-user needs):

1. Sepsis team members must be able to view the real-time location of the antibiotics within the PICU
2. Sepsis team members must be able to see how the antibiotic delivery is progressing within the process map
3. Sepsis team members must be notified once the antibiotics have reached predetermined locations

System Design:

Inputs:

1. Real-time location of antibiotics
2. Process map of sepsis management workflow
3. Real-time location of sepsis team members (ideal but not necessary)

System:

1. Relational database of antibiotic locations, relevant sepsis team members, and steps in the process map
2. EPIC Secure Chat - group chat with all sepsis team members

Outputs:

1. Dynamic process map showing current and next steps depending on the location of the antibiotics
2. Notification system to alert sepsis team members at each stage of the antibiotic delivery

Dependencies

Dependency	Need	Status	Planned Deadline	Hard Deadline	Contingency Plan
IRB approval for tracking	Tracking location of antibiotics from the pharmacy	No approval needed for sticking a gps tag in the antibiotics bag because someone from the pharmacy is on the existing IRB	2/16	2/28	N/A
Access to Versus Information System technology	Tracking location of antibiotics from the pharmacy	Still need access to the API Cannot get ahold of the tags	2/28	3/16	~~Use our own tracking device like an Apple AirTag and find out how to export that location data~~ **Use barcode system**
Access to timestamp data	Gap analysis for identifying solution space	We have some of the data but not all. IRB change was approved!	2/20	~~3/16~~ **4/10**	Conduct gap analysis using limited available data in combination with nurse interviews
HIPAA Training	Access to certain datasets and Epic Secure Chat	All trainings are complete	2/28	4/13	May be able to use anonymized data for all analysis purposes