BAYES IMPACT

# Sustainability Plan

## Precision Discharge Platform

May 2016

**Issue Analysis**

Readmissions after hospital discharge result in substantial burdens on the healthcare system, in terms of both cost and quality of care. The US Department of Health and Human Services estimates that readmissions contribute more than $15 billion a year in cost for Medicare patients alone, a significant portion of which is preventable.[1] Research by the Health Resource and Education Trust (HERT), an affiliate of the American Medical Associate, shows that identifying high-risk patients and effectively coordinating care are primary drivers for reducing readmissions.[2] Identifying high-risk patients to deploy targeted interventions is essential to triage limited hospital resources, especially for resource-intensive discharge plans that have been proven to reduce readmissions.[3] However, many hospitals lack the tools to accurately assess patient risk and effectively manage multi-step discharge plans. Moreover, due to newly established penalties under the Affordable Care Act, hospitals that care for vulnerable patient communities incur harsh penalties for high readmission rates. The shift to population health management, such as shared risk and capacitated reimbursements, exacerbates the need to reduce readmissions. Safety net hospitals are not only disproportionately affected by changes in federal penalties and reimbursements, but also suffer from limited resources – leading to lagging health information technologies and ultimately, a worsening disparity of care between the wealthy and poor.

One of the major challenges in assessing readmission risk is due to the complexity of analyzing vast and heterogeneous sets of patient medical records and claims data. The complex and disparate nature of patient records presents an ideal problem set for data science. Statistical risk prediction and machine learning could enable automated, real-time stratification of patient

[1] http://www.hcup-us.ahrq.gov/reports/statbriefs/sb196-Readmissions-Trends-High-Volume-Conditions.pdf
[2] http://www.aha.org/research/reports/tw/15mar-tw-readmissions.pdf
[3] http://www.ahrq.gov/professionals/systems/hospital/red/toolkit/index.html

readmission and provide a basis for targeted delivery of intervention and transitional care. A web-based application that recommends, coordinates, and implements tailored discharge plans based on patient risk could enable hospitals to better allocation scarce hospital resources to help the highest-risk and most costly patients.

However, few data science approaches have been implemented in clinical practice, and even fewer are accurate enough for real-time clinical usage, particularly those that are robust across diverse patient populations. One major limitation has been the lack of data standards and technical infrastructure across hospitals to access, share, and integrate patient data. The lack of interoperability has lead to limited access to critical data sets and time-consuming and length data integration cycles. The adoption of FHIR across EHR vendors presents a critical opportunity to implement data science approaches rapidly across a spectrum of providers and patient populations.

**Solution**

Overview

With funding through the Robert Wood Johnson Foundation, Bayes Impact is developing a precision discharge platform with a focus on safety net hospitals. Our tool will identify patients at high risk of readmission, deliver patient specific intervention, and evaluate care effectiveness (Figure 1). We are developing our product through two stages: first, building a predictive machine learning model that can stratify patients by their readmission risk and second, to co-develop the precision discharge platform with our hospital partners.


Figure 1: Precision Discharge Platform schematic

Identify: The Bayes Impact Predictive Readmission Model

Bayes Impact collaborated with Sutter Health's Research Development and Dissemination (RDD) team to develop a real time predictive risk score to identify high-risk patients. Our model utilizes patient data of over two million patients within the Sutter Health network to build a highly predictive risk assessment model. At the heart of the predictive engine is an adaptive machine-learning algorithm that

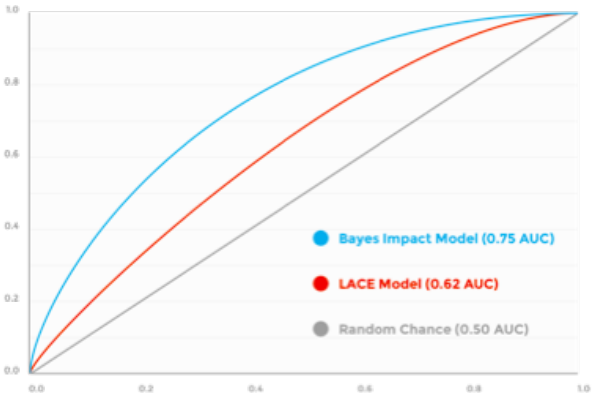



Figure 2: Comparative predictive values of the Bayes Impact Model, LACE, and random choice

evaluates patient's risk profile based on previous electronic records system. Unlike LACE (the current industry standard), the machine-learning algorithm allows for multi-faceted and comprehensive risk profiling. Furthermore, this method is adaptive to patient population in different hospitals, and allows for a more accurate risk profiling among different cohorts. We have successfully tested the retrospective accuracy of our model, demonstrated via the graph in Exhibit 2.

Intervene: The Precision Discharge Platform

The discharge planning process is a critical driver of reducing readmissions. Over the course of our research and interviews with clinicians, hospital administrators, case managers, and patient advocates, we found that managing the discharge process once high risk patients are identified is highly varied both within and between hospitals. Furthermore, compliance with the instituted discharge or care plan is difficult to manage and assign. To achieve meaningful change to the quality of care, our product (Figure 3) addresses both the proper identification and management of high-risk patients. Our tool is launched from a link within the EHR page of each patient. Clinicians are then taken to the web-based application.

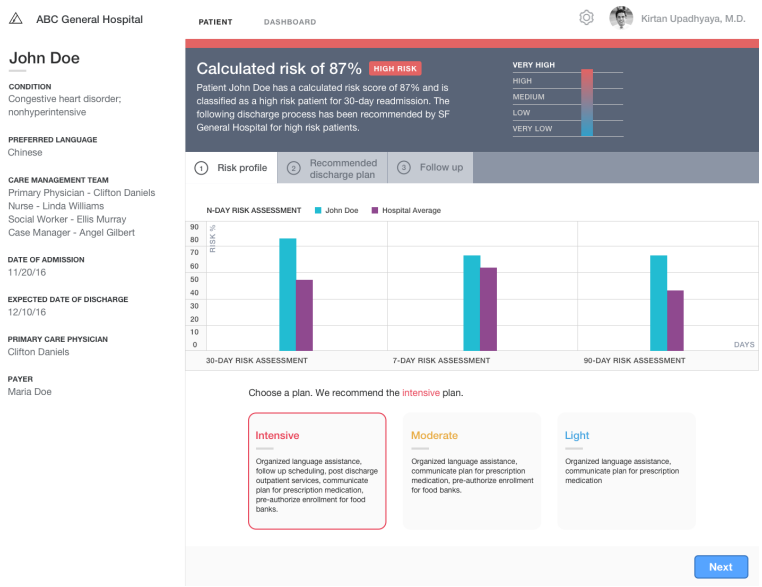



Figure 3: Risk Profile view within the precision discharge platform

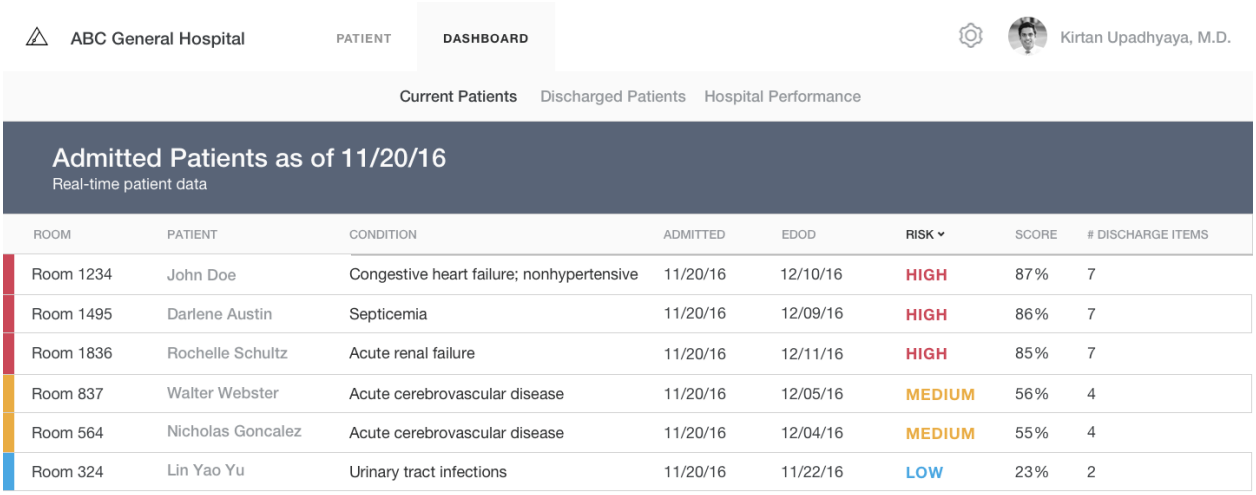
There are three main users for the web based application, with each user drawing different value propositions for using our tool: clinicians who can evaluate risk and chose an appropriate plan for the care team to follow, care teams who can check off items as they complete them and schedule reminders to patient on follow up care items, and hospital management who can track compliance and visualize hospital performance.

Evaluate: The Precision Discharge Platform

With text based questions such as "Did you attend your appointment on Thursday May 26th with your pulmonary specialist? (Yes/No)" or "Have you taken your evening medication? (Yes/No)"

care teams can track patient compliance and intervene when necessary with phone calls or in-home care visits (Figure 4). Dashboards (Figure 5) can provide clinicians, care teams, and hospital administrators a snapshot of all patients currently in the ward. With simple indicators for high-risk patients and outstanding discharge tasks, hospital staff can efficiently manage multiple patients at a glance. Hospital administrators will also be able to assess hospital performance in real time via a hospital overview dashboard.


Figure 4: This example follow up reminder was sent using text message




| ROOM | PATIENT | CONDITION | ADMITTED | EDOD | RISK | SCORE | # DISCHARGE ITEMS |
|---|---|---|---|---|---|---|---|
| Room 1234 | John Doe | Congestive heart failure; nonhypertensive | 11/20/16 | 12/10/16 | HIGH | 87% | 7 |
| Room 1495 | Darlene Austin | Septicemia | 11/20/16 | 12/09/16 | HIGH | 86% | 7 |
| Room 1836 | Rochelle Schultz | Acute renal failure | 11/20/16 | 12/11/16 | HIGH | 85% | 7 |
| Room 837 | Walter Webster | Acute cerebrovascular disease | 11/20/16 | 12/05/16 | MEDIUM | 56% | 4 |
| Room 564 | Nicholas Goncalez | Acute cerebrovascular disease | 11/20/16 | 12/04/16 | MEDIUM | 55% | 4 |
| Room 324 | Lin Yao Yu | Urinary tract infections | 11/20/16 | 11/22/16 | LOW | 23% | 2 |

Figure 5: All current patients dashboard highlight risk, important dates, and number of outstanding discharge items remaining.

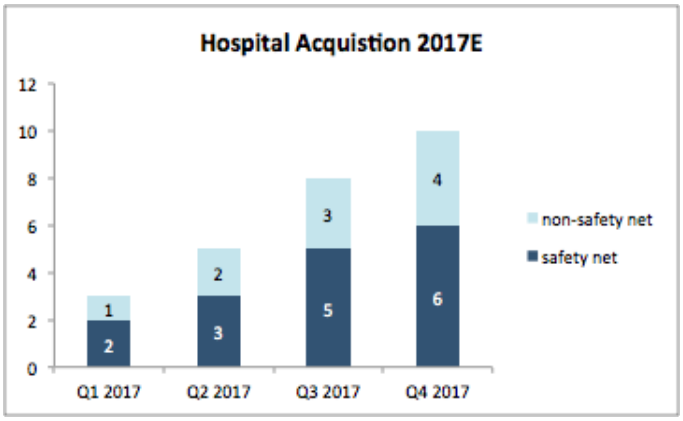
## Financial Stability

### Financial Summary

We present quarterly financial estimates for 2017. Our financial model is based on conservative estimates derived from pricing and costs structures of comparable healthcare software and IT vendors. For our projection, we focused on identify topline revenue, cost of goods sold, and gross margin. We chose FY 2017 as our projection period because we estimate that, given our current stage of R&D and customer acquisition, our first implementations and subsequent revenue generation will begin in Q4 2016.

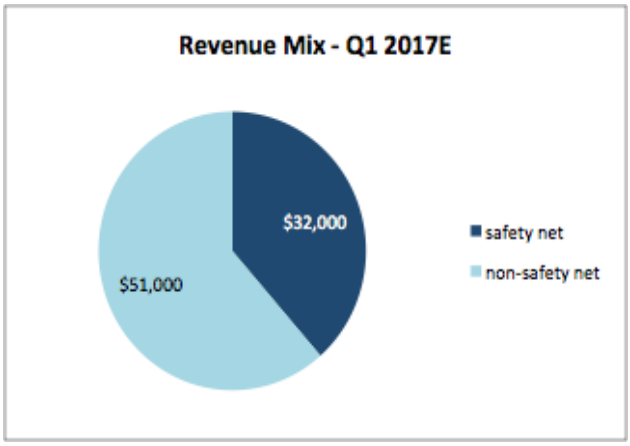
Customers

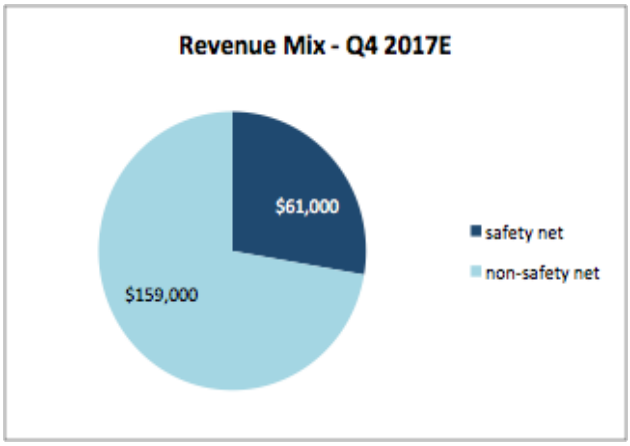
Our main customers are hospital and hospital systems. A unique focus of our organization is to provide our services, at a discount, to safety net hospitals and other providers who have a disproportionate share of Medicare and/or Medicaid patient. We will be targeting both safety net and non-safety net hospitals. We estimate a three-month sales cycle to onboard a new customer (Figure 6). By the end of 2017 we anticipate 10 hospital customers; six safety net compared to four non-safety net.




Revenue

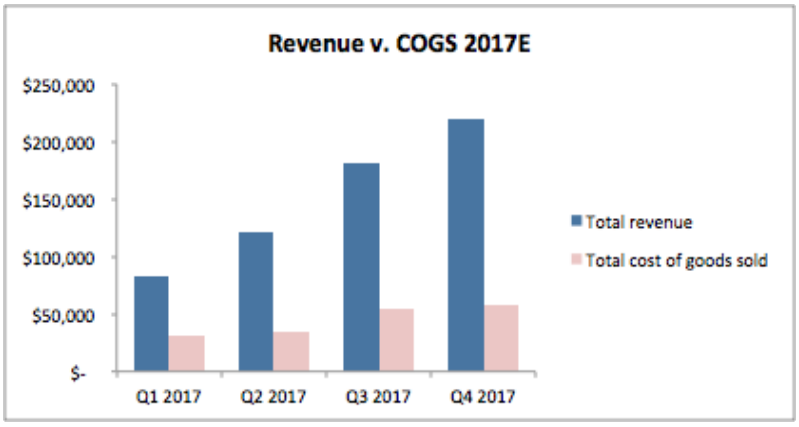
Our revenue is generated primarily through fees from hospitals in three forms; 1) license fees 2) integration and 3) maintenance and support. Integration fees are paid in one-time instances, with integrations generally taking one month. Licenses are booked annually and accounted for on a monthly basis (accrual), while maintenance and support fees are collected monthly. As we acquire more customers, we anticipate our revenue mix shifting towards non-safety net hospitals. We associate larger revenue contributions with higher fee structures for non-safety net hospitals as compared to safety net hospitals.



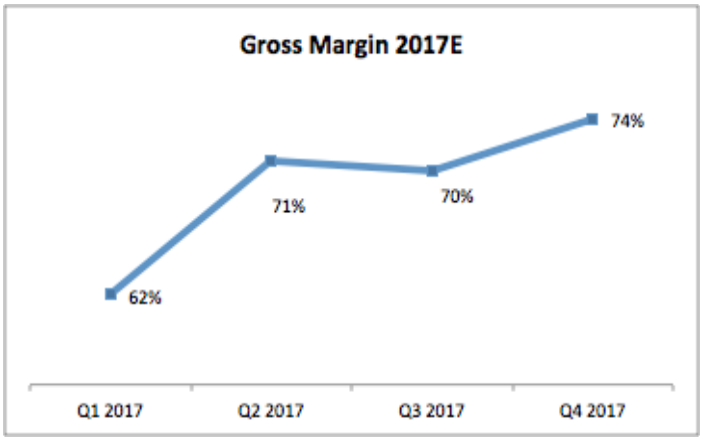
Expenses (Cost of Goods Sold)

Our main cost of goods sold are 1) technical integration, 2) maintenance and support, 3) server and other technical infrastructure costs. We did not include operational expenses (e.g. general and administrative). We anticipate cost of goods to scale proportionally with revenue.




Gross Margin

We anticipate our gross margin to increase overtime as we secure more non-safety net hospitals. Also, in Q4 2017, we expect to launch new application features which present an opportunity to increase top line revenue with minimal impact on costs of goods sold and thus improving our gross margin over time.



**Engagement Plan**

Initial Outreach and Partnership Development

| Customer acquisition |
| --- |
| **Target customer base**<br>Hospitals are our target customers. We have a specific focus on safety net hospitals because these organizations are disproportionately affected by patient readmissions and have the most complex and difficult cases of patient care. As a nonprofit, our mission is to enable precision care for the most vulnerable populations. Moreover, safety net hospitals have highly constrained clinical resources. In settings with complex patients and limited resources, our product's precision recommendations and automated workflows have an outsized impact in optimizing clinical pathways, reducing costs by improving resource allocation, and improving patient outcomes.<br><br>**Individuals of interest**<br>Executive: Chief Information Officer, Chief Medical Information Officer, VP of Clinical Innovation, Chief Financial Officer, Chief Medical Officer<br>Clinical: Care managers, nurses, physicians, discharge coordinator<br><br>**Acquisition strategy**<br>We have a two-pronged customer acquisition strategy. First, we present a population health management and cost-reduction case to individuals at the executive level. The CIO and CMIO are the lead contacts that determine partnership opportunities, information technology integrations, and establish agreements. Second, we present our product to clinical care teams, who are direct users of our product. We present a case for improved patient management, care coordination, and staff resource reduction. These users become our champions for executives to establish a partnership agreement. |

**Piloting and Implementation**

| | |
| --- | --- |
| **Phase 1: Implementation** | **Stakeholders:** information technology staff, chief medical officer, clinical directors<br><br>For technical implementation, we engage the information technology |

| | |
|---|---|
| | teams to integrate our software with their EHR. In this stage, we are mainly building data pipes from the hospitals FHIR API to our system and testing for security compliance. We are also working with the chief medical officer to identify initial roll out to care teams. |

| | |
|---|---|
| **Phase 2: Training and pilot** | **Stakeholders:** clinical directors, staff physicians, nurses, hospitalists, case managers, discharge coordinator<br><br>After technical implementation, we work closely under the guidance of clinical directors to pilot our product with care teams and integrate with existing clinical workflows. This includes role assignment, product training, discharge plan construction, and troubleshooting with care team staff (physicians, case managers, etc.). Importantly, the product is designed with minimal training requirements to improve onboarding. |

| | |
|---|---|
| **Phase 3 Launch and Evaluation:** | **Stakeholders:** information technology staff, C-level, and clinical staff (physicians, nurses, etc.)<br><br>After a successful training and pilot phase, we then launch our platform to the hospital, usually including additional technical implementation with information technology staff. We conduct a periodic evaluation to gauge care team satisfaction. We also present executives data to show the impact of our product on population health and care management. These efforts will help drive product iteration as well as further adoption in the hospital. |

**Maintenance and Servicing**

| **Continued Support** |
|---|
| **Retraining our model**<br>The machine learning models that power our software will continue to improve as more |

hospital-specific data is analyzed with each deployment. We will periodically reconfigure and retrain models to improve performance and robustness.

**Customer support**
In addition to automate security inspections and performance management, we will also provide on-call customer support for hospitals as needs arise.

**Additional Stakeholders**

- **Patients:** Through our platform, patients receive automated reminders of medical appointments, prescriptions, and other relevant discharge information. This information is relayed to care teams to further continuity of care efforts in their clinical workflows. We hope to expand our patient engagement efforts to address the continuity of care, such as addressing social determinants of health via data sharing.
- **Researchers:** We plan to publish a series of peer-reviewed articles on our predictive models and intelligent clinical workflow recommendations. The adoption and use of our work in the research community could magnify our impact by providing a basis for future innovation.

# User Story

## Precision Discharge Platform

May 2016

**Users**

There are three main users for the web app, with each user drawing different value propositions for utilizing our tool: clinicians (doctors) who can evaluate the risk plan and chose an appropriate plan for the care team to follow, care teams (nurses, social workers, case managers) who can check off items as they complete them and schedule reminders to patient on follow up care items, and hospital management (chief financial officer, chief medical officer, chief information officer, etc.) who can track usage of the platform and visualize hospital performance. Final iterations of the application will have separate logins for each of the user groups to control access to different features.

**Product Walkthrough**

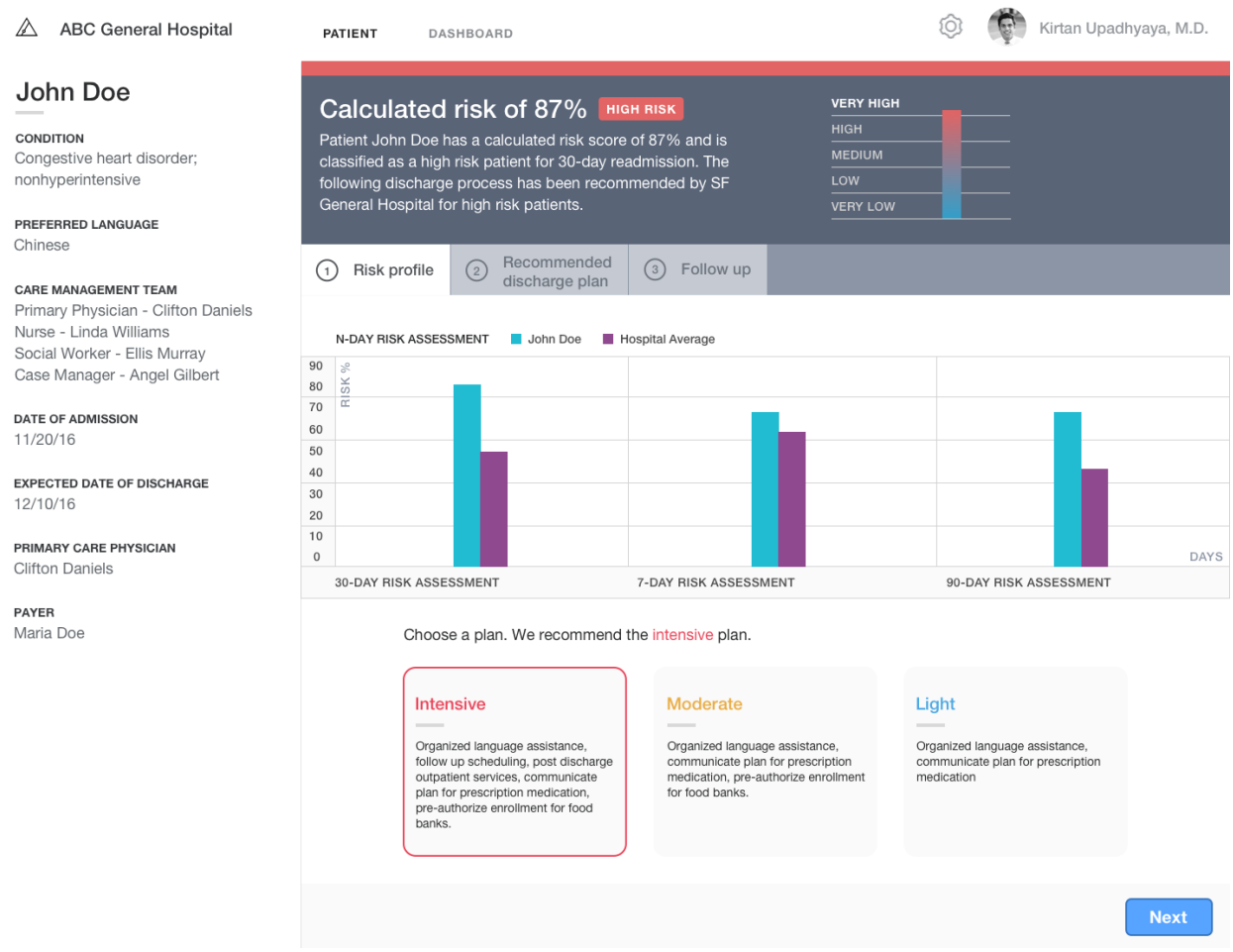
Risk Assessment – Figure 1

The risk assessment step is the first screen that clinicians and case managers will see after clicking our link within the patient chart. Integrating a link to the web based platform insures that there are no added workflow changes to a doctors regular routine. Using FHIR, the patient's data is inputted into our model and used to create a unique risk profile that highlights four key metrics: 30-day risk of readmission, short term risk of readmission (7-day), long term risk of readmission (90-day), and length of stay predictor (not pictured).

Discharge Plan Selection – Figure 1

Clinician and case managers use our real time predictive metrics to drive the selection of a care plan. Clinicians can choose from our discharge plans, each one tailored to different risk profiles for the patient. In our example, the intensive care plan has been recommended for the patient. While our tool highlights a suggested plan based off the unique risk profile, the clinician can select which plan to initiate.

Figure 1: Risk assessment and discharge plan selection

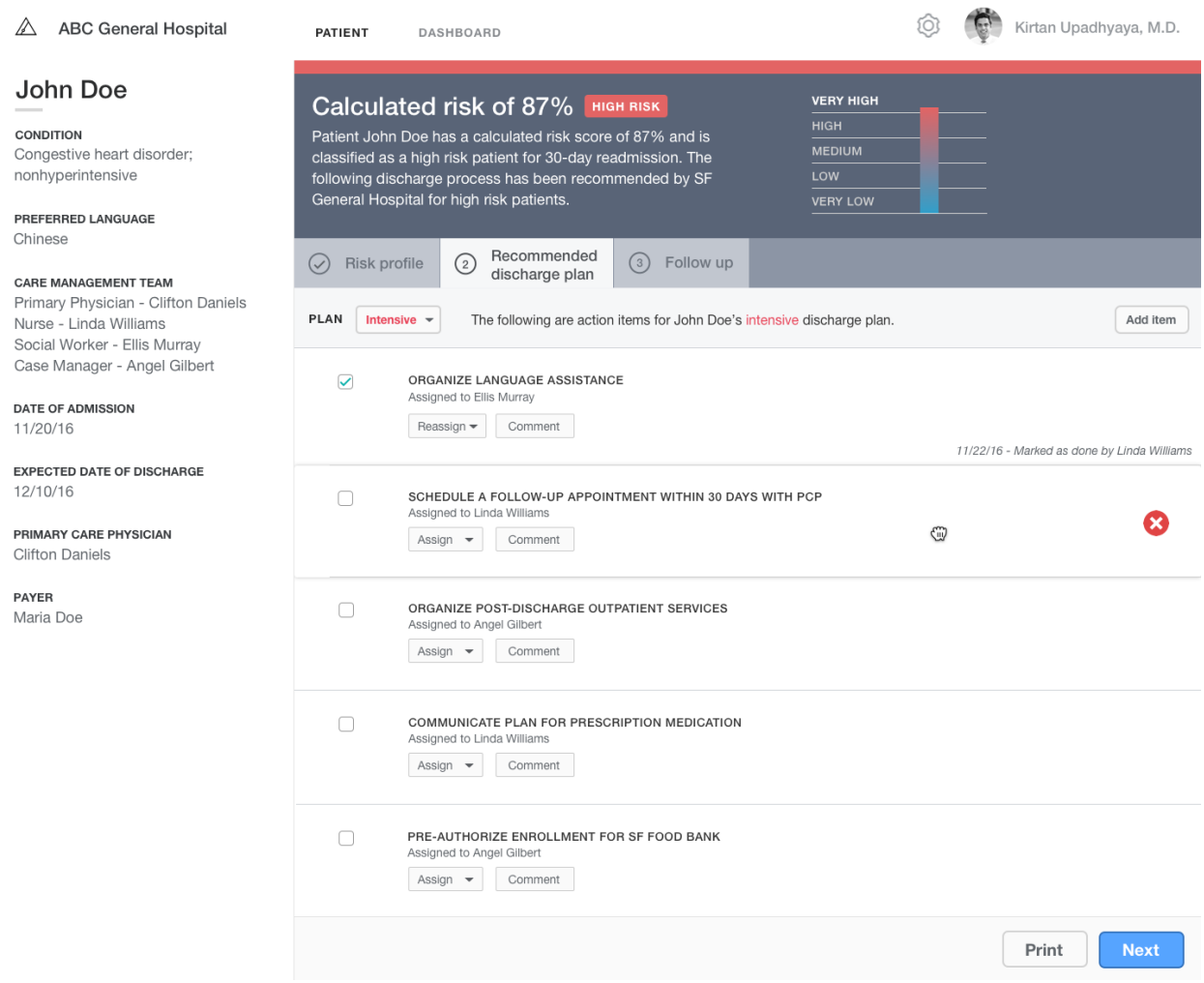



Discharge Plan Execution – Figure 2

Each plan consists of a series of tasks, which are pre-assigned to the care team. This ensures that there is little to no overhead for care managers while maintaining accountability for each step of the discharge process. Clinicians can add or remove items from the care plan. Care managers cannot remove steps from a plan but can add steps as necessary. For each task, members of the care team can comment or mark the task as complete. This mirrors several hospital protocols for discharge management but insures accountability by adding electronically signed checklists and task assignments.

Reminders to assigned hospital staff can include emails or notifications via the EMR. Case managers, who currently manage this process manually, can use our platform to organize and streamline their workflow.

Figure 2: Discharge plan execution




Follow Ups – Figure 3, 4

In this tab, the care team can set up automatic follow-ups and track the reception of the follow up communication. For example, for a patient discharged for heart failure, the follow-up can be to remind a patient to schedule an appointment with their cardiologist. Care teams can select the method of follow up, such as text-message, phone call, or email. Additionally, discharge management teams can select the frequency of follow up, such as once a day. The follow-up can be reminders to schedule appointments or when to take certain medications.

With text based questions such as “Did you attend your appointment on Thursday May 26th with your pulmonary specialist? (Yes/No)” or “Have you taken your evening medication? (Yes/No)”, care teams can track patient compliance and intervene when necessary with phone calls or in-home care visits.

Figure 3: Clinicians can choose the mode and frequency of follow up communication

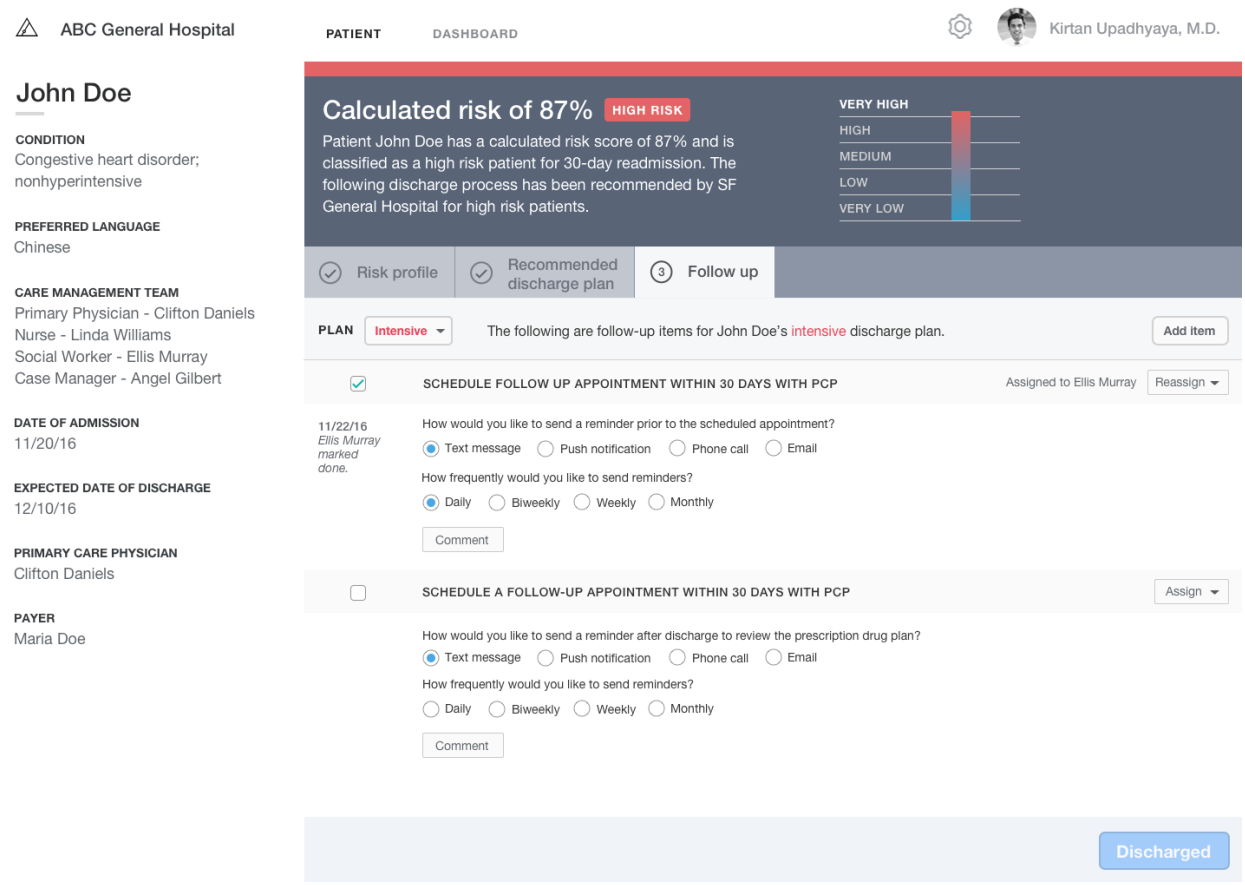
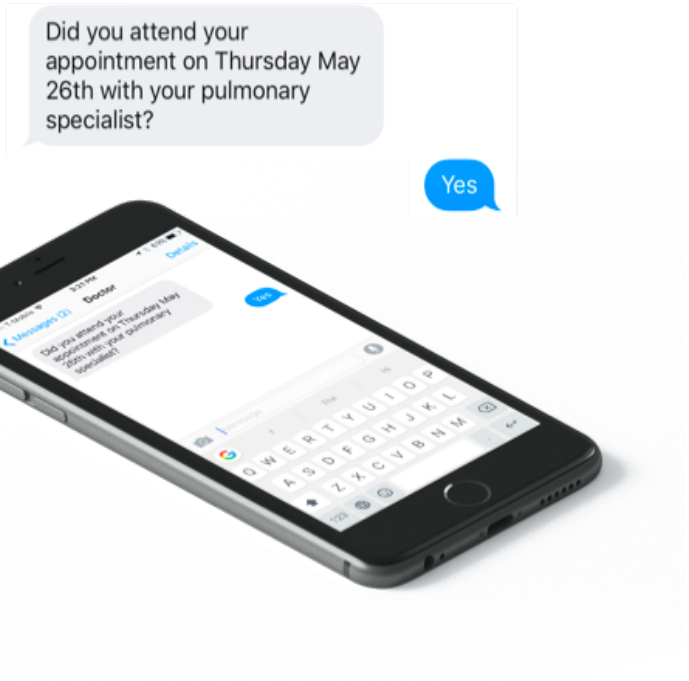


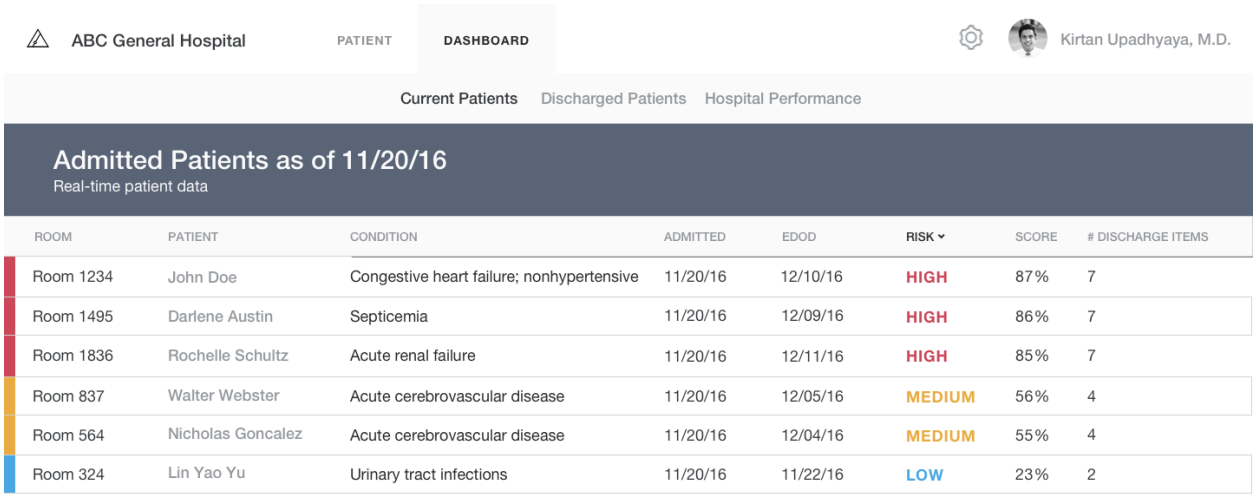

Figure 4: Simple text and email integrations can improve compliance and prevent readmission



Patient Dashboard – Figure 5

Clinicians care teams, and hospital administration can view a snapshot of all patients currently in the ward. With simple indicators for high-risk patients and outstanding discharge tasks, hospital staff can efficiently manage multiple patients at a glance.

**Figure 5: Example of a patient dashboard**




Hospital Performance

Hospital administrators will have access to a performance dashboard to assess population health in real time. Safety net hospitals rely on these critical metrics to determine everything from Medicare and Medicaid reimbursements to national hospital standards. By capturing predictive hospital measures in readmission, customer satisfaction, and length of stay, hospitals can quickly iterate and evaluate new care strategies to improve care.

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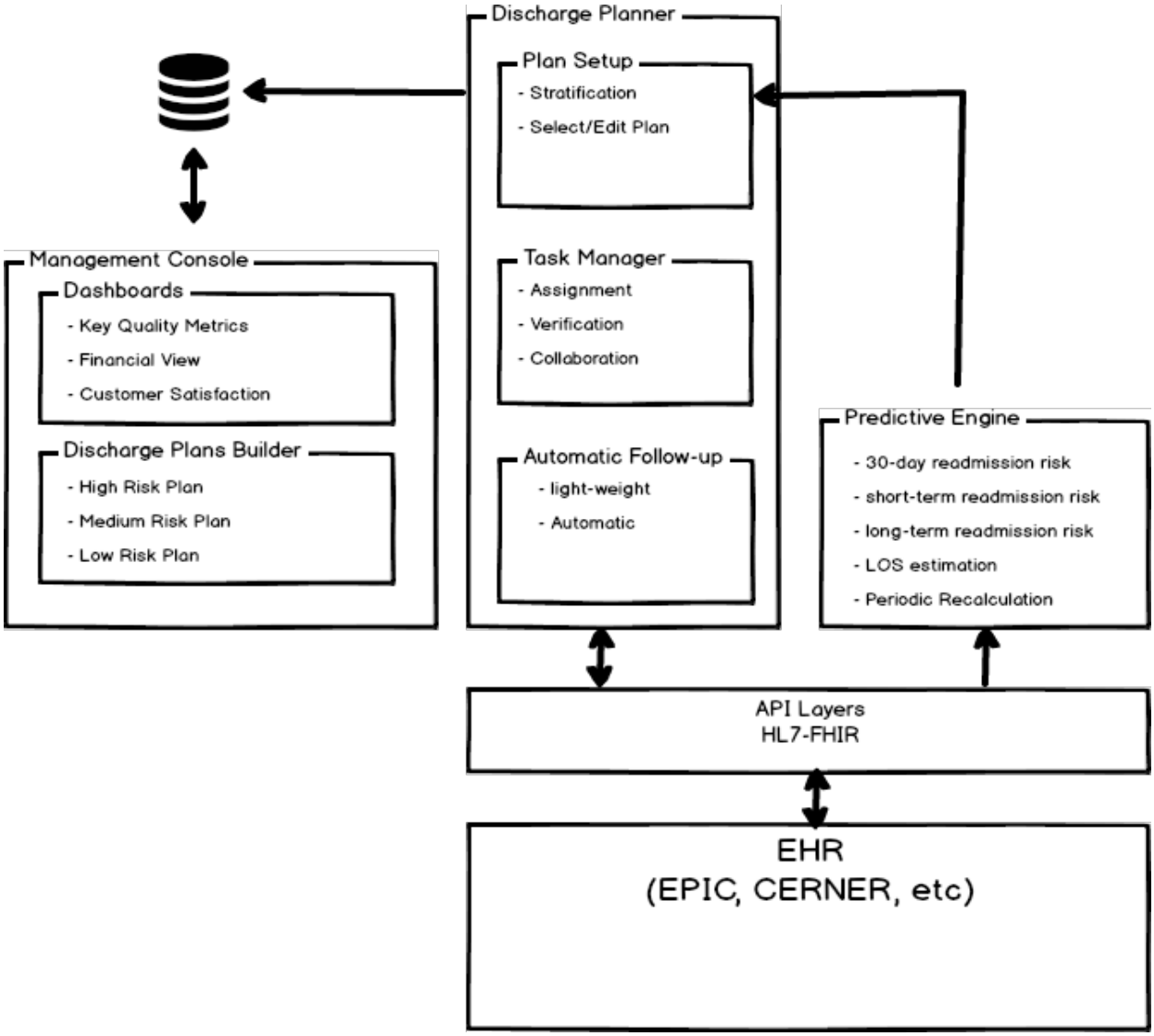
# Technical Specifications

## Precision Discharge Platform

May 2016

**Technical Specifications**

Systems Architecture Diagram



System Overview

- **EMR front-end integration:** The application will be accessible via a link in patient's EHR page. The application will be rendered in a web browser.
- **Data API layer (FHIR):** FHIR provides the essential connection between the EHR system and the predictive engine of the application. Abstraction of this communication layer enables the product to be transferable to major EHR vendors like EPIC, Cerner, etc. that have adopted (or are in the process of adopting) FHIR.
- **Predictive engine ("Risk Profiler"):** Upon opening the application, the platform calls the predictive engine, which is a separate module accessible via a custom API. The predictive engine, then, calls for the most predictive clinical and administrative features of the patient data via the aforementioned data API layer. After certain transformations of the features, built-in machine learning algorithms inside the predictive engine provide a comprehensive risk profile for the patient. The risk profile includes 30-day readmission risk, short-term readmission risk, long-term readmission risk, length-of-stay prediction, etc. The risk profile is fed into the discharge planner, which is the main front-end interface displayed to the user.
    - At the heart of the predictive engine is an adaptive machine-learning algorithm that evaluates patient's risk profile based on previous electronic records system. Unlike LACE (the current industry standard), the machine-learning algorithm allows for multi-faceted and comprehensive risk profile. Furthermore, this method is adaptive to patient population in different hospitals, and allows for a more accurate risk profiling among different cohorts.
- **Discharge planner:** The core front-end interface for the user at a patient-level view. The discharge planner provides users recommendation discharge plans, customization options, task managers for collaboration and compliance, and automated follow ups.
    - Plan set up - Different discharge plans are stored in the database as series of tasks assigned to various care team members. Based on the patient's risk profile data from the predictive engine, and their condition, the discharge planner recommends a specific discharge plan to the physician. However the physician is able to override the plan by selecting one of many standard plans.
    - Task manager - Once the plan is selected, the application loads the task list, and assigns each task to one team member. Everyone in the team can see and collaborate on discharge tasks.

    - Follow up - Automated text message are sent to remind patients of 1) outpatient appointments and 2) discharge instructions
- **Application database:** Stores application-level data; such as discharge plans, tasks, follow ups, user interactions, risk profiles, and provides data for the management dashboard and console.
- **Management console:** The management console provides information for users at a population view. This includes dashboards for quality and financial metrics, as well as customization options for adjusting discharge plans. Data is pulled from the application database and displayed in interactive charts and diagrams.

Technology stack

The predictive engine's algorithms and methods will be built on Python. The API layer will be built by Django REST framework. The application will be built on Angularjs as the front-end framework and Django-Python as the back-end. PostgresQL will be used as the database engine. Twilio will be used for follow up functionality.

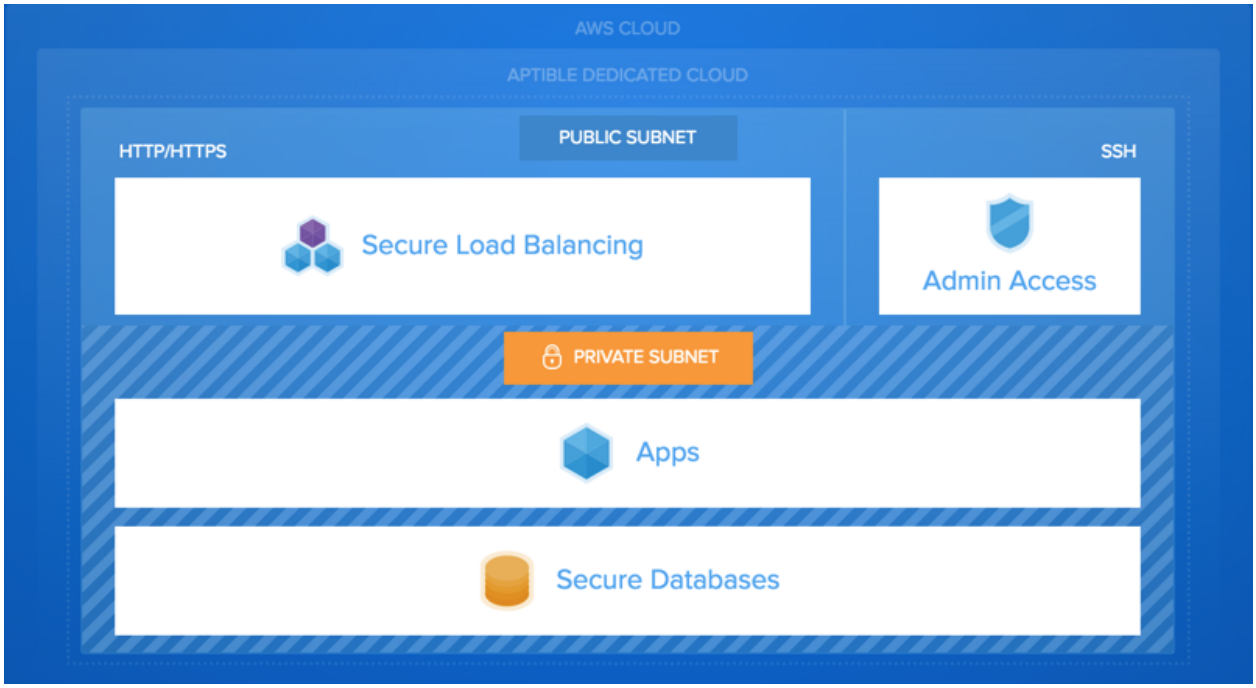
Data elements

For reference, data elements may include the following. All information is pulled from the EMR via FHIR.

- Demographic: Age, sex, race, education, income, language, marital status
- Source of admission: Direct from home, outpatient clinic, transfer, etc.
- Insurance: Medicare, Medicaid, other insurance
- Utilization statistics: ER visits, inpatient admissions, outpatient admissions, third-day readmissions, etc.
- Discharge features: Time of day, day of the week, length of stay, discharge status, medications at discharge, discharge service type etc.
- Comorbidities: Hypertension, lymphoma, obesity, liver disease, neurologic diseases, etc.
- Laboratory measures: Hemoglobin, calcium, sodium, blood urea nitrogen, glucose, etc.
- Condition-specific features: E.g. In the case of heart failure – left ventricular ejection fraction; atrial fibrillation, blood urea nitrogen, creatinine, etc.

Privacy and Security

The application and management of data sources is fully compliant with HIPAA. The following is a description of the privacy and security measures we've taken.




Source: Aptible

- **Deployment:** Our application is built on a HIPAA compliant cloud service called Aptible. Aptible is a HIPAA compliant service layer built on top of Amazon Web services that allows us to deploy Docker containers in secure and isolated HIPAA-ready environments. We have signed a business associate agreement with Aptible
    - Secure load balancing: Each SSL/TLS endpoint receives a dedicated load balancer. Our SSL/TLS endpoints allow us to manage x509 SSL/TLS certificates, force SSL/TLS connections, and create private services. Each endpoint receives automatic security updates on a regular basis.
    - Administrative access: Role-based access controls enable secure authorization and audit. Robust role-based access controls make it easy to authorize and audit your team's activity. This includes our SSH and tunnel access via an operations API that helps to manage our stack.
    - Secure databases: Databases run in a private subnet, hidden from the outside Internet. Access is restricted to your apps and team members. Database traffic is encrypted in transit, and data is encrypted at rest, using FIPS 140-2 approved modules and managed keys. Nightly backups are automatically taken and stored in a separate geographic region.
- **Application-level security:** Our application security features include storage encryption (FIPS 140-2 with AES 256 encryption algorithm), multifactor authentication,

anonymization in select application layers, multilayer firewalls, and vulnerability scanning. We also have pipelines for data disposal and PHI integrity, e.g. isolation of data to prevent tampering. Similar to the deployment infrastructure, our application-level security includes the ability to track incidents and audit logs, as well as create alerts for suspicious logins and other anomalies.

- **Physical compliance and protection:** We have an in-house HIPAA administrator that manages personnel-level compliance with privacy regulation. This includes maintaining and enforcing policies and ensuring workplace security. Every computer in our office that has PHI is physically locked down and screens are isolated. We regularly conduct the following:
    - Risk assessment to identify vulnerabilities
    - Define and develop policies and procedures to manage PHI risk
    - Assess documentation of policies, procedures, and security programs
    - Assess workplace use policies and controls
    - Keep inventory of all workplace devices that have PHI
    - Data backup and cleansing
    - Personnel trainings for PHI access and use
    - Define incident workflows and complaints system
- **Legal framework:** For our existing model and software development with Sutter Health, we have passed an institutional review board (IRB) evaluation, instituted a confidentiality agreement, and signed a business associate agreement. The BAA includes background checks, obligations for security patches, technical security requirements, mitigation procedures, breach reporting, insurance, and defined authorizations. We will follow a similar model with other hospitals partners without the IRB, which will help to improve adoption and integration timelines.

# Partnerships

## Precision Discharge Platform

May 2016

**Partnership with Sutter Health**

We have a business associate and contract agreement with Sutter Health. Sutter Health is the largest non-HMO hospital network in Northern California. Sutter serves more than 100 cities and towns, with 26 hospitals in its network. Our agreement with Sutter Health includes 1) access medical record data from 26 hospitals within Sutter Health's network 2) determine integration with medical record systems (EPIC with FHIR), and 3) develop and pilot software product. See Statement of Work and excerpt from signed Business Associates Agreement on following pages.

Figure 1: Statement of Work with Sutter Health

## APPENDIX A

### STATEMENT OF WORK

Project Title: "Developing Clinically-Viable Predictive Readmission Risk Models and Evaluating Clinical Implementation"

***A.1 Statement of Purpose*** *(Why and Who?)* - Bayes Impact is partnering with Sutter Health to develop condition-specific readmission prediction models, using a variety of supervised machine learning methods. Specific conditions of interest include (but are not limited to) acute myocardial infarction (AMI), heart failure (HF), chronic obstructive pulmonary disease (COPD), and pneumonia (PN). Bayes Impact will develop the initial models using data from one hospital within Sutter Health's network. They will then investigate the generalizability of their results to other systems by validating our models with data from a variety of hospitals across Sutter's network of twenty six care facilities and examining the effects of population differences (e.g. socioeconomic, demographic, and geographic) on model performance.

***A.2 Scope of Services*** *(What Services?)* - Sutter Health will work with Bayes Impact to verify compliance and security requirements for data use, including any necessary de-identification of personally identifiable patient information. Sutter Health will send Bayes Impact available administrative, clinical, and electronic health records data for use in model development. Sutter Health will send additional supplemental hospital data as needed and will provide ongoing feedback on data analysis and model development. Bi-weekly meetings will be held for the duration of the project (18 months).

***1.3 Project Milestones*** *(When?)* -

| Phase | Timeline (18 Months) | Work Plan |
|---|---|---|
| 1 | 4.5 Months | Data Collection, Security, Assessment |
| 2 | 2 Weeks | Exploration of Literature and Supplementary Data |
| 3 | 6 Months | Analysis and Model Development |
| 4 | 4 Months | Demonstration Prototype Software Development |
| 5 | 2 Months | Research on Clinical Application |
| 6 | 1 Month | Planning for Future Work |
| 7 | 1 Month | Communication and Distribution of Results |

***A.4 Deliverables and Acceptance Criteria*** *(What Tangible Goods?)* -
Sutter Health will send Bayes Impact available administrative, clinical, and electronic health records data for use in model development (phases 1-2). In return, Bayes Impact will create a pilot project proposal that applies their readmission model in clinical practice at Sutter's network of hospitals (phase 7).

***A.5 Place of Performance*** *(Where)* –
All work by Sutter Health's RDD team will take place at their Walnut Creek office.

Figure 2: Business Associate Agreement with Sutter Health

## APPENDIX C: Business Associate Agreement

10. **Entire Agreement**. This Agreement (together with any recitals and exhibits, which are hereby incorporated by this reference) constitutes the entire understanding and agreement between the parties relating to PHI, and it supersedes any and all prior or contemporaneous agreements, representations and understandings of the parties.

11. **Waiver**. Any failure of a party to insist upon strict compliance with any term, undertaking or condition of this Agreement shall not be deemed to be a waiver of such term, undertaking or condition. To be effective, a waiver must be in writing, signed and dated by the parties to this Agreement.

12. **Counterparts**. This Agreement may be executed in multiple counterparts, each of which shall be deemed an original and all of which together shall be deemed one and the same instrument. Any photocopy of this executed Agreement may be used as if it were the original.

13. **Governing Law**. Notwithstanding any other provision to the contrary, this Agreement shall be governed and construed in accordance with the laws of the State of California.

14. **Interpretation**. Any ambiguities shall be resolved to permit Covered Entity to comply with HIPAA and HITECH, and regulations promulgated under these laws.

15. **Execution**. By their respective signatures and execution dates, below, each of the following represents that he or she is duly authorized to execute this Agreement and to bind the party on whose behalf such execution is made.

| **SUTTER HEALTH** | **BAYES IMPACT** |
|---|---|
| By: Jacki Monson | By: |
| Name: Jacki Monson | Name: Eric Liu |
| Title: Chief Privacy Officer | Title: COO |
| Date: 8/13/15 | Date: 8/13/2015 |