A Novel Use of Electronic Health Record Data To Inform Patient and Clinician Treatment Choices

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Acknowledgements

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Objectives

- Describe the process of developing an early innovation project in the VA
- Examine how a comparative effectiveness research model can be brought to the frontline of care
- Discuss consideration and challenges of the use of relatively “real-time” data
- Describe how this tool can be expanded for use in promoting patient-centered outcomes

Early VA Innovation Project

- VA Innovations Program: 2008
- First Stage: Greenfield Incubation
  - Mechanism to encourage innovation from the field
- Competitive formal submission of projects (over 200 submitted, 75 awarded)
- Now: Brief ideas, voting

Early VA Innovation Project

- Crash-course in government contracting
- Learning “Scope of Work” language
- Experimenting in Wiki and a “sandbox”
- Guidance and help from talented Innovations staff: Jason Carley, Bill Cerniuk, Jim McCain
- Actual Start: 1 year after funding notification

Our Objectives

- There is no mechanism for individual patients to examine the outcomes of other patients like them using the treatment they are considering.

Currently:

- Results from small-sample studies and clinical trials

No direct model to build from, but 2 existing useful approaches

Conceptual Model

1. Patient Self-Report online sites:

   e.g.: www.patientslikeme.com

- Patients self-report treatment outcomes

  Problem: search capability limited (gender, age, diagnosis, symptoms)

- Important search fields not available:
  - Co-morbidity -Family History
  - Smoking status -Concurrent Medications
  - Weight factors -Mental health issues
  - Geographical region -Race/ethnicity

  Etc…….

Conceptual Model

2. Comparative Effectiveness Research (CER)

- CER compares treatments head-to-head for effectiveness

- Problems:
  - Efficiency
  - Relevance
  - Replication and updating
  - Distant from frontline of care

SOLUTION

- Electronic Health Records (EHR) in local healthcare systems provide the missing elements:
  - "Grouping" power
  - Regional reach allows geographical homogeneity
  - Common methods of data collection

- VHA's VistA EHR

Formulation of Project

- EHR systems have problems of their own regarding data access and integrity (data errors, missing data, etc.)

- Must determine the best data fields to use for both treatments and outcomes.

- "Medications" as the set of treatments
  - Easily quantifiable
  - Well-developed data fields
  - Informatics-friendly

- Project name: "Outcomes-Based Prescribing" (OBP)

Formulation of Project

First step: Which VistA data fields are good?

- Fileman queries to determine data fields to analyze
- Evaluated integrity/useability of data fields with SAS
- Final list of “useable” fields as indicators for either direct or indirect clinical outcomes.

Formulation of Project

Second step: Develop our Models: **Conceptual Use**

The scenario:

1. Patient receives a new diagnosis or needs to start on a new medication
2. Patient reviews information on disease, identifies and becomes familiar with potential treatments, receives input from provider
3. Patient and provider view data on how other similar patients have fared on the different treatment options under consideration
4. Patient and provider view additional data on cost, generic availability, FDA warnings, and FDA adverse events
5. Patient and provider jointly reach treatment decision

General Software Roadmap

1. Data Retrieval and Definition:
   - Use near real-time data
   - Locate index patient record and choose medication to evaluate
   - Choose comparison cohort

2. Collate Outcomes Data:
   - Retrieve outcomes data

3. Analysis and reporting:
   - Algorithms calculate expected outcomes based on pre-set parameters
   - Results reported to computer screen

Actual Development Process

Project goal: Develop a **working prototype**

- Developers: we partnered with:
  - CWI for project oversight: Joe Linza
  - ICF International for software development: Ashley Byrd and team

- Background Database Design: we worked with VISN 2 CIO Dianne Nieman's team to construct the working dataset from VistA

.

Actual Development Process

- System Architecture: Open-source coding
  - Source code built using Maven.
  - Presentation layer
    - uses JSF 2.0 to display data via a web browser without refresh.
    - accesses display data through calls to backing beans which use data access objects (DAO) to manipulate Hibernate persistence objects.
  - Persistence layer
    - abstract layer separating direct database calls from business logic.
    - Java objects are mapped to database tables via Hibernate configuration files.
    - Once mapped, persistent objects allow access to database data through their various method calls.

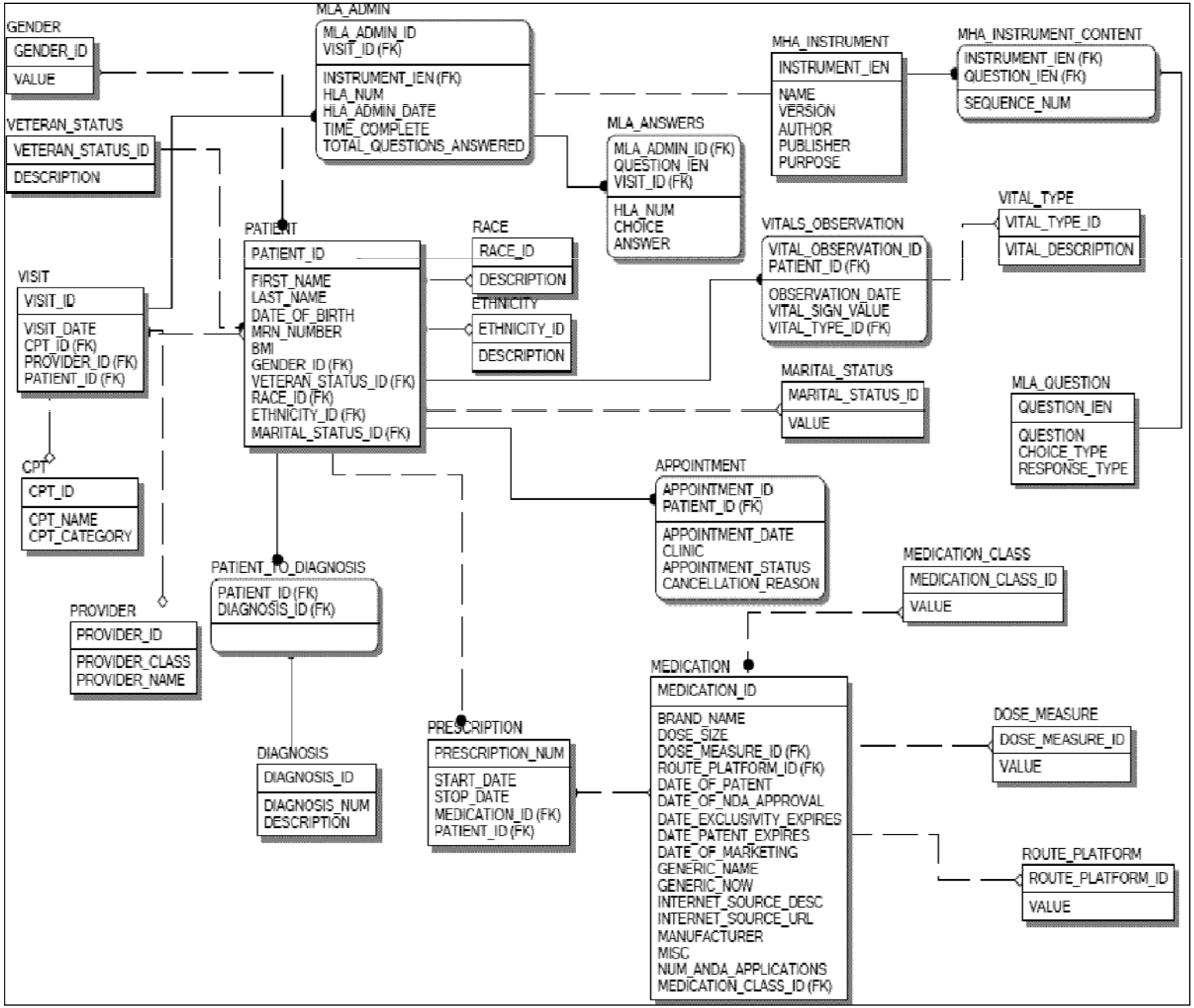
Actual Development Process

- Data Source: Near real-time data from VistA
  - VISN 2 programmers developed call routines using the data fields identified at the start
  - Dataset intended to be updated on a regular basis (daily, weekly)
  - Query routines must be run during off-hours (nights, weekends)

NOTE: Initial work for data field testing was done with live patient data. OBP program was developed using patient test data.

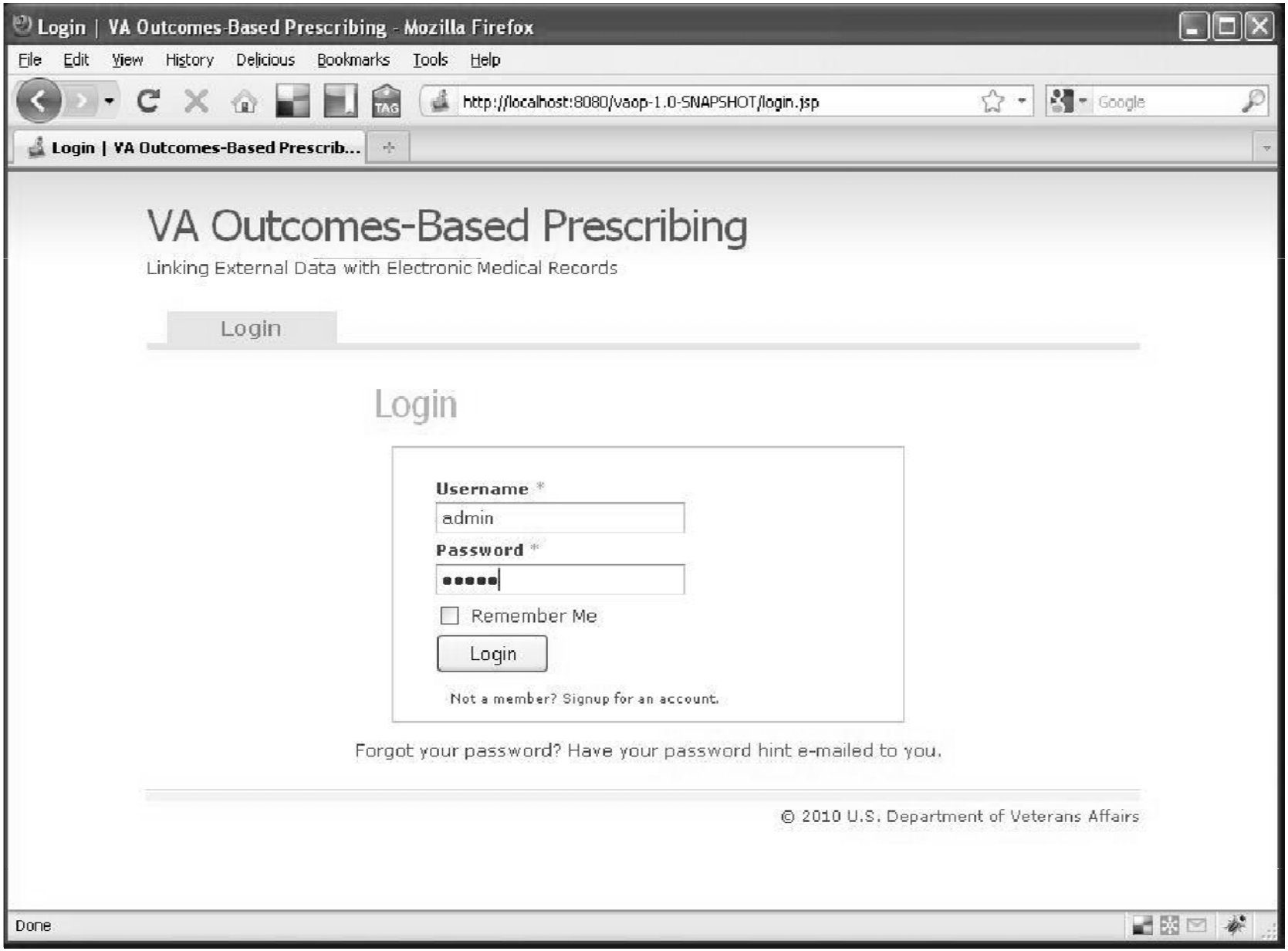
Actual Development Process

Data Map



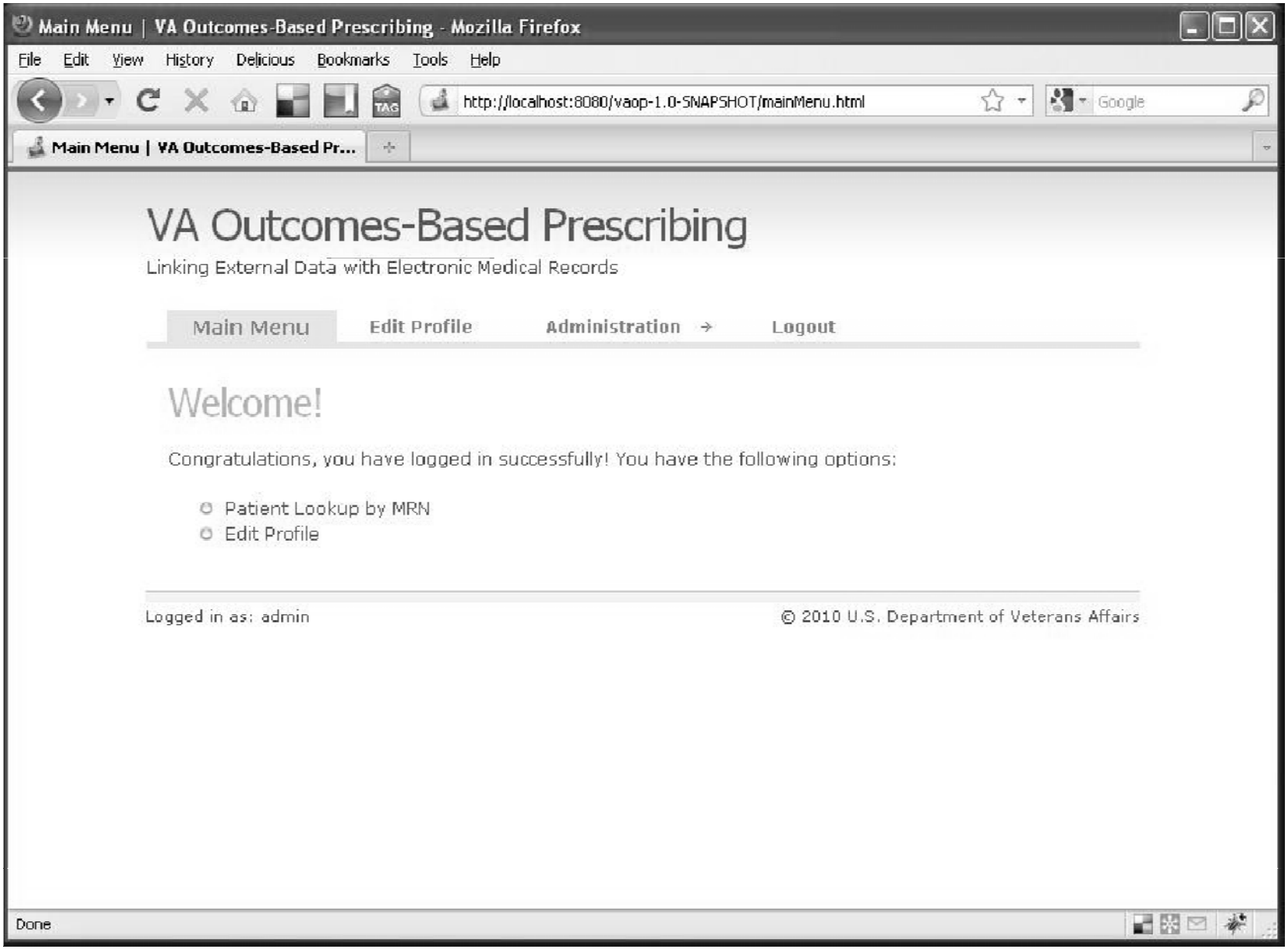
Actual Development Process

Log-in Screen



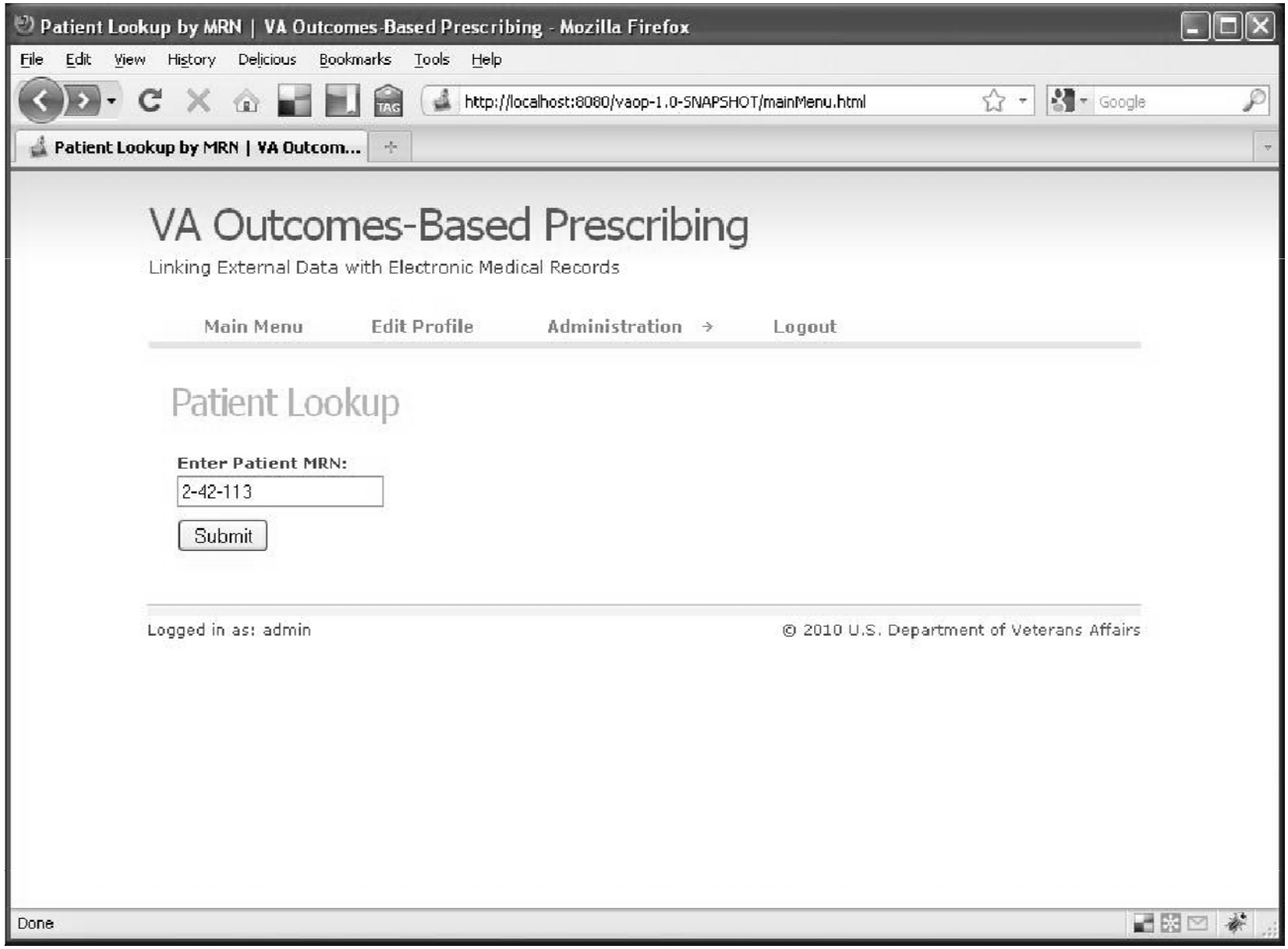
Actual Development Process

Home Page



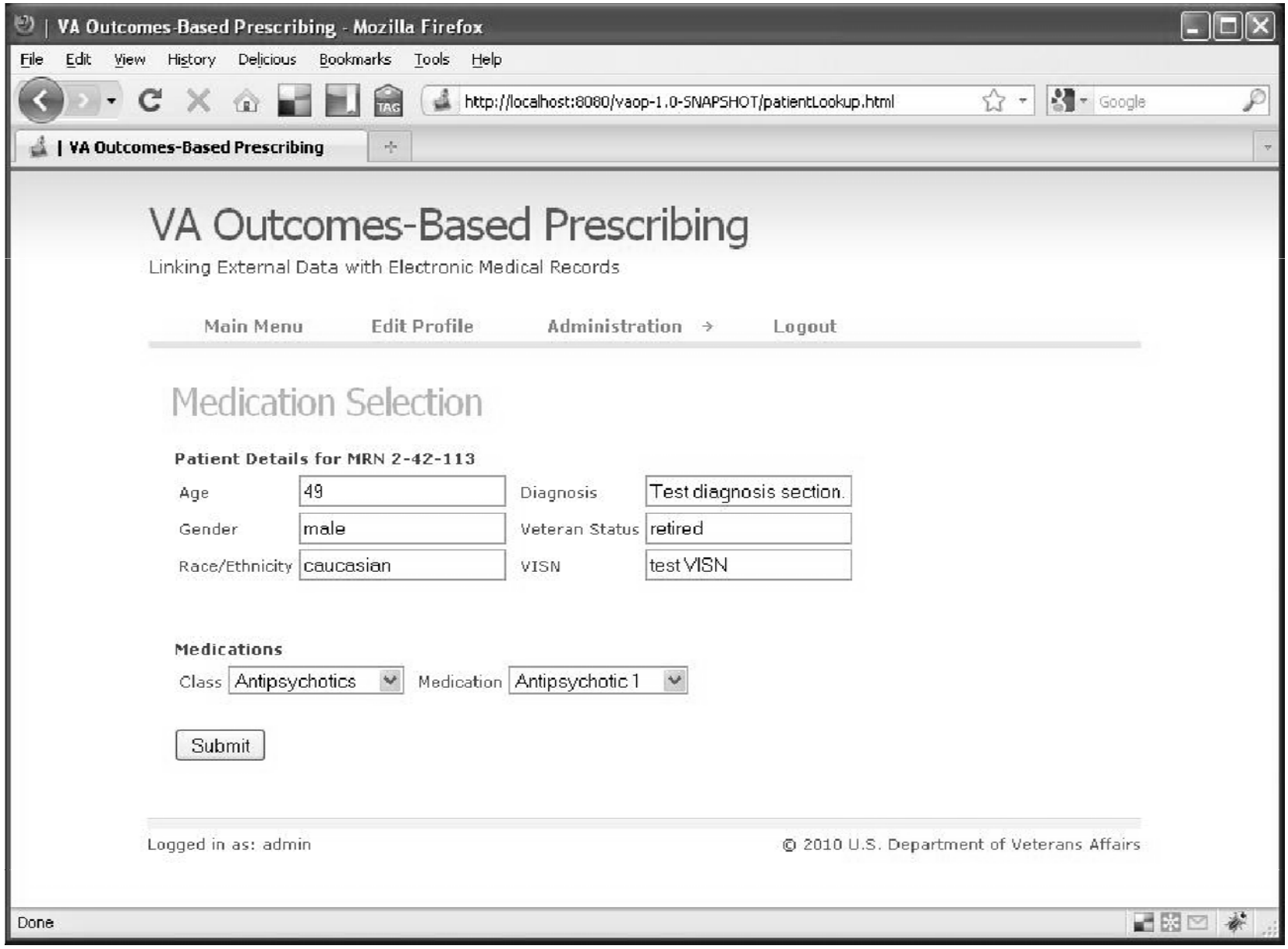
Actual Development Process

Patient Look-up Page



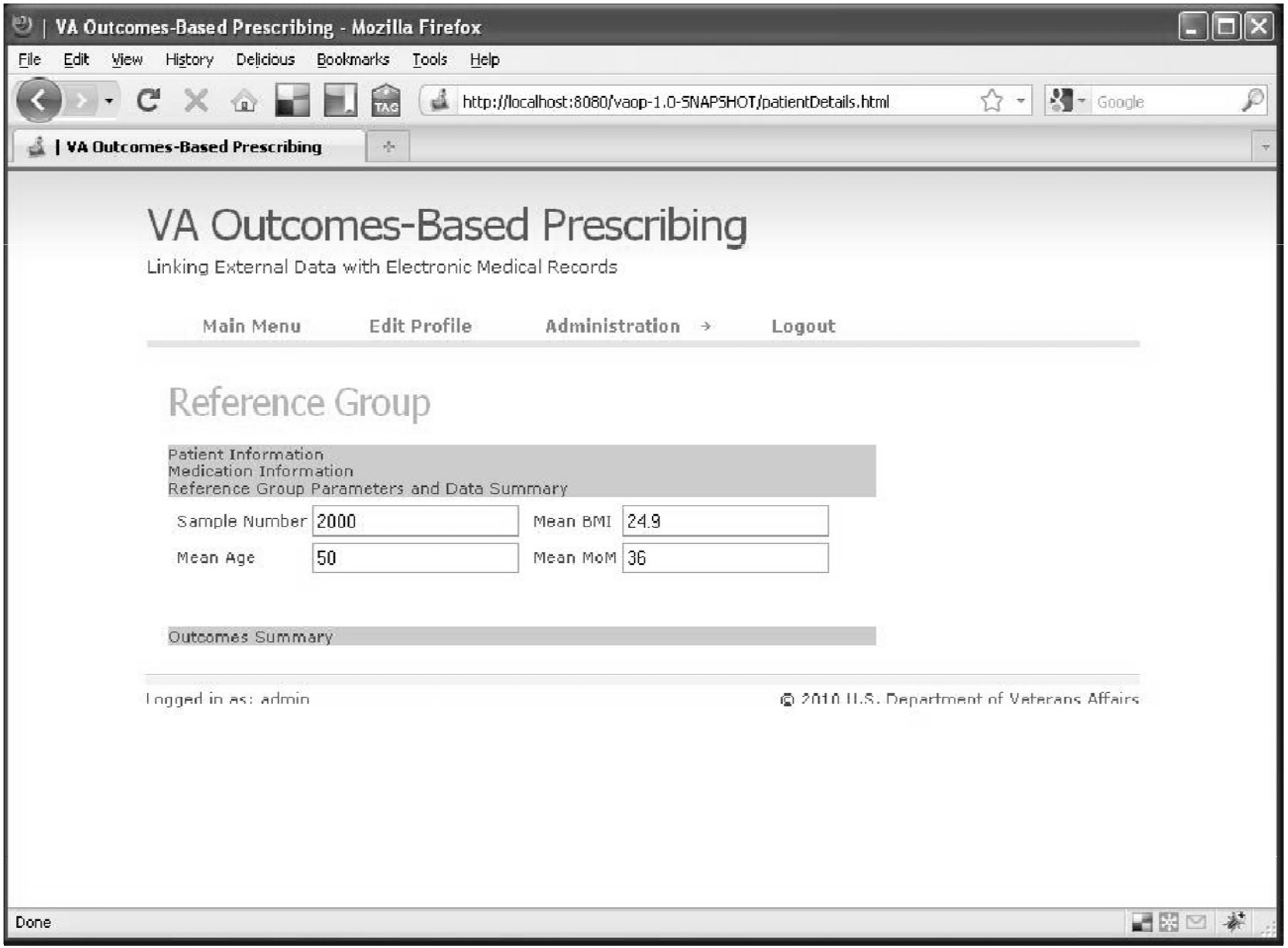
Actual Development Process

Medication class and Medication Look-up Page



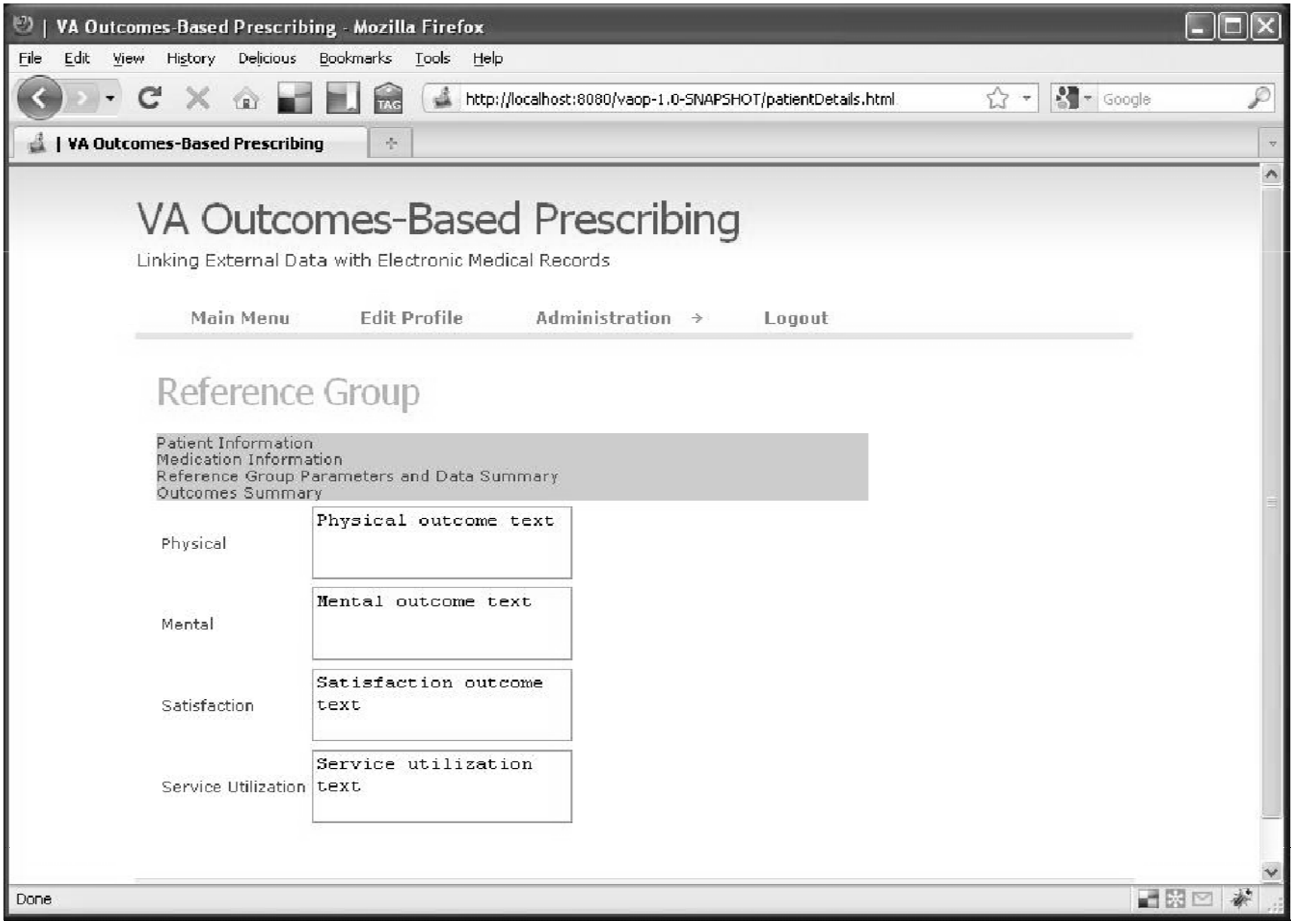
Actual Development Process

Reference Group Output Page



Actual Development Process

Outcomes Summary Page



Log-on Screen

Home Page

Patient Look-up Screen

Medication Class and Medication Look-up Screen

Reference Group Output Screen

Outcomes Summary Screen

Novel Use?

Definition of *novel* : "New or unusual in an interesting way"

- EHRs do not have decision-assistance tools for patients. OBP can be used by both patients and clinicians.
- EHRs initiate input from outside sources, primarily literature-based. OBP uses clinical data from the EHR as well as outside sources
- EHRs do not clinically apply patient experience. OBP allows direct clinical application of data from real patients across a healthcare system.
- Few applications within EHRs can be directly portable to PHRs. OBP is directly portable for use by patients on their own as part of the PHR.
- KEY: Uses social media framework

Observations From Project

- Some large EHR systems (e.g., Epic) have tools to build an OBP-type application, but the vast majority do not

- The vast majority of EHRs have data which can drive an OBP-type system

- OBP is simple, non-intrusive, and portable to EHR/PHR environments

Next Steps

- OBP has potential to be a stand-alone module, integrated into an EHR, and as a feature of patient portals or PHRs.

- Currently writing R-18 (AHRQ) to expand prototype into a working application adding the following features:
  - Assess its use on non-VistA EHR systems
  - Develop versions for mobile platforms
  - Add ability for patient commentary regarding their treatment experiences

Next Steps

- Expand the algorithm capability:
  - Use additional variables (life expectancy, side effects, drug mix, drug-drug interactions, etc.)
  - Build in "Prescription Optimization”
  - Allow users to adjust the weighting of the model's objective function
  - Allow users to change the weighting of the terms
  - Determine optimal groups of users and secondary clinical effects (e.g., impact on suicide rates)

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THANK YOU!

Comments?
Questions?