Prescription DrugSafe

CSE403 - LCA Proposal

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Ideal Current Scenario

- Jon is sick and goes to see a doctor.
- The doctor writes him a prescription.
- Jon runs to a local pharmacy
- Jon waits in a long line only to drop off his prescription.
- Jon should have his prescribed medicine with the right dosage to take home.

Problems

- Only 20% of patients are satisfied with the prescription process. (NIH)
- Inaccuracy, Speed, and Efficiency:
  - Doctor’s messy handwriting
  - Prescriptions easily forged
  - Wait time in pharmacy lines are long
  - Pharmacists manually type prescription information
- Accessibility:
  - Pharmacies need to call doctors, who are usually busy
  - Prescriptions can be lost easily
  - Many pharmacies have no electronic copies
- Information:
  - Consumers know little about the drug/prescription or related alternatives.

Operational Concepts

Objectives

- Increase accuracy and efficiency of prescription transactions
- Reduce overhead required for prescription processing
- Provide patients with information on prescription and alternatives

Scope

- Seamless integration into legacy systems
- No unified store for patient’s medical history
- Doesn’t seek to solve patient insurance problems

Major benefits

- Paperless
- Consistent and accurate electronic data
- Verified and secured doctor’s signature
- Easily accessible prescription information
- Traceable prescription history
The DrugSafe Client

Prescription entry and lookup

- The Main Prescription
  - Can be used by both Doctors and Pharmacists
  - Unified form for prescription information
  - Flexible and Simple Design

UI workflow - Desktop

- The Desktop:
  - Users first choose their professions
  - Intended for all a doctor's or pharmacist's actions in DrugSafe
  - V2.0 features could make this similar to Google Desktop
    - More on this later

DrugSafe Prescriptions
What’s in a Prescription?

- Doctor and/or Pharmacist Comments
- Serving Count Per Refill
- Drug may be substituted with another
- Start Date – End Date of Prescription
- Total Refills
- Dosage
- Patient Name
- Patient DOB
- Drug Name

```
<xs:complexType>
  <xs:sequence>
    <xs:element name="substitute" type="xs:boolean"/>
    <xs:element name="startDate" type="xs:date"/>
    <xs:element name="endDate" type="xs:date"/>
    <xs:element name="servingCountPerRefill" type="xs:int"/>
    <xs:element name="totalRefills" type="xs:int"/>
    <xs:element name="dosage" type="xs:string"/>
    <xs:element name="drugName" type="xs:string"/>
    <xs:element name="doctorComment" type="xs:string"/>
    <xs:element name="pharmComment" type="xs:string"/>
  </xs:sequence>
</xs:complexType>
```

Passing Prescription to Web Service

- SOAP Request w/ XML string
- Internet
- DB Verify Web Service
- XML is Returned

QR Codes

- Any arbitrary string can be encoded into a QR code, but there is no software for x86 platforms available to us that does decoding
  - Not possible to implement decoding within this time frame
- Up to 30% error correction capacity
- Capable of storing 2953 bytes
- See ISO 18004

QR Alternative

- UPC Barcodes
  - The prescription ID and XML can both be sent to the mobile device
    - Mobile device displays barcode for pharmacist to scan
    - Mobile device also displays prescription information obtained from XML
v2.0 Features

- Prescription history – when do you get sick? What drugs were you on before?
- Encoding/decoding QR codes
- DrugSafe Desktop!
  - RSS Feeds
  - Medical Articles/Journals
  - Medicine news
  - Patient Monitors

Demo!

DrugSafe Mobile

Cell Prescription

- Source of information for the patient prior to getting the actual drugs
- Gets data from Prescryber
- Displays data to patient
Prescription Information

- Access to prescription information
  - Name
  - Dosage
  - Number of refills
  - Expiration date
  - Doctors notes
  - Other relevant information

Transferring Prescriptions to Mobile

- ActiveSync
- Bluetooth/Wireless
- QR codes
  - Picture
  - Decryption
- XML Parsing

Additional Cool Features (V2.0)

- Outlook Integration
  - Reminders
  - Daily/weekly pill
  - Refills
- Personal History
  - Previous medications
  - Drug interactions
  - Statistics, drug usage

DrugInfo Retriever

- Prescryber
- Verify
- Prescript
- Fill

- Authorization
- Validation
- Encryption
- Expiration
- Walk to pharmacy
- Get relevant info

- Google
Retrieve Additional Info

- Display relevant information about drug
  - Cost
  - Side effects
  - Alternatives
- Data Mining
  - Pre-fetch
  - Database
  - Information available
  - Anytime, Anywhere

Verify Database

- Prescryber
- Validation
- Encryption
- Prescript Filler
- Prescription
- Capture QR Code
- Cell Prescription
- Get relevant Info
- Prescryption
- Cell Prescryption
- DrugInfo Retriever
- Google
- Walk to pharmacy
- Expiration

DB Verify

- Back-end system
- Serves requests from Prescryber keeping the prescription information in a database.
- The information is sent as XML strings.
- All the communication is sent through an ssh connection.

Prescript Database Schema

- Support active prescriptions only
  - Patients: no direct access
  - Physicians: insert new prescriptions
  - Pharmacists: read/modify prescriptions
**DB Supported API**

- API provided through webservices
  - string physicianSignup(string XMLPhysicianData);
  - string createPrescription(string XMLPrescriptionRequest);
  - string doctorGetPrescription(string XMLPrescriptionRequest);
  - string pharmGetPrescription(string XMLPrescriptionRequest);
  - string pharmFulfillPrescription(string XMLFulfillRequest);
  - string pharmSignup(string XMLPharmData);

**An XML request example**

```xml
<?xml version="1.0" encoding="utf-8"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema"
<xs:element name="physician">
  <xs:complexType>
    <xs:sequence>
      <xs:element name="firstName" type="xs:string"/>
      <xs:element name="lastName" type="xs:string"/>
      <xs:element name="address" type="xs:string"/>
      <xs:element name="phone" type="xs:string"/>
      <xs:element name="fax" type="xs:string"/>
      <xs:element name="hours" type="xs:string"/>
      <xs:element name="licenseNum" type="xs:int"/>
      <xs:element name="userName" type="xs:string"/>
      <xs:element name="password" type="xs:string"/>
    </xs:sequence>
  </xs:complexType>
</xs:element>
</xs:schema>
```

**An XML response example**

```xml
<?xml version="1.0" encoding="utf-8"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema"
<xs:element name="physcreateresponse">
  <xs:complexType>
    <xs:sequence>
      <xs:element name="success" type="xs:boolean"/>
      <xs:element name="usernname" type="xs:string"/>
    </xs:sequence>
  </xs:complexType>
</xs:element>
</xs:schema>
```

**System Requirements**

- **Software**
  - Cell phone client with wireless connectivity capabilities.
  - Web interface for doctors/pharmacies to submit and retrieve prescriptions.
  - Prescriptions Drugsafe Server for authorization of doctors and pharmacies.

- **Stakeholders**
  - Doctors and pharmacists pay a small fee for registering with the verification server.
  - Consumers will get the service for free.
  - Profit from ads when displaying related info.
Why?

- Healthcare is one of the largest industries in the world and affects the lives of almost every consumer.
- Pharmaceuticals and prescription drug industry have many problems.
  - Complex
  - Non-uniformity
  - Hassle of picking up prescriptions

Is it still Feasible?

- Definitely!

Hardware
- Widespread cellphone use
  - 62% of American adults owned a cell phone
  - QR codes are already mainstream in Japan
- Availability of wireless internet connections

Software
- Centralized verification systems like PrescriptVerify
  - Success of services such as VeriSign
- Cellphone development widespread

- You’ve already seen a prototype!