Developing a Mobile Application for Clinical Pharmacists

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Background

- We observed a clinical pharmacist managing patients on 3"x5" index cards
- We thought that index cards had some disadvantages:
  - Manual preparation = time consuming
  - Must keep cards with you at all times
  - May get lost – contain patient information

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Objectives

- Create an alternative to index cards
- To develop a mobile application for use by clinical pharmacists
- To provide pertinent patient information to aid in patient monitoring and decision making
- Provide clinical pharmacists with a mechanism to record notes on patients

How does it work?

- Web Application – runs in a web browser
- Backbone
  - ☐ Written in PHP
  - ☐ All data stored in a MySQL database
  - ☐ JavaScript used for added UI functionality

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Why a web application?

- Accessible from any device on the hospital network with a web browser
- Installation not necessary
- Ideally used on a mobile device such as the iPad™

PHP

- **P**HP: **H**ypertext **P**reprocessor
- Free, open-source server-side programming language used to create dynamic web pages
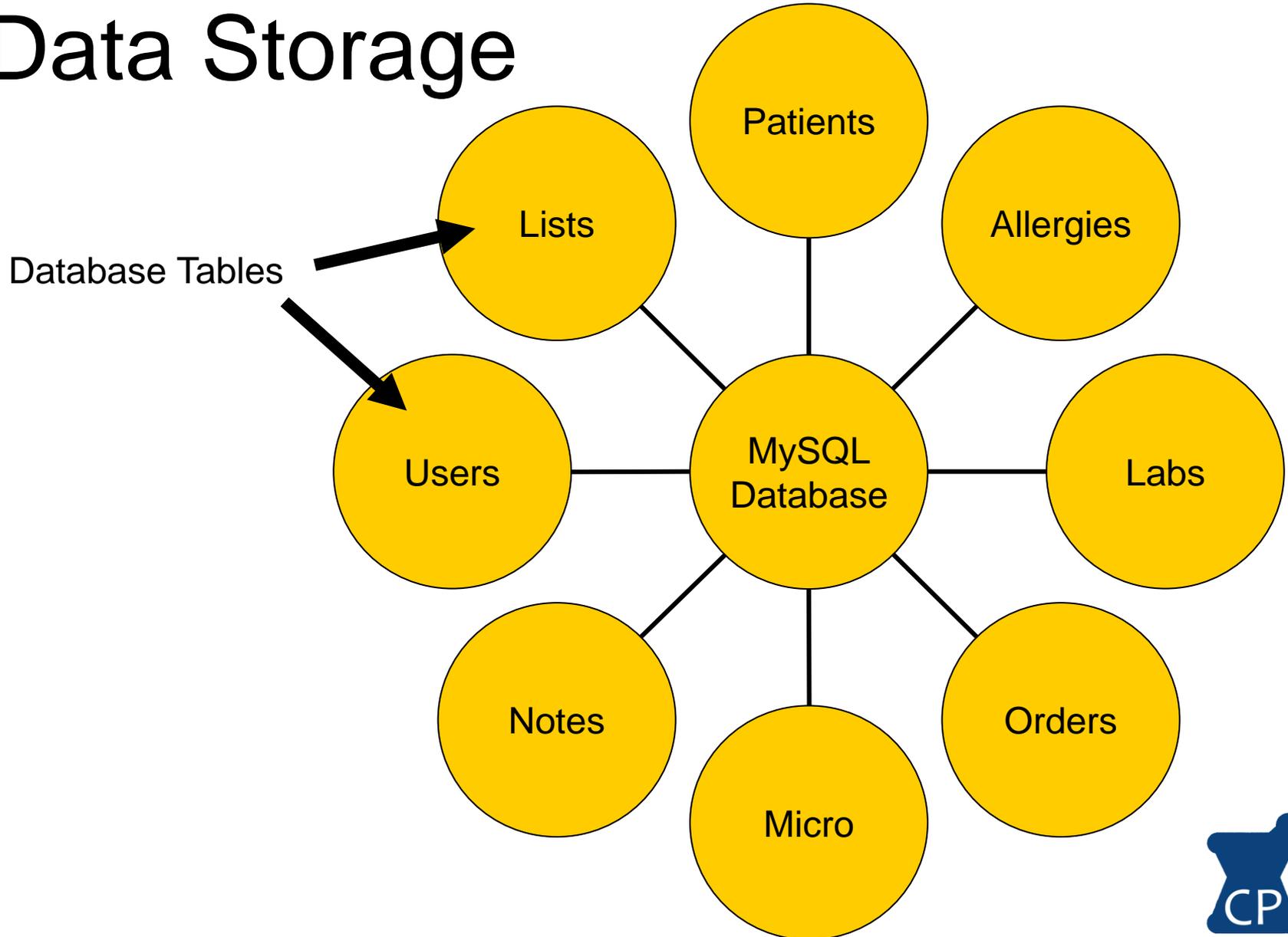- Advantage: no licensing fees

MySQL

- A relational database management system (RDBMS) – data is stored tables and the relationship among the data is also stored in tables

- Runs as a server, allowing multi-user access to multiple databases

- Free, and open-source

Data Storage

Patients

Allergies

Lists

Database Tables

Users

MySQL Database

Labs

Notes

Orders

Micro

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Database Tables

- Consists of various data fields
- Example: Allergies Table

ID	MRN	visitID	Allergy	Reaction	dateEntered
1	00000000test	019283702394	Sulfa Drugs	Rash	2010-05-24
2	00000000test	019283702394	Penicillin	Hives	2010-05-25

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SQL Queries

- How we interact with the stored data

- MySQL is based on SQL (Structured Query Language)

- Example structure:

  - SELECT *field1,field2* FROM *table_name* ORDER BY *field2, field1*

  - This query would return an array of all values of field1 and field2 in the table "table_name", sorted field2 and then field1.

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SQL Queries Continued

- SELECT patients.MRN, patients.visitID, patients.lastName, patients.firstName, patients.middleName, patients.gender, patients.birthDay, patients.Unit, patients.roomNum, patients.admitting, lists.MRN, lists.ID, lists.visitID, lists.userID

- FROM patients, lists

- WHERE patients.MRN = lists.MRN AND patients.visitID = lists.visitID AND lists.userID = '$ID'

- ORDER BY patients.lastName,patients.firstName

SQL Queries Continued

- The result of that query is then formatted and appears to the end user as:

Patients (2)

Name	Visit#	Age	Sex	Location	MRN	Admitting	
Kent, Clark David	074532895908	57	M	2WCV 241800	92837456test	Mark Wagner	❌
Witch, Blair Xena	019283702394	37	F	2WCV 240700	00000000test	Steven Tyler	❌

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JavaScript

- Client-side scripting language
- Enhances the UI (user interface)
- Allows for additional functionality such as the expanding and collapsing patient data
- Interesting fact: first introduced in Netscape Navigator 2.0 in December 1995
  - I turned 10 the following month

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Features

- Patient Search

- User Generated Patient Lists

- Patient Profiles

- Expandable/Collapsible sections of patient profiles

- Calculates: CrCl, BSA, IBW

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Features Continued

- Convenient links to references
- Allows pharmacists to record patient notes
- Application Control Panel

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Patient Search

- Allows use of wildcard (%) and searches in a lastName, firstName format

Patient Search

Name: %,bla   **Find Patient**

Results (1)

Name	Visit#	Age	Sex	Location	MRN	Admitting	
Witch, Blair Xena	019283702394	37	F	2WCV 240700	00000000test	Steven Tyler	➕

Patient Lists

- Users can add patients to their list in one click and remove them in another click

Patient Profiles

- Provide a quick summary of important patient information

Witch, Blair Xena
2WCV   240700
DOB: 1972-10-31
MRN: 00000000test   **Visit#:** 019283702394

Penicillin (Hives) - *2010-05-25*
Sulfa Drugs (Rash) - *2010-05-24*

Sex	Age	Height	Weight	BSA	Admitting	Chief Complaint
F	37	182.88 cm	75.00 kg	1.952 m2	Steven Tyler	chest pain

CrCl	IBW	BSA	Dietary Status
59.3 mL/min	73.1 kg	1.952 m2	STANDARD ORAL DIET

✚ **Orders**

✚ **Labs**

✚ **Microbiology**

✚ **Notes**

Write A Note

Expandable/Collapsible Sections of Patient Profiles

- Prevents the user from being overwhelmed with information

− Orders

Simvastatin 20 mg TAB AT BEDTIME ORAL (2010-05-28 17:00:00 - 2011-05-27 17:00:00)

Warfarin 10 mg TAB ONCE DAILY ORAL (2010-05-25 00:01:00 - 2011-05-24 00:01:00)

+ Labs

− Microbiology

Aerobic Blood Cx - *2010-06-01 00:00:00*
No growth after 1 day

Anerobic Blood Cx - *2010-06-01 00:00:00*
No growth after 1 day

+ Notes

Calculation of CrCl, BSA, IBW

- **Automatically calculates these values and places them in the patient profile**

- **CrCl is based off most recent lab value of serum creatinine**

CrCl	IBW	BSA
59.3 mL/min	73.1 kg	1.952 m2

Links to References

- The home section contains links to useful drug references

Resources
Provided By St. Vincent Hospital

Lexi-Comp

MicroMedex

Natural Medicines

St. Vincent Library

Patient Notes

- Allows pharmacists to create free text notes or use predefined templates

Note for Witch, Blair Xena
2WCV   240700
DOB: 1972-10-31
MRN: 00000000test   **Visit#:** 019283702394

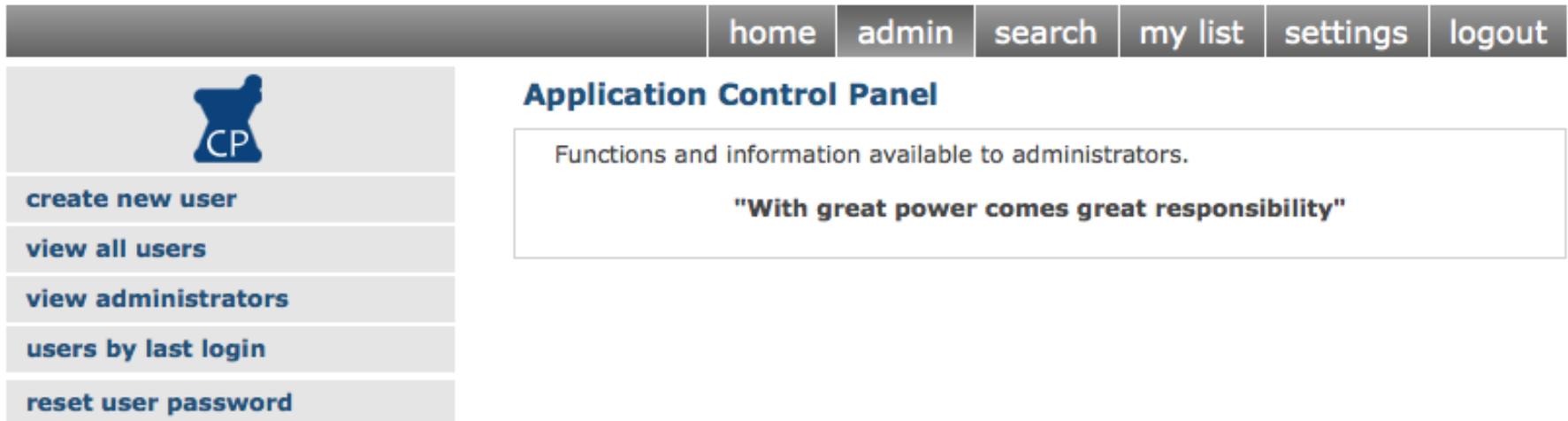note type: ⊙ Progress   ○ Patient Ed.   ○ Lab

note templates: [Choose One   ▲▼]

note:

Post Note

Application Control Panel

- Allows creation of new users and resetting of forgotten passwords

	home	admin	search	my list	settings	logout

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create new user

view all users

view administrators

users by last login

reset user password

Application Control Panel

Functions and information available to administrators.

"With great power comes great responsibility"

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Future Features

- Mechanism to allow users to modify their notes
- To Do List functionality with optional reminders (pop-ups, emails, text pages)
- Unit based location lists
- Audit trail recording and reporting

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Future Features

- Kinetics calculations for vancomycin, aminoglycosides and phenytoin.

- Sort lab results by category

- Risk assessment scoring to highlight patients most in need of clinical pharmacy services

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Demonstration Time

- Login
- Search for Blair Witch and Clark Kent
- Add Them To My List
- View Clark Kent
- Add Patient Ed. Warfarin Consult Note
- Update Pager # to show integration

Questions?

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Resources

- http://w3schools.com
- http://php.net
- http://mysql.com