Usability and Access

CHOP: Scenario-based design and test
Center for Biomedical Informatics (CBMi)
Dean Karavite
Robert Grundmeier, MD

Yale: iPad tool for patient-centered data capture
Requirements: Understanding Our Users

- Study Representative Users
  - Contextual Inquiry, Shadow, Interview, Survey...
  - Utilize EMR data

- Define their task flow
  - Develop Use Cases

- Use cases as the foundation of the entire development process
  - Design to the use cases
  - Usability test via use cases
  - System test via use cases
  - Guide questions in post deployment surveys...
System Independent Use Cases

- Develop use cases that describe interaction with any system

<table>
<thead>
<tr>
<th>Use Case ID:</th>
<th>5.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use Case Title:</td>
<td>Synaxis: Subsequent dose scheduling</td>
</tr>
</tbody>
</table>
| Precondition(s):    | Use Case 3.0 Patient Approved for Synaxis  
                        Use Case 4.0 Patient has Dose 1 |
| Primary Actor:      | Nurse, "The User" |
| Additional Actor(s):| Patient Parent/Guardian |
| Primary Use Case -  | User identifies date of previous dose  
                        Calculate recommended date range for next dose  
                        Access patient schedule  
                        If patient has no future scheduled encounters  
                        Call Patient Parent/Guardian  
                        Schedule encounter during range  
                        Record in System |
| Sequence of actions:| 5.1 Patient has future encounter scheduled during recommended range  
                        5.2 Patient has future encounter scheduled, but not during recommended range |

Current Paper Based System

New CDS System
A patient has received their first dose of Synagis.

The nurse calculates the date range for the next dose.

The nurse checks the schedule to see if the patient has an appointment scheduled during the date range. Nothing is scheduled.

The nurse calls the patient’s parent/guardian to schedule a visit during the date range to administer the injection.
Use Case Validation

• Present use cases to end users
  – Scenario based format, simple diagrams...

• Determine use case accuracy
  – “Is this what you do/would like to do?”

• Stratify use cases
  – How important is it?
  – How frequently is it encountered?
  – How satisfied are users with the current process?

<table>
<thead>
<tr>
<th>Use Case</th>
<th>Importance</th>
<th>Frequency</th>
<th>Current Satisfaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use Case 1</td>
<td>High</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Use Case 2</td>
<td>High</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Use Case 3</td>
<td>Low</td>
<td>High</td>
<td>Med</td>
</tr>
<tr>
<td>Use Case 4</td>
<td>Low</td>
<td>Low</td>
<td>Med</td>
</tr>
<tr>
<td>Use Case 5</td>
<td>Low</td>
<td>High</td>
<td>High</td>
</tr>
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</table>
Design to the Use Cases
Validate Use Case Based Designs

- Develop sequential dynamic mockups that represent each step in a use case / series of use cases

- “Walkthrough” these mockups with end users
  - Collect subjective and objective data from users
  - Will almost certainly discover new use case details in the process

- Iterate, iterate, iterate
8/15/2011 visit with Robert Grundmeier, MD for Office Visit

Premature Infant
Assistant
Chronological Age: 5 months
Gestational Age: 30 5/7 weeks
Corrected Age: 3 months
Birth Weight: 1.686 kg

RSV and Synagis
Patient is Candidate for Palivizumab (Synagis)

Criteria:
Chronic Age < 24 months, Chronic Lung Disease (CLD), Bronchodilator

Will submit for approval?
Yes [ ] No [ ]

Insurance Provider: [ ]
Synagis Distributor: [ ]

Initial Submission Date: 9/4/2011
Initial Submission Response: Approved [ ]

Doses approved:

<table>
<thead>
<tr>
<th>Dose</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
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</thead>
<tbody>
<tr>
<td>Date Range:</td>
<td>11/1 - 11/7</td>
<td>12/7 - 12/14</td>
<td>1/5 - 1/12</td>
<td>2/3 - 2/10</td>
<td>3/3 - 3/10</td>
</tr>
<tr>
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<tr>
<td>Date:</td>
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<td>11/4/11</td>
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<td></td>
</tr>
<tr>
<td>Weight Estimate:</td>
<td>2.8 kg</td>
<td>3.1 kg</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Order:</td>
<td>Received</td>
<td>Ordered</td>
<td>Select...</td>
<td>Select...</td>
<td>Select...</td>
</tr>
</tbody>
</table>

Comments: [ ]

Close [ ]
**Premature Infant Assistant**

- **Chronological Age:** 5 months
- **Gestational Age:** 30 5/7 weeks
- **Corrected Age:** 3 months
- **Birth Weight:** 1.686 kg

**RSV and Synagis** — Patient is Candidate for Palivizumab (Synagis)

**Criteria:**
- Chronic Lung Disease (COPD), Bronchodilator
  - Will submit for approval:
    - Yes
    - No

**Initial Submission Date:** 9/4/2011
**Initial Submission Response:** Approved
**Doses approved:** 5

<table>
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**Comments:**

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8/15/2011 visit with Robert Grundmeier, MD for Office Visit.
Schedule in EMR as any other appointment (Well Visit or Nurse Visit)
Premature Infant
Assistant

Chronological Age: 5 months
Gestational Age: 30 5/7 weeks
Corrected Age: 3 months
Birth Weight: 1.686 kg

RSV and Synagis ✔ Patient is Candidate for Palivizumab (Synagis)

Criteria: Chronological Age < 24 months, Chronic Lung Disease (CLD), Bronchodilator

Will submit for approval?
- Yes
- No

Insurance Provider: KM
Synagis Distributor: ACRO

Initial Submission Date: 9/4/2011
Initial Submission Response: Approved
Doses approved: 5

<table>
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<td>2/3 - 2/10</td>
<td>3/3 - 3/10</td>
</tr>
<tr>
<td>Status:</td>
<td>Given</td>
<td>Scheduled</td>
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<td></td>
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<tr>
<td>Date:</td>
<td>11/4/11</td>
<td>12/10/11 9:00a</td>
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<td></td>
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<tr>
<td>Weight Estimate:</td>
<td>2.8 kg</td>
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</table>
Challenges with Use Cases

• Difficult to have everyone think in terms of use cases
  – Mockups/UI designs are more accessible

• Difficult to develop and maintain (if highly detailed)

• Difficult to provide as a deliverable that developers can actually work from
Improving Usability and Accessibility of Decision Support With iPad

Rick Shiffman
Case 1: Yale Pulmonology

- With input from 2 pediatric pulmonologists, we developed CDS for chronic management of asthma based on newly released NHLBI guidelines
  - Assist assessment and documentation of control, severity, impairment, and risk
  - Facilitate choice and ordering of appropriate pharmacologic interventions
  - Provide patient handout and med authorization form for school
- Direct observation demonstrated that CDS templates were used for documentation at end-of-session (Lomotan, et al)
Reasons

- Specialty: Experts don’t need DS, patients more complex
- Workflow: Habit
- Social: Adverse effect on clinician-patient relationship
- Technical: Warm-up time, noisy fans
- ...
Facilitation of Decision Support Avoidance

- Patient’s interim history collected on paper form completed by patients in waiting room
- Physicians jotted notes on form in exam room
- Transcribed data into EHR at end of session
Architecture

Enterprise Appointment System

Application Server

Microsoft SQL Server

E-Link Interface Engine

Centricity EMR
Registrar selects patient, language

Today's Patients - 4/14/11

Select Patient
Jim Jones

Language to use:
- English
- Spanish

Go To History
In the Past Month...

<table>
<thead>
<tr>
<th>Question</th>
<th>Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>How often has your child had cough due to asthma?</td>
<td>None, 2 days per week or less, More than 2 days per week, Daily, Not Sure</td>
</tr>
<tr>
<td>How often has your child had wheezing?</td>
<td>None, 2 days per week or less, More than 2 days per week, Daily, Not Sure</td>
</tr>
<tr>
<td>How often has your child had chest tightness or chest pain?</td>
<td>None, 2 days per week or less, More than 2 days per week, Daily, Not Sure</td>
</tr>
<tr>
<td>How often has your child had shortness of breath or trouble breathing?</td>
<td>None, 2 days per week or less, More than 2 days per week, Daily, Not Sure</td>
</tr>
</tbody>
</table>
### Asthma Control - Katherine Flanagan

#### Classifying Components of Asthma Severity and Initiating Treatment

**Is patient currently on controller medication?**
- Yes
- No

**Has this patient's severity been classified?**
- Yes
- No

**Assessment for:**
- Control
- Severity

<table>
<thead>
<tr>
<th>Impairment</th>
<th>Intermittent</th>
<th>Mild</th>
<th>Moderate</th>
<th>Severe</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HPI</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cough due to asthma</td>
<td>None</td>
<td>&lt;=2 days/wk</td>
<td>&gt;2 days/wk</td>
<td>Daily</td>
</tr>
<tr>
<td>Wheezing</td>
<td>None</td>
<td>&lt;=2 days/wk</td>
<td>&gt;2 days/wk</td>
<td>Daily</td>
</tr>
<tr>
<td>Chest tightness</td>
<td>None</td>
<td>&lt;=2 days/wk</td>
<td>&gt;2 days/wk</td>
<td>Daily</td>
</tr>
<tr>
<td>Shortness of breath</td>
<td>None</td>
<td>&lt;=2 days/wk</td>
<td>&gt;2 days/wk</td>
<td>Daily</td>
</tr>
<tr>
<td>Nighttime awakening</td>
<td>None</td>
<td>&lt;=2x/month</td>
<td>3-4x/month</td>
<td>&gt;1x/wk</td>
</tr>
<tr>
<td>Interference with normal activity</td>
<td>Reduction in school/play/work</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SABA use (not for EIB)</td>
<td>None</td>
<td>&lt;=2 days/wk</td>
<td>&gt;2 days/wk</td>
<td>Daily</td>
</tr>
<tr>
<td>Lung Function</td>
<td>None</td>
<td>&lt;=2 days/wk</td>
<td>&gt;2 days/wk</td>
<td>Daily</td>
</tr>
<tr>
<td>FEV1 or peak flow</td>
<td>None</td>
<td>&lt;=2 days/wk</td>
<td>&gt;2 days/wk</td>
<td>Daily</td>
</tr>
<tr>
<td>FEV1/FVC</td>
<td>None</td>
<td>&lt;=2 days/wk</td>
<td>&gt;2 days/wk</td>
<td>Daily</td>
</tr>
</tbody>
</table>

**Impairment Classification:** Moderate

<table>
<thead>
<tr>
<th>Risk</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute/ER visit(s) due to asthma</td>
<td>0</td>
<td>1 in last year</td>
<td>2 in last year</td>
<td>3 in last year</td>
</tr>
<tr>
<td>Hospitalizations due to asthma</td>
<td>0</td>
<td>1 in last year</td>
<td>2 in last year</td>
<td>3 in last year</td>
</tr>
<tr>
<td>Exacerbations requiring oral systemic corticosteroids</td>
<td>0-1/year</td>
<td>&gt;=2/year</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Risk Classification:** Low

**Asthma Severity Classification:** Moderate Persistent
Severity Classification: Moderate Persistent  
Recommended therapy is Step 3 or 4

-- Regular follow up every 1 - 6 months --