Health Design Challenge: Reinventing the Patient Medical Record

The Problem

Electronic Medical Records (EMR) are often difficult to read by a patient. Lack of adequate hierarchies and visual cues make it difficult for readers to understand the content without having to learn how to read the record. Current health issues of importance are often not highlighted, leaving the patient overwhelmed with information.

Our Solution

For this design challenge, the Parsons Institute for Information Mapping (PIIM) approached the problem from both a “macro” and “micro” perspective. We started by conceptualizing the domain of the medical record as a whole. Utilizing the fields and sections found in the Continuity of Care Document, we reorganized the structure of the information to better clarify and highlight data of vital importance to the patient. Working with our Medical Informatics Specialist, each lab result was thoroughly investigated and redesigned using preferred elements for typography, color, and graphs. The result is a medical record that is easy to understand and discuss with a primary care provider. The design also puts medical information in reach for those who may have limited English proficiency or low literacy.

Based on the description of target audience, this medical record is designed with the following in mind:

1. Written medical information is simplified;
2. The designs visual cues highlight important information through iconography and graphs;
3. The record compatible with a variety of devices (desktops, mobile devices, tablets) and is functional in both color and black and white print.

Design Explorations

Overall visual concepts are explored further at the end of this document and detail additional styles and iconography sets.
Ellen Ross

DATE OF BIRTH
7 December 1972

GENDER
Female

MARITAL STATUS
Married

PHONE
415-555-1229

ADDRESS
17 Daws Road
Portland OR 97006

ETHNICITY
Asian

LANGUAGE SPOKEN
English

GUARDIAN
SISTER
Martha Shan

PHONE
415-555-1229

ADDRESS
1357 Amber Drive
Beaverton OR 97006

IMMUNIZATIONS
You have 2 upcoming immunizations.

NAME
Influenza Virus Vaccine

TYPE AND DOSE
Intramuscular injection

VALUE / UNIT
50 / mcg

EDUCATION / INSTRUCTIONS
Possible flu-like symptoms
for 3 days

DUE BY
Dec 2013

NAME
Tetanus and Diphtheria Toxoids

TYPE AND DOSE
Intramuscular injection

VALUE / UNIT
50 / mcg

EDUCATION / INSTRUCTIONS
Mild pain or soreness in the local area

DUE BY
Jan 2013

ALLERGIES
You have 8 known allergies.

<table>
<thead>
<tr>
<th>NAME</th>
<th>SEVERITY</th>
<th>REACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bee Stings</td>
<td>Severe</td>
<td>Anaphylactic Shock</td>
</tr>
<tr>
<td>Dogs/pets</td>
<td>Severe</td>
<td>Anaphylactic Shock</td>
</tr>
<tr>
<td>Peanuts</td>
<td>Severe</td>
<td>Anaphylactic Shock</td>
</tr>
<tr>
<td>Penicilin</td>
<td>Moderate to severe</td>
<td>Shortness of breath</td>
</tr>
<tr>
<td>Codeine</td>
<td>Moderate</td>
<td>Hives</td>
</tr>
<tr>
<td>Latex</td>
<td>Moderate</td>
<td>Hives</td>
</tr>
<tr>
<td>Shellfish</td>
<td>Moderate</td>
<td>Hives</td>
</tr>
<tr>
<td>Soy</td>
<td>Moderate</td>
<td>Hives</td>
</tr>
</tbody>
</table>

PLANNED DATE
Office consultation
1 DEC 2012

Chest X-ray
15 DEC 2012

Sputum Culture
8 JAN 2013

PROVIDER
Ashby Medical Center

PHONE
415-555-1229

ADDRESS
1002 Healthcare DR
Portland OR 97266
Urinalysis
A Urinalysis evaluates a sample of your urine, and is used to detect problems with your kidneys, urinary tract infections, and diabetes. Urinalysis alone usually does not result in a medical diagnosis.

Lipid Panel
A Lipid Panel measures different parts of cholesterol in your blood. High cholesterol can lead to heart disease, so it is important to discuss abnormal test results with your healthcare provider.

Complete Blood Count
A Complete Blood Count is one of the most common blood tests. It is used as a measure of your overall health and can help your healthcare provider detect problems like anemia and infection.

Pap Smear
A Pap Smear is a screening test for cervical cancer in women. A swab from your cervix — the lower part of your uterus — is tested for abnormal cells.
LAB RESULTS

LIPID PANEL PAGE 3 OF 5

**PATIENT’S NAME**
Ellen Ross

**DATE OF BIRTH**
7 Dec 1972

**ISSUED DATE**
30 Nov 2012

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**CHOL TOT: TOTAL CHOLESTEROL**

**230 mg/dL**

**BORDERLINE HIGH**

An overall reading of lipid particles in your blood.

---

**HDL: HIGH DENSITY LIPOPROTEIN**

**50 mg/dL**

**NORMAL**

Known as the “good” cholesterol — higher is better.

---

**LDL: LOW DENSITY LIPOPROTEIN**

**170 mg/dL**

**POOR**

Known as the “bad” cholesterol — lower is better.

---

**TRIG: TRIGLYCERIDES**

**80 mg/dL**

**GOOD**

The chemical form of most fats found in foods.

---

**NON-HDL: NON-HIGH DENSITY LIPOPROTEIN**

**180 mg/dL**

**NORMAL**

This is your total cholesterol minus your HDL, high density lipoprotein.

---

**CHANGE OVER THE LAST 5 YEARS**

- **CHOL TOT**: 220, 210, 225, 220, 230
- **HDL**: 45, 55, 45, 45, 50

---

**NOTES**

*my doctor recommended regular exercise.*
<table>
<thead>
<tr>
<th>Test</th>
<th>Reference Range</th>
<th>Result</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>RBC: Red Blood Cell</strong></td>
<td>LOW: 3.4-4.6 M/μL</td>
<td>3.7 M/μL</td>
<td>Red Blood Cell count is a component of a Complete Blood Count test.</td>
</tr>
<tr>
<td><strong>WBC: White Blood Cell</strong></td>
<td>LOW: 4-10.9 K/μL</td>
<td>6 K/μL</td>
<td>White blood cells are part of the body's immune system.</td>
</tr>
<tr>
<td><strong>HGB: Hemoglobin</strong></td>
<td>LOW: 11-15 g/dL</td>
<td>11 g/dL</td>
<td>The hemoglobin test measures the oxygen carrying capacity of the blood.</td>
</tr>
<tr>
<td><strong>HCT: Hematocrit</strong></td>
<td>LOW: 32-45%</td>
<td>34%</td>
<td>Hematocrit is the percent of blood made up of red blood cells.</td>
</tr>
<tr>
<td><strong>PLT: Platelets</strong></td>
<td>LOW: 140-450 K/μL</td>
<td>180 K/μL</td>
<td>Platelets are cell fragments needed for normal blood clotting.</td>
</tr>
<tr>
<td><strong>MVC: Mean Corpuscular Volume</strong></td>
<td>LOW: 80-100 fL</td>
<td>93 fL</td>
<td>Mean Corpuscular Volume is the average size of a red blood cell.</td>
</tr>
<tr>
<td><strong>HGB A1C: Glycosylated Hemoglobin</strong></td>
<td>LOW: 4.5-6.0%</td>
<td>6.2%</td>
<td>Hemoglobin A1C is used to diagnose and manage diabetes.</td>
</tr>
</tbody>
</table>
### IBUPROFEN 600MG TAB

**Reason for Medication:** For treatment of lower back pain.

**Directions / Notes:**
- 1 tablet by mouth 4 times a day with food every 4 hours

**Possible Side Effects:**
- Headache
- Dizziness

**Schedule:**
- 8:00AM
- 12:00PM
- 4:00PM
- 8:00PM

### INSULIN, GLARGINE, HUMAN 100 UNT/ML INJ

**Appearance:**
- 1 injection at bedtime

**Reason for Medication:** Reduce blood pressure.

**Directions / Notes:**
- Inject 10 ml vial under the skin as directed for 28 days
- Inject 25 units under the skin at bedtime
- Do not mix with other insulins/discard open vials after 28 days.

**Possible Side Effects:**
- Headache
- Fatigue
- Nausea

**Schedule:**
- Bedtime

### TERAZOSIN HCL 2MG CAPSULE

**Reason for Medication:** For treatment of symptoms of an enlarged prostate.

**Directions / Notes:**
- 3 capsules before bed

**Possible Side Effects:**
- Dizziness
- Headache
- Constipation
- Loss of appetite
- Fatigue
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LAB RESULTS

Lipid Panel

PATIENT'S NAME: Ellen Ross
DATE OF BIRTH: 7 Dec 1972
ISSUED DATE: 30 Nov 2012

CHOL TOT: TOTAL CHOLESTEROL

230 mg/dL
BORDERLINE HIGH
An overall reading of lipid particles in your blood.

HDL: HIGH DENSITY LIPOPROTEIN

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NORMAL
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180 mg/dL
NORMAL
This is your total cholesterol minus your HDL, high density lipoprotein.

CHANGE OVER THE LAST 5 YEARS

CHOL TOT 220 210 225 220 230
HDL 45 55 45 45 50

NOTES

My doctor recommended regular exercise.
**LAB RESULTS**

**Complete Blood Count**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Normal Range</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>RBC: RED BLOOD CELL</strong></td>
<td>3.7 M/uL</td>
<td>3.90 - 5.03</td>
<td>Low</td>
</tr>
<tr>
<td><strong>WBC: WHITE BLOOD CELL</strong></td>
<td>6 K/uL</td>
<td>3.5 - 10.5</td>
<td>Normal</td>
</tr>
<tr>
<td><strong>HGB: HEMOGLOBIN</strong></td>
<td>11 g/dL</td>
<td>12.0 - 15.5</td>
<td>Low</td>
</tr>
<tr>
<td><strong>HCT: HEMATOCRIT</strong></td>
<td>34 %</td>
<td>34.9 - 44.5</td>
<td>Low</td>
</tr>
<tr>
<td><strong>PLT: PLATELETS</strong></td>
<td>180 K/uL</td>
<td>150 - 450</td>
<td>Normal</td>
</tr>
<tr>
<td><strong>MVC: MEAN CORPUSCULAR VOLUME</strong></td>
<td>93 fL</td>
<td>81.6 - 98.3</td>
<td>Normal</td>
</tr>
<tr>
<td><strong>HGB A1C: GLYCOXYLATED HEMOGLOBIN</strong></td>
<td>6.2 %</td>
<td>4.5 - 6.0</td>
<td>High</td>
</tr>
</tbody>
</table>

**NOTES**
Exploration of Graphs

1. CONDENSED BAR GRAPH

2012 before

2. GAUGE/DIAL

3. TRAFFIC LIGHT

You: 260

You: 230

You: 260
**Exploration of Medications display**

**MEDICATIONS**

<table>
<thead>
<tr>
<th>1. IMAGE</th>
<th>2. IMAGE + OVERLAY TEXT</th>
<th>3. ICON</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="MSD740.png" alt="Image 1" /></td>
<td><img src="MSD740.png" alt="Image 2" /></td>
<td><img src="MSD740.png" alt="Image 3" /></td>
</tr>
</tbody>
</table>

**INTAKE TIMELINE SOLUTIONS**

**1. PLAIN TEXT**

**DIRECTIONS/NOTES**

Take one tablet by mouth four times a day with food every 4 hours.

- **10:00AM**: 1 capsule with meal.
- **2:00PM**: 1 capsule with meal.
- **6:00PM**: 1 capsule with meal.
- **10:00PM**: 1 capsule with meal.

**3. PLAIN TEXT VER.2**

**DIRECTION**

- **6:00PM**: 3 capsules before bed

**2. COLORIZED TIME SCALE**

Take 3 capsules around each time frame

<table>
<thead>
<tr>
<th>~8:00AM</th>
<th>~2:00PM</th>
<th>~8:00PM</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="MSD740.png" alt="Icon 1" /></td>
<td><img src="MSD740.png" alt="Icon 2" /></td>
<td><img src="MSD740.png" alt="Icon 3" /></td>
</tr>
</tbody>
</table>

The dotted line scale shows 24 hours.
Exploration of icons for side effects

ANXIETY  CONSTIPATION  DIZZINESS  DROWSINESS

FATIGUE  GAS  HEADACHE  HEARING LOSS

INCREASED APPETITE  LOSS OF APPETITE  NAUSEA  PAIN

STOMACH PAIN  SUICIDALITY  WEIGHT GAIN  WEIGHT LOSS
**METFORMIN HCL 1000MG TAB**

**SIDE A**

**DIRECTIONS/NOTES**
Take one tablet by mouth twice a day with meals.

- 10:00AM 1 tablet with meal.
- 6:00PM 1 tablet with meal.

**POSSIBLE SIDE EFFECTS**
headache
gas
muscle pain
dizziness
nausea

**SIDE B**

**REASON FOR TAKING**
Treat type 2 diabetes.

**PREScriber**
Ashby Medical Center

**ATC CODE**
A10BD07

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**SIMVASTATIN 20 MG TAB**

**SIDE A**

**DIRECTIONS/NOTES**
Take one tablet by mouth at bedtime.

- 1 tablet at bedtime.

**POSSIBLE SIDE EFFECTS**

**SIDE B**

**REASON FOR TAKING**
Treat cholesterol level.

**PREScriber**
Ashby Medical Center

**ATC CODE**
C10BX04
HDL
A component of total cholesterol, high density lipoprotein is called “the good cholesterol.”

**Your Result**

**50**

Normal values are set in grey, abnormal values in color.

**WBC: WHITE BLOOD CELL**

**6** K/uL

White blood cells are part of the body’s immune system.

**HGB: HEMOGLOBIN**

**11** g/dL

The hemoglobin test measures the oxygen carrying capacity of the blood.

**Exploration of Lab Results display**

NORMAL AND ABNORMAL VALUES ARE IN THEIR RESPECTIVE COLORS.
About Us
Since 2008, the Parsons Institute for Information Mapping has been designing solutions for improving the clarity of medical information through better design. A research institute of The New School in New York City, PIIM specializes in creating knowledge through better design.

In 2012, PIIM announced plans for the first full GUI solution and prototype for the Patient-Centered Medical Home. The project will be released through the Open Source Electronic Health Record Agent (OSEHRA) initiative. Our staff consists of information designers, theorists, software programmers and medical informatics researchers. For more information about us or any of our open source products, please visit http://piim.newschool.edu or http://piim.newschool.edu/healthboard.

PIIM Team Members
Leadership
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Jihoon Kang  Associate Director

Researchers
Damian Bendersky  Adobe Flex Developer
William Bevington  Sr Information Theorist / Associate Professor
Sabrina Farhi  Media / Conference Planner
SeungWon Hur  Information Designer
Anthony Ina  Usability Lead
Marine Koshkakaryan  Web Application Developer
Prin Limphongpand  Information Designer
Angela Laurio  Medical Informatics Specialist
Noah Pedrini  Adobe Flex Developer
Katie Wanner  Office Manager
Scot Weir  Systems Administrator
Ann Yi  Information Designer
Sayoko Yoshida  Sr Information Designer

Visiting Researcher
Giorgia Lupi  Politecnico di Milano / Density Design Lab