

MID:Notes

designing an information
service for public hospitals

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Purpose of Project

- Understand how public hospitals are making the transition from paper records to electronic medical records
- Design an information system that meets their needs
- Specific focus on how 2 Bay Area hospitals work with progress notes

Public Hospital Waiting Room



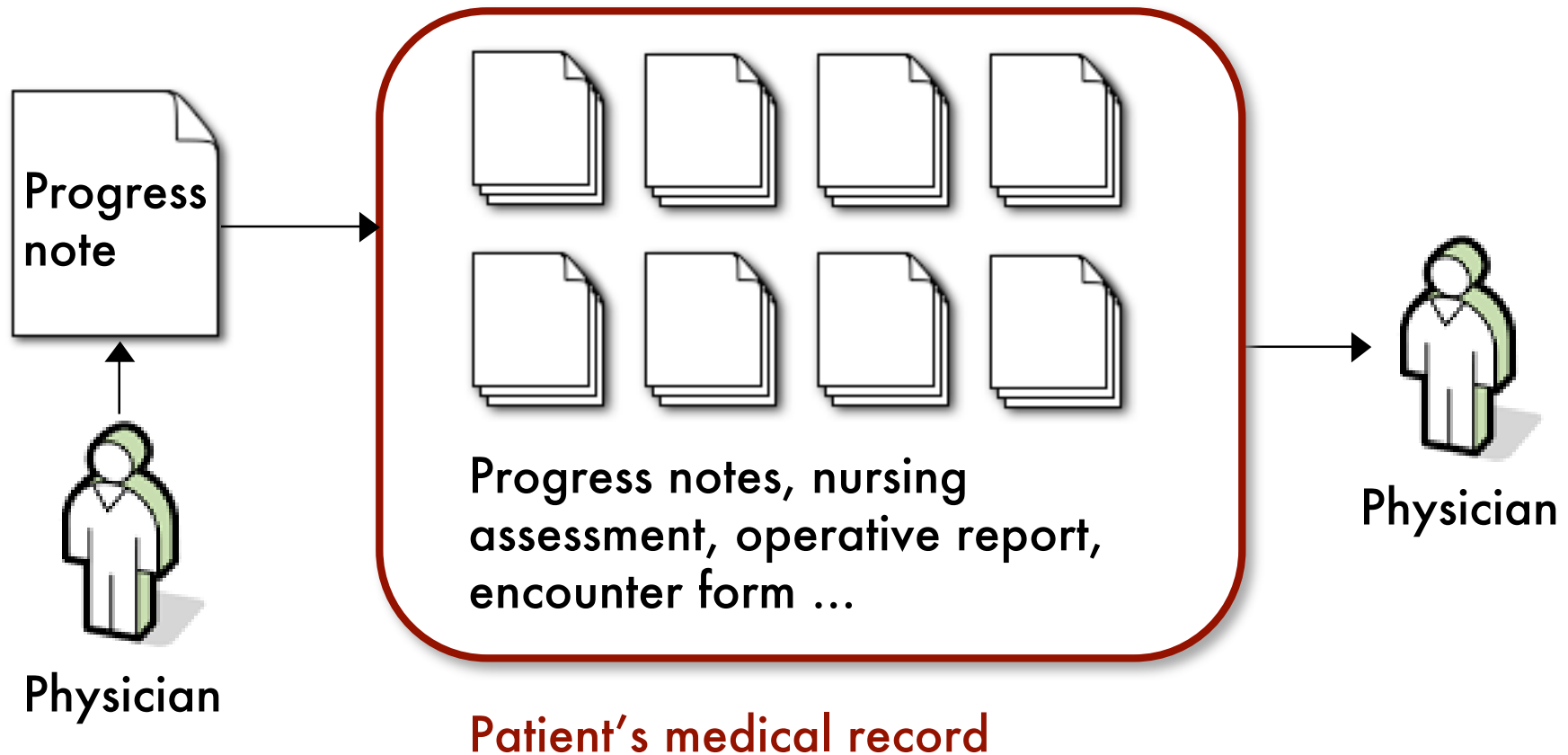
[Photo from Flickr user Andy and Elayne](#)

Our Methods

- Contextual inquiry - interviewed 14 people from 2 public hospitals
- Sequence diagrams
- Affinity notes
- Paper prototype with usability test
- Functional prototype

About Progress Notes

Notes written by a physician to describe a patient's condition during a visit, assessment and plan for treatment



Handwritten vs Electronic Progress Notes

A handwritten progress report form titled "CLINIC PROGRESS REPORT". The form includes fields for patient information, clinic name (ENDOCRINE CLINIC), and a section for recording observations and opinions regarding treatment and progress. The form is filled out with handwritten text.

PATIENT ACCOUNT NO. [REDACTED]
MEDICAL RECORD NO. [REDACTED]
PATIENT NAME: [REDACTED]
DATE OF BIRTH: [REDACTED]
UNIT: [REDACTED] DATE: [REDACTED]

CLINIC PROGRESS REPORT
CLINIC NAME - MUST BE FILLED IN
ENDOCRINE CLINIC

USE TO RECORD OBSERVATIONS AND OPINIONS REGARDING THE PATIENT'S TREATMENT AND PROGRESS

Date: [REDACTED]
Provider/Service: [REDACTED]
Reason for visit: [REDACTED] Completed by: [REDACTED]
Allergies: Food/Drug [REDACTED]
BP: [REDACTED] PR: [REDACTED] RR: [REDACTED] Temp: [REDACTED] Wt: [REDACTED]
Pain: No Yes Scale ___/10 Location: [REDACTED]
Onset/Duration: [REDACTED]
Processed by: [REDACTED]
Patient Education documented: Yes No

MEDICATIONS RECORD

ORIGINAL-CHART YELLOW-CLINIC

499-GR-182T Rev. 10/00

Handwritten

An electronic progress note for an outpatient visit. The note includes patient information, a summary of the visit, and a list of observations and opinions regarding treatment and progress. The note is typed and signed electronically.

(01083443) - Outpatient Visit Note - 02/12/2008 06:06:00 PM Page 1 of 1

Patient Name: [REDACTED] Date of Birth: [REDACTED] MRN: [REDACTED]
Outpatient Visit Note, Primary Care, [REDACTED] Outpatient
entered on 02/12/2008 06:06 PM
Note Author: [REDACTED] CHN#: 001040

Wt 222 BP 138/99, 156/98 P 88
49 year old AA man with low back pain, chronic marijuana use, umbilical hernia, obesity, asthma, tobacco use. Started smoking again but promises to stop before his next visit. Son out on parole. Working at SFState doing floors, has medical benefits, very happy. Makes his back a little worse but its OK. Again resistant to taking BP meds but has lost 15 lbs, started to walk and even run. Di d not get bloods drawn yet.

not examined today
BP recheck 150/105 R arm large cuff sitting

continue weight loss - wants to get to under 200lbs
again postponed BP meds
promises to stop smoking!
get blood drawn before next visit
RTC 2 months

Electronically signed by [REDACTED]

Electronic note - dictation, typing, speech recognition

Paper Chart vs. Electronic Record



<http://flickr.com/photos/annzas/2151972335/>

- Handwritten, printed progress notes
- Orders
- Photos ...

The screenshot shows an electronic medical record interface. On the left is a navigation menu with categories like 'Main Menu', 'Patient Search', 'Patient Menu', 'Clinical Alerts', 'Demographics', 'Primary Care Data', 'LHH Photo/Data', 'Latest Dx Data', 'Specific Lab Test', 'Lab - Last 24 Hours', 'HEMATOLOGY', 'CHEMISTRY', 'COAGULATION', 'URINALYSIS', 'FLUIDS / OTHER', 'TOXICOLOGY/DR', 'SEROLOGY', 'BLOOD BANK', 'POC Results', 'Lab', 'Micro', 'Radiology', 'Dx Tests Other', 'Pen Op Ck-In', 'Inpt. Census Fxn', 'Inpt. Documentation', 'Orders', 'Hand-Off', 'Allergies/Advs RXN', 'InPt Meds', 'OutPt Meds', 'Problem List', 'Visit History', 'Appointments', and 'Reports/Notes'. The 'CHEMISTRY' menu item is highlighted.

The main content area displays '[Patient Info]' and two sections of 'CHEMISTRY' results. The top section is for a test posted after 02/11/2008, and the bottom section is for a test since 02/11/2008. Both sections have 'All' and 'Graph' buttons. The results are presented in a table format with checkboxes for each test.

Test Name	Value
Sodium ((136-145)) mmol/L	138
Potassium ((3.5-5.4)) mmol/L	4.4
Chloride ((98-107)) mmol/L	102
CO2 ((22-29)) mmol/L	28
Anion Gap (No K) ((7-16)) mmol/L	8
BUN ((6-20)) mg/dL	15
Creat, Serum ((0.70-1.30)) mg/dL	1.17
eGFR if Non-African American ((>59)) mL/min/1.73m2	8

Test Name	Value
eGFR if African American ((>59)) mL/min/1.73m2	8
Hgb A1C ((4.9-6.7)) % Tot Hgb	6.1
Glucose ((70-139)) mg/dL	125
Gluc, Fasting	REFERENCE RANGE ASSUMES NON-FASTING STATE
Total Bili ((0.1-1.2)) mg/dL	0.5
Direct Bili	
Protein, Total ((6.4-8.3)) g/dL	8.5 H
Albumin ((3.4-4.8)) g/dL	4.8

- Electronic progress notes
- Lab results, reports
- X-Ray reports ...

Missing Charts

- 10% to 80% charts are missing - "This is really devastating"
- Physicians and nurses try to locate chart
- Physician questions patient to reconstruct history
- Physician orders new tests



[Photo from Flickr user kris247](#)

Handwriting vs Dictating Notes

Write note by hand

Intent: Create note

Trigger: Patient visit concluded

1. In exam room, get progress note form in notebook
2. Look in paperwork for patient MRN
3. Fill out form with physician ID, patient MRN, note category
4. Write summary of visit
5. Put note in chart and give to nurse

Dictate note

Intent: Create note

Trigger: Patient visit concluded

1. Go to dictation station
2. Look at schedule
3. Find patient MRN
4. Refer to directions on using system
5. Call system on landline, listen to instructions
6. Enter required info using touchtone phone - physician ID, patient MRN, note category ID, etc.
7. Repeat note category via speech
8. Speak summary of visit
9. Repeat physician ID, patient MRN via speech
10. Hang up, wait for transcription

Pain Points in Existing Tools

- Writing by hand - hard to retrieve
- Dictation (landline)
 - In-patient settings
 - Some physicians dislike dictating
 - Touch-tone phones
 - Time lag for transcription
- Typing
 - Some physicians can't type
 - In-patient settings

Key Takeaways for Design

- One application
 - Create & find notes
 - Multiple methods - speaking, typing
 - Multiple devices
- Based on physician's schedule
- Speech recognition replaces dictation
- Compatible with existing systems, ROI

Prototype Design and Usability Test

MD:Notes Welcome, [First name] [Last name] | [Sign out](#)

Create & Find Notes

Schedule [Note Status](#) [Patient](#)

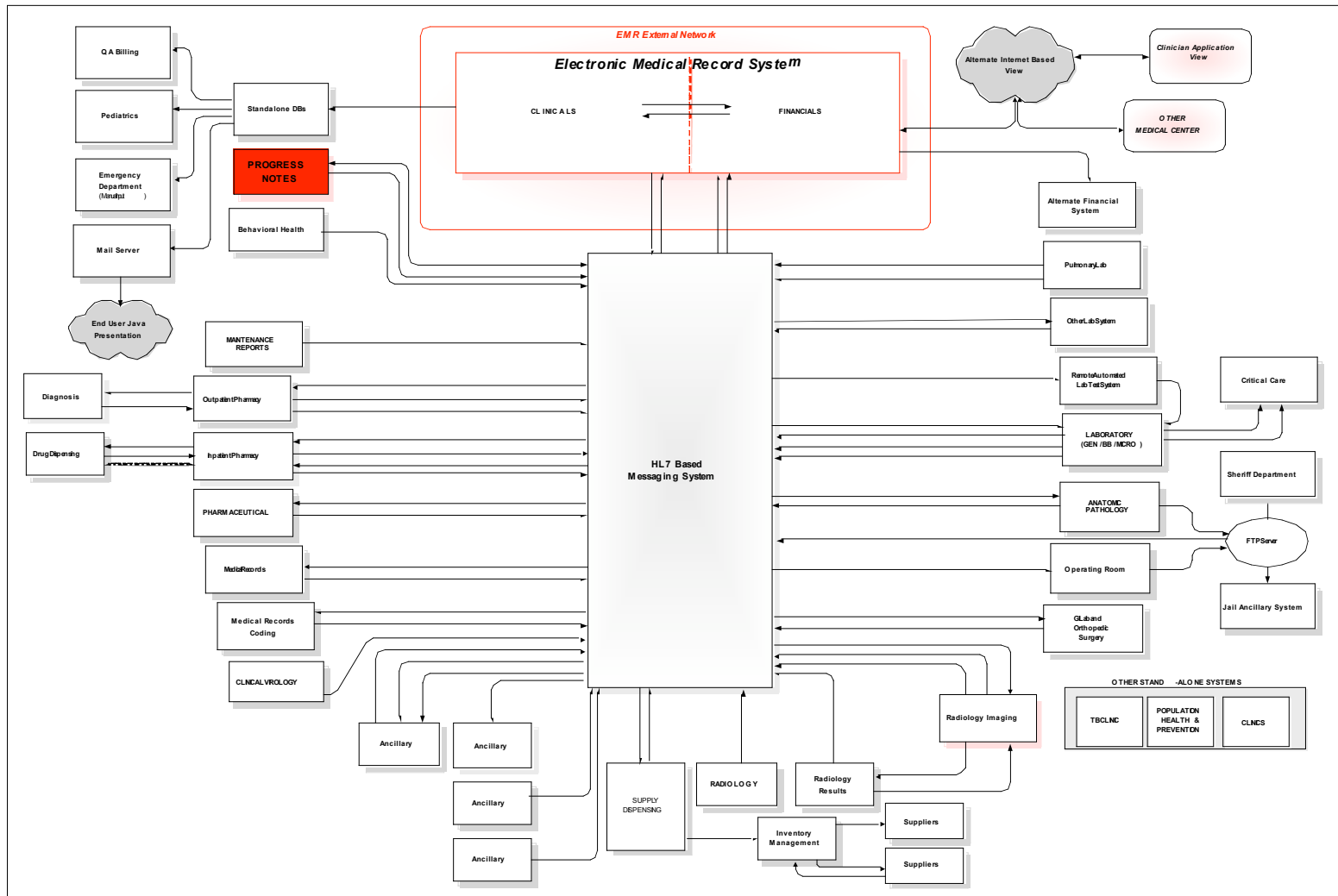
Clinic: Date: 3/19/07

Time	MRN	Name	Note status
9:00 am	123456789	Last name, First name	Complete
9:00 am	123456789	Last name, First name	Draft
9:15 am	123456789	Last name, First name	Signature required
9:15 am	123456789	Last name, First name	<input type="button" value="Create note"/>
9:30 am	123456789	Last name, First name	<input type="button" value="Create note"/>
Add-on	123456789	Last name, First name	<input type="button" value="Create note"/>

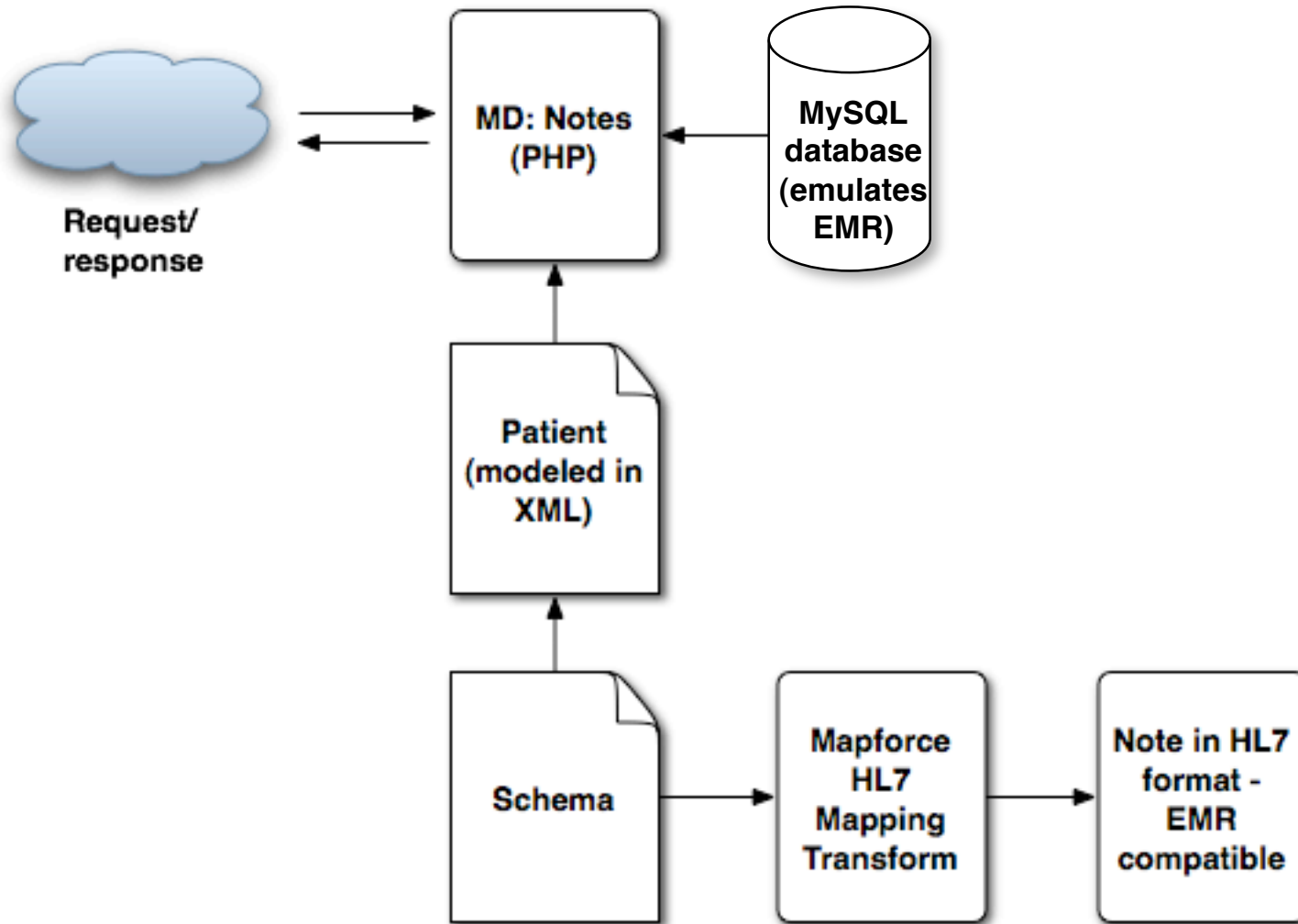
Results:

- Some users had no major problems
- Novice user did not understand the prototype

Complex system environment



Technical Architecture



Prototype demo

MD:Notes

Welcome, John Smith | [Sign out](#)

Create and find progress notes by schedule or patient

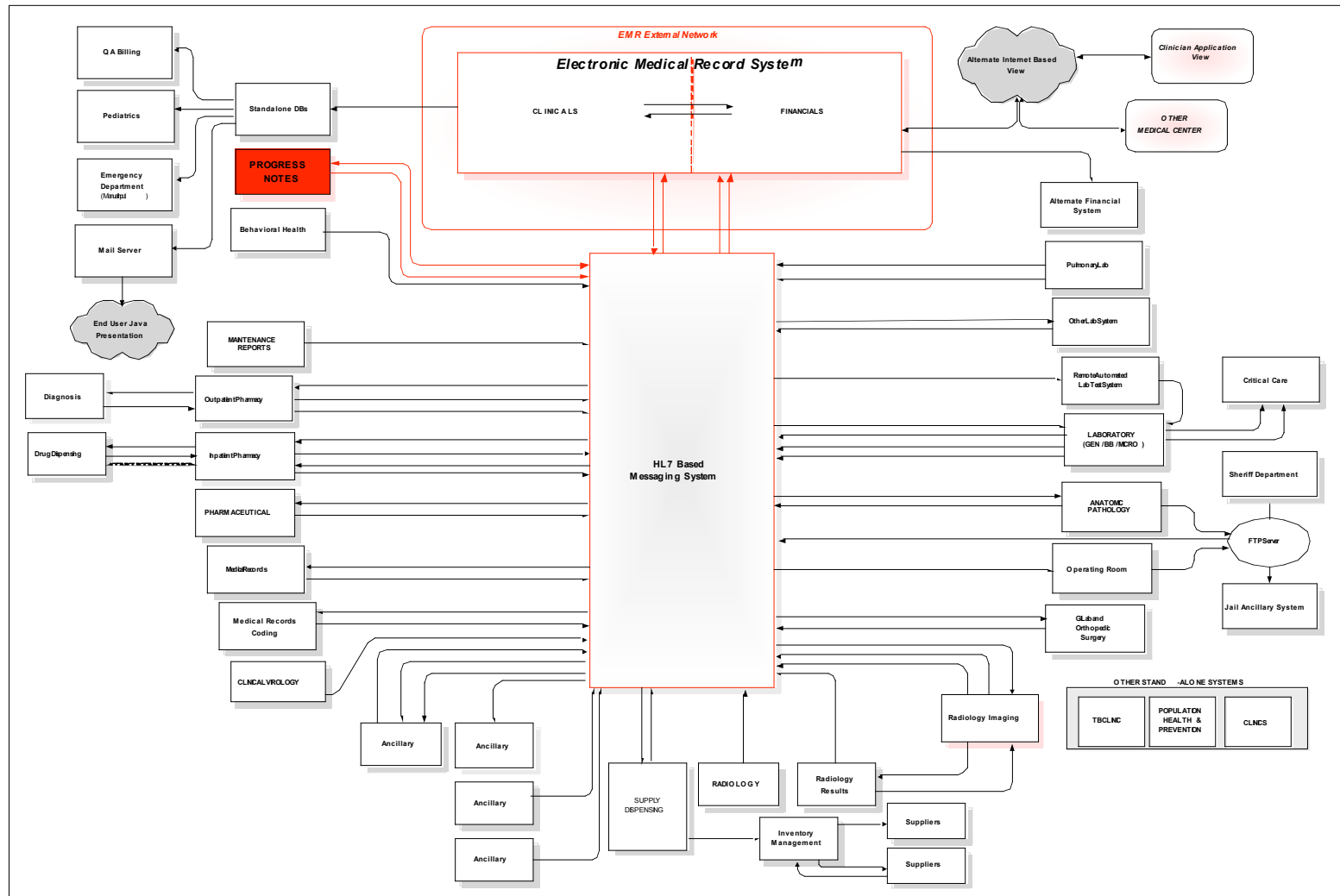
Setting:

Note status:

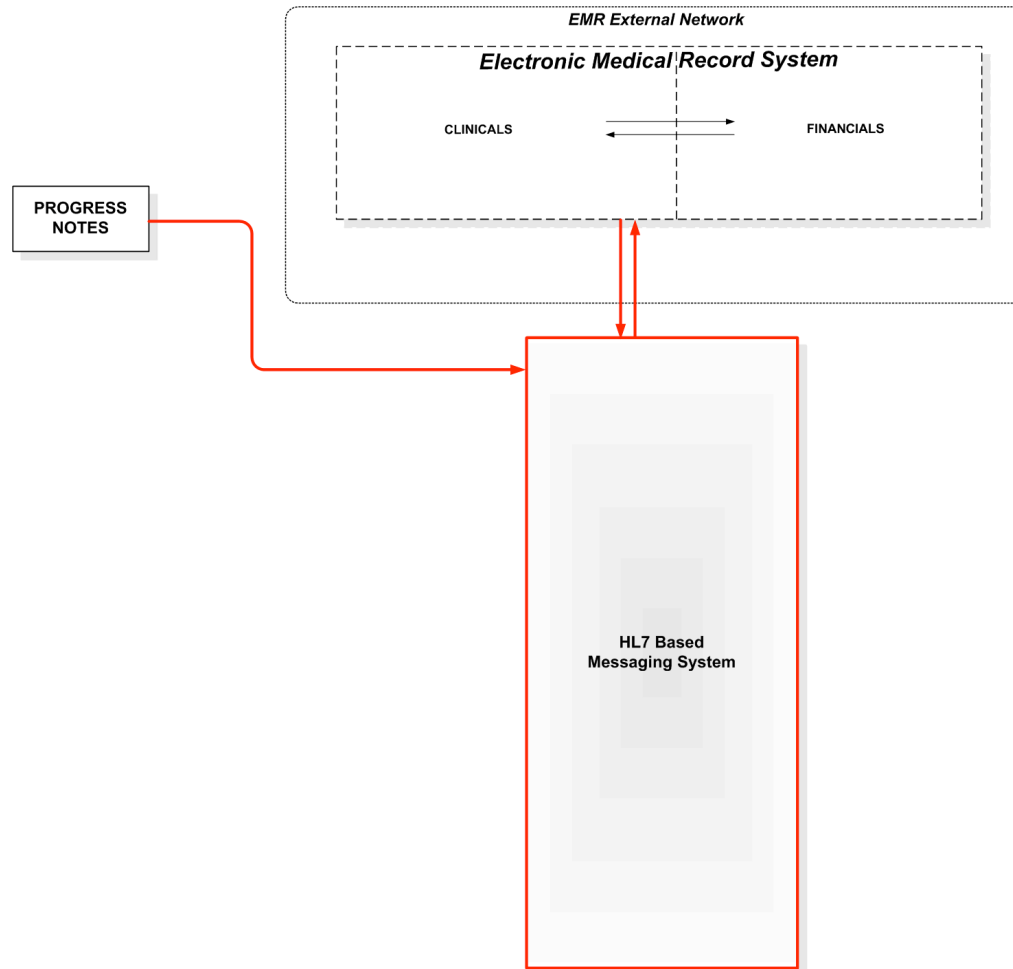
Date: Clinic:

Time	Name	Note Status
9:00 am	John Smith	Draft
9:10 am	John Smith	Signature required
9:20 am	John Smith	Complete
9:30 am	John Smith	-
9:30 am	John Smith	-
9:30 am	John Smith	-

Preventing a new information silo

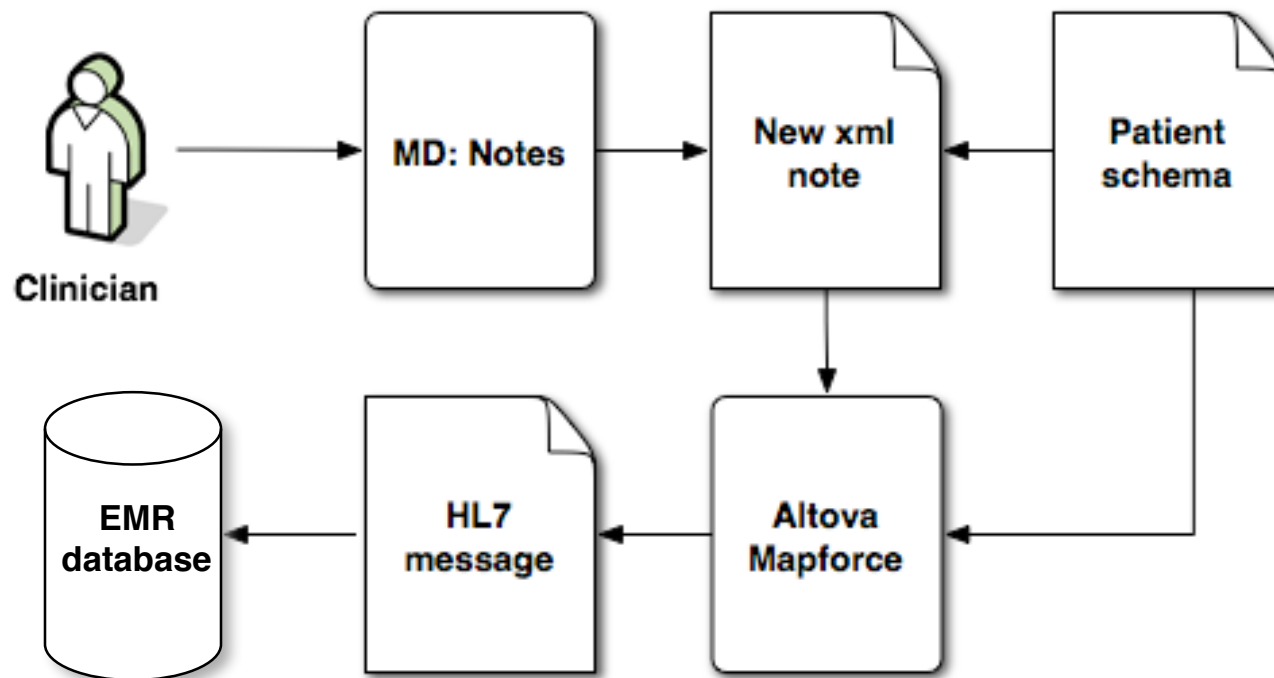


Preventing a new information silo



Converting to the HL7 Standard

- A healthcare messaging standard for system interoperability.
- **Must be able to send progress notes to the EMR!**



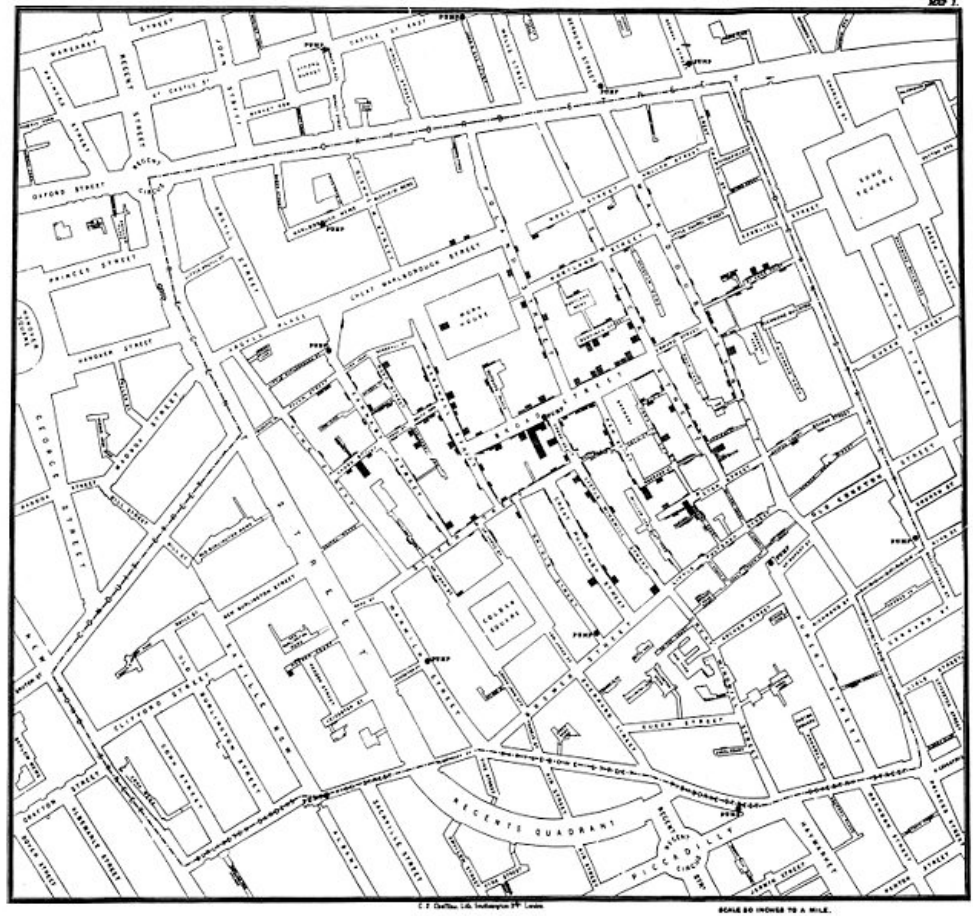
Future Work

- Integration
- Templates
- Security
- Extending the patient model
- Supporting multiple devices



Future Work, cont.

- Exploiting network effects
- Taking advantage of standards



Summary

- Many hospitals have problems managing patient information
- Our product makes it easier to enter and retrieve notes

Questions

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