Electronic Medical Records Design and Implementation

A clinician’s perspective

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Why do doctors avoid using an EMR?
• Doctors are busy
• The perfect interface does not exist*
• Doctors are busy
• The perfect interface does not exist
  • EMRs are not often well made
  • Doctors do not get enough returns from the technology
• Designing an EMR is not very easy as it is made by software engineers for use by doctors neither of whom understand each other's domains properly

• Even a well-designed EMR can become user unfriendly if it takes more than a few minutes to use, as doctors are busy creatures

• The success of an EMR implementation starts with the design of the EMR itself
• Doctors usually feel they are being forced to enter data in an EMR with nothing in return for them

• EMR companies have to ensure that doctors get value back for their efforts

• A value return at an organizational level is less an incentive for a doctor than a value return at a personal level*

• Providing clinical analytics is a very strong motivator
• Doctors give wrong and varying input to EMR developers, leading to the muddle

• EMR companies should
  • Get input from visionary doctors and not run-of-the mill doctors
  • Separate the wheat from the chaff
  • Plan ahead. Factor in change of requirements in the future – hospitals evolve
The user is always right, but the user does not know what he needs
– Jacob Nielson (leading usability expert)

Understanding the customer is the wrong thing to do — it’s confusing
What is really important is understanding the job that customers are trying to accomplish

- Prof M Christensen, Harvard Business school
• Inconsistent menus, obscure placement of data, and overwhelming number of clicks required

• Residents spend hours aggregating data from various clinical information systems into a usable format*

• Programmers often do not understand usability factors. They try to keep their programming easy

• Often the basic design requirements for medical IT systems stem from the needs of insurance companies, whose priorities have much more to do with collecting data for billing purposes than providing doctors with tools to support their work
• A good design and user friendliness
  • ‘I need to know’ information
  • Clinical summaries.
  • Group results based on what the doctor would like to see. For diabetes, show results of blood glucose, urine, HbA1c, lipid profile, recent eye examination, etc. together
  • Intuitiveness
  • Minimum time usage

• Getting something in return that cannot be obtained without an EMR
  • Better information about the patient
  • Decision support
  • Analytics*

• Money *(NHS, US)*
### Problems
- Arthritis other (716.90)
- Diabetes mellitus insulin dep (250.01)
- Headache (734.0)
- Mild Cognitive Impairment (331.83)
- Moderate persistent asthma (493.92)
- Nausea (787.02)
- Poliomyelitis (045.90)

### Medications
- Acetaminophen
- Amoxicillin 0.25 MG/ML
- Ampicillin 500 MG
- Aspirin 500 MG
- Erythromycin 500 MG
- Esomeprazole 20 MG
- Furosemide 80 MG
- Glimepiride 1 MG
- Hydrocodone

### Recent Orders
<table>
<thead>
<tr>
<th>Date</th>
<th>Order Name</th>
<th>Provider</th>
</tr>
</thead>
<tbody>
<tr>
<td>14-Aug-2012</td>
<td>Amlodipine/Alovastatin DC</td>
<td>DEV MD, DR STAFF ONE D</td>
</tr>
<tr>
<td>13-Aug-2012</td>
<td>Esomeprazole</td>
<td>TEST, RESIDENT DEV</td>
</tr>
<tr>
<td>13-Aug-2012</td>
<td>Amlodipine/Alovastatin</td>
<td>SIMPSON, HOMER</td>
</tr>
<tr>
<td>09-Aug-2012</td>
<td>Insulin Hum 70/30</td>
<td>SIMPSON, HOMER</td>
</tr>
</tbody>
</table>

### Prevention/Recommendations

### Alerts
**Diabetes Drug Adherence**

**ACTOS 92% (GOOD)**

Congratulations the patient on their good adherence to the above medication(s).

**AMARYL 20% (POOR)**

HUMALOG MIX 75/25 12% (POOR)

Please discuss with patient and document issues such as:
- Medication concerns
- Perceived need
- Perceived affordability
- Forgetting to take or pick up
- Transportation problems
- Other issues
• What are the 16 Deyo’s diagnostic criteria that distinguish benign low back ache from that which requires an MRI?

• Quickly calculate the Glasgow Coma Scale or the APACHE score

• Such predefined templates is also easier to use than typing in the information – simply tick the relevant answers
• Doctors do not have the time to spend time in prolonged learning

• A system should take doctors 20 minutes to learn instead of 20 hours

• They cannot afford to make mistakes during the initial learning curve
• All screen interactions across the EMR must be uniform
  • If patient scheduling or lab test ordering works in a particular way in inpatients, it must work the same way in outpatients
  • Use the same labels across the system
  • Position the ‘Save’ and ‘Cancel’ buttons in the same position in all the screens
• Poor usability endangers patients

• It is the biggest resistance factor to implementation

• An IBM study: Every $1 spent on usability in design phase results in a $100 internal return.
How do we capture and store the data?
• Unstructured – free text
  • Mimics the way doctors usually record information
  • Difficult to analyse
  • Decision support is difficult
  • Least value return

• Structured – tick boxes, drop down, etc.
  • Able to use the recorded information to analyse, provide decision support, etc
  • Doctors find it difficult to use
  • Creation & updating of the structured templates is a massive task
• **Unstructured >> Structured**  
  • Doctors type in free text  
  • The system is able to extract structured information from the text  
  • No system is perfect. The best *analytic* systems approach 90% accuracy.  
  • Decision support virtually non existent.

• **Structured >> Unstructured**  
  • Doctors enter structured data  
  • System parses and produces text for documentation*  
  • Doctor avoids double entry

The technology is not ripe yet...
• A HARD STOP requires the user to perform the mandatory action (e.g. entering a diagnosis code) before he can proceed further.

• A SOFT STOP only requires a user to acknowledge a recommendation before proceeding further

• Messages can be made even less intrusive based on circumstances
Regenstrief Institute’s Next-Generation Clinical Decision Support System

Jon D. Duke, MD, MS
Burke Mamlin, MD
Doug Martin MD
Embedded mechanics to dynamically change the alert display based on context

- Patient
- Physician
- Institutional
TRIAMTERENE Interacts with LISINOPRIL
Risk of Hyperkalemia
Severity: Moderate
Relevance: 5 (Average)

TRIAMTERENE Interacts with LISINOPRIL
Risk of Hyperkalemia
K 5.3*, Cr 1.3, GFR 55
Relevance: 7 (High)

Patient has lab values:
K 5.3*, Cr 1.3, GFR 55

Hyperkalemia Has Relevant Labs:
K, Cr, GFR

Related Concepts

Data Repository
Risk of Hyperkalemia

Triamterene-75/HCTZ-50 interacts with Lisinopril

Patient on Lisinopril

Management Recommendations

Cancel Triamterene-75/HCTZ-50 Order

-or-

D/C Lisinopril

Helpful Alert?

Yes No

No thanks, continue with this order
TRIAMTERENE Interacts with LISINOPRIL
Risk of Hyperkalemia
Severity: Moderate
Relevance: 5 (Average)

TRIAMTERENE Interacts with LISINOPRIL
Risk of Hyperkalemia
K 3.3, Cr 0.8, GFR 114
Relevance: 3 (Low)

Hyperkalemia Has Relevant Labs: K, Cr, GFR

Patient has lab values: K 3.3, Cr 0.8, GFR 55
Alerts That Learn

Amiodarone interacts with Warfarin

Risk of bleeding

Details

Patient on Warfarin 5.0MG

Details

Drug-drug

Severe Interaction

You have ignored this alert on Mr TEST 3 times.

☐ For this patient, show this interaction in the sidebar in the future.

Cancel Amiodarone Order  Continue Order

You have ignored this alert on Mr TEST 3 times.

☐ For this patient, show this interaction in the sidebar in the future.

Cancel Amiodarone Order  Continue Order
A/P:

1) DM - due for A1c, optho consult, lytes.
2) HTN increase lisinopril, get EKG, consider ECHO
3) Hyperlipidemia - overdue for lipids, get today
4) Screening- need colonoscopy, PSA
FHx: Breast CA, HTN

Study Reminder
Dr. Smith is recruiting for a study on patients with a family history of breast cancer. If appropriate, may we contact this patient for this study?

- [ ] Yes
- [ ] No
- [ ] No Family History of breast CA

Submit
Creating decision support - dynamically

For patients with age > 60 and problem Diabetes Mellitus,

If...

Choose a trigger channel...
- Order
- Observations
- Chart
- NLP
- Alert
- Allergy
- Diagnosis

Next

Then...

Name your rule

Save

Cancel

Favorite Parameters
- Cardiologists
- Patients with problem Hypertension
- Users at location Blackburn Clinic
- Patients with age 60+
- Patients with family history of Colon Cancer

My Rules
- Hypertension meds on formulary
- Pediatric alert#1
For patients with age > 60 and problem Diabetes Mellitus,

If...

Choose a trigger channel...

Order
Observations
Chart
NLP
Alert
Allergy
Diagnosis

Then...

Name your rule

Save

Cancel
For patients with age > 60 and problem Diabetes Mellitus,

If...

Choose a trigger channel...
- Order
- Observations
- Chart
- NLP
- Alert
- Allergy
- Diagnosis

Rosiglitazone @

Choose...
- is selected
- is discontinued
- is added to cart

Add to favorite parameters

Then...

Name your rule

Save

Cancel
For patients with age > 60 and problem Diabetes Mellitus,

If Rosiglitazone is selected,

Then...

Choose a trigger channel...
- Order
- Observations
- Chart
- Alert
- Log

Sidebar Display @ Popup Display (critical alerts)

Show
Rosiglitazone has been shown to increase risk of congestive heart failure and myocardial infarction.

Add your suggested orders...
- Pioglitazone

Name your rule

Save
Cancel
The success of EMR implementation starts with EMR design.

Implementation of a poorly designed EMR may succeed as long as administrative pressure continues

But doctors will soon stop using it.
Give doctors what they need, not what they want
Towards Touching

A Billion lives !!!

Apollo
HOSPITALS
TOUCHING LIVES