Improving Electronic Health Record (EHR) Functionality: Toward the Solution-Oriented Medical Record

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Outline

• Motivation for better health records
• Creation – the *Problem-Oriented* Health Record
• Evolution – the *Solution-Oriented* Health Record
  – How did we get here?
  – Where we are going?
  – Where we will be?
In attempting to arrive at the truth, I have applied everywhere for information, but in scarcely an instance have I been able to obtain hospital records fit for any purposes of comparison. If they could be obtained they would show subscribers how their money was being spent, what amount of good was really being done with it, or whether the money was not doing mischief rather than good.

Nightingale F. Notes on Hospitals. London: Longmans, Green and Company; 1863:176

“A general purpose [health] record system would serve to improve the quality, planning and administration of health services, to help in the evaluation of comparative therapies, and to forward research on epidemiology and human genetics, and problems of diagnosis and especially on the natural history of disease.”

“We recommend the establishment of a special standing committee...to guide the development of a general purpose health record system...”

- President's Science Advisory Committee
Life Sciences Panel, 1963
MEDICAL RECORDS THAT GUIDE AND TEACH—WEED

SPECIAL ARTICLE

MEDICAL RECORDS THAT GUIDE AND TEACH

LAWRENCE L. WEED, M.D.*

Pt. received 40 units of regular insulin yest. because of B & 4+ urine sugars. Got 2000 cc Amigen yest. & 500 cc D₅W. Was febrile all night up to 40 at 8 PM this gradually came down to 39. 8 PM yest. suctioned & coughed up ċ return of ½ cup of thick white sputum — cultured also blood cultures. Was in must. tent ċ mucomist overnight. At 4 PM yest had B-R base. Sputum smear unremarkable — WBC's but no bacteria.

9/10-12:30

10 o'clock urine 2-3+/-0. Given 10 U. reg. ins. at 12:30 PM. Temp. down to 38? Suctioned N.T. ċ little return. However during suctioning pt. vomited 100-150 cc green fluid. Proximal jejunostomy tube draining well now.

9/11-9 AM

Urine 3+ given 10 U reg. insulin. Pt. was hiccupsing all night & this AM. Levine tube passed ċ 900-1000 cc bileous fluid removed. Jejunostomy tubes have been draining minimally. Will have Levine tube down.

(THREE PAGES OF SIMILAR NOTES FOLLOW UNTIL 9/26/67)
CVA: Cerebrovascular Accident (Stroke)
SSKI: Potassium Iodide Oral Solution
LE Prep: Test for Systemic Lupus Erythematosus
Blood Pressure 180/100 (high)
BBIs: ???
CBC: Complete Blood Count
#1 Rheumatoid Arthritis — maintained on Aspirin gram 15 q.4.h. and Prednisone 5 milligrams twice a day.

#2 Anemia — probably related to blood loss by G.I. tract but also rule out persistent folic acid deficiency and hypothyroidism. R/O myxedema & folic acid def.

#3 Peripheral neuritis — uncertain etiology

#4 Peripheral edema — uncertain etiology — malnutrition

#5 Depression and memory impairment or slowing up of thought processes — uncertain etiology — myxedema.

**PLANS:**

#1 Continue same regime although would suggest elevating head of bed, addition of Belladonna and Maalox PC and HS.

#2* Serum Iron, folic acid, total protein AG ratio. PBI.

#3 Continue multiple vitamin possibly should add folic acid. Folic acid level to be checked.

#4 Evaluate serum protein level as well as PBI.

#5 Probably I am overly impressed by her skin texture suggesting myxedema and her voice changes which may be due to the Thorazine. If the PBI is normal, then perhaps a more vigorous or intensive trial on antidepressants, more rapidly acting such as Perto-frane or Aventyl should be given or possibly shock therapy employed.
What Did Weed Want?

• Each medical record should have a complete list of all the patient's problems, including both clearly established diagnoses and all other unexplained findings that are not yet clear manifestations of a specific diagnosis, such as abnormal physical findings or symptoms.

• Careful analysis and follow-through on each problem as revealed in the titled progress notes, requiring that the proper data be collected and that the conclusions drawn from this data are logical and relevant.
The Problem-Oriented Medical Records: (SOAP)

Subjective
Objective
Assessment
Plan
In the beginning, there was....
Ancillary Systems Make their Contribution

Subjective

Objective

Assessment

Results

Billing
The Beancounters Triumph!

Subjective

Assessment

Billing

Results

No
Can you say: Return on Investment?
A Digital Shift on Health Data Swells Profits in an Industry

Dr. Vivek Reddy, a neurologist at the University of Pittsburgh Medical Center, also works on its digital records effort.

By JULIE CRESWELL
Published: February 19, 2013 | 525 Comments
“We called it the Sunny von Bülow bill. These companies that should have been dead were being put on machines and kept alive for another few years,” said Jonathan Bush, co-founder of the cloud-based firm Athenahealth and a first cousin to former President George W. Bush.

“On a really good day, you might be able to call the system mediocre, but most of the time, it’s lousy,” said Michael Callaham, the chairman of the department of emergency medicine at the University of California, San Francisco Medical Center.

“Nothing that these companies did in my eyes was spectacular,” said John Gomez, the former head of technology at Allscripts.
Sometimes, the informaticians get to be in charge
We have been doing these for over 40 years.
Automated Clinical Decision Support

Alerting and Reminder System
Infobuttons

Anticipate Need and Provide Queries
Sodium, Sweat

Laboratory Specialty Laboratory

Request Form General

Phone (212) 305-6569

Availability By appointment only

Turnaround Time 1 day

Special Instructions Schedule appointment with laboratory to collect sweat at (212) 305-6569.

Specimen Sweat

Minimum Volume 75 mg

Collection Specimen will be collected by laboratory personnel.

Storage Instructions Refrigerate

Causes for Rejection Insufficient sweat yield

Reference Range Negative: <40 mmol/L; borderline: 40-60 mmol/L; consistent with the diagnosis of cystic fibrosis: >60 mmol/L

Use Establish the diagnosis of cystic fibrosis

Methodology Flame photometry
**Adverse Effects**

**Common**
- Neurologic: Headache

**Serious**
- Cardiovascular: Cardiac dysrhythmia
- Hematologic: Thrombocytopenia (rare)
Dawn of Computer-Based Clinical Documentation

Clinical Decision Support

Subjective

Objective

Assessment

Orders

Results

Billing

Alert
Better Data Capture

Clinical Decision Support

Subjective → Objective → Assessment → Plan → Orders → Results → Billing → Alert

- Subjective
- Objective
- Assessment
- Plan
- Orders
- Results
- Billing
- Alert
Better Data Capture

• Mobile and home devices
• Systematic, consistent discrete data capture for the purposes of “learning from every patient”
• Smart inclusion of relevant data into notes
Subjective

Medications

Objective
  Vital signs
[<<VITALS_CURRENT>>]
  PE

Results
[<<LABS_COMMON_24>>]

Assessment

Plan

Data Fields (drag or double-click)

[<<AGE>>]
[<<ALLERGIES>>]
[<<BIRTH_DATE>>]
[<<BMI>>]
[<<DATE_TODAY>>]
[<<HEIGHT>>]
[<<IO_ITEMIZED>>]
[<<IO_SUMMARY>>]
[<<LABS_COMMON_48>>]
[<<LABS_COMMON_24>>]
[<<MEDS_ACTIVE>>]
[<<MEDS_OUTPATIENT>>]
[<<SEX>>]
[<<VITALS24H>>]
[<<VITALS_CURRENT>>]
[<<WEIGHT>>]

Patient's age in years, months, days (depending on age)
Better Views of the Record

Clinical Decision Support

- Subjective
- Objective
- Assessment
- Plan

Orders
Results
Billing
Alert
Better Views of the Record

- Disease-specific patient-oriented summaries
- Sign-out to support transitions
- Expert systems to render context-sensitive summaries
- Integration of personal genomes into EHRs
- Medication timeline
- Heads-up displays
- Automated communications: discharge summaries, patient letters, etc.
CAD/DM Smart Form: Graphs

BMI


Weight


Blood Pressure


Assessment

No recent LDL measurement
Patient is on anti-platelet therapy
Blood Pressure is above goal (avg. over last 2 visits 130/80, goal < 130/80)
Patient is due for Pneumovax (older than 65, no record of prior vaccination)
Patient is due for Influenza Vaccine (high risk medical condition)
Patient may be Current Smoker, not thinking of quitting. Last counsel date is 10/31/06.
Patient is overweight or obese (BMI 27.1 on 10/31/06, goal < 25)

Lipid Management
Antiplatelet Therapy
Blood Pressure Management
Immunizations
Smoking
Weight/BMI
Follow-ups
**StarTracker Conditions/Diseases:** No Tracked Conditions

<table>
<thead>
<tr>
<th>Preventive</th>
<th>BP</th>
<th>BMI</th>
<th>eGFR</th>
<th>HCT</th>
<th>FLUVAX</th>
<th>CRC</th>
<th>Mammogram</th>
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<td>143</td>
<td>31.7</td>
<td>52</td>
<td>33</td>
<td>NONE</td>
<td>NONE</td>
<td>UNKNOWN</td>
<td>UNKNOWN</td>
</tr>
</tbody>
</table>

**SMOKE**

**UNKNOWN**

---

**Patient-specific guidelines**

**MedicationsLog**

**ICD9 History**

---

**General Information:**

- PCP:
- Primary cardiologist:

**Significant Medical Diagnoses and Conditions:**

1. Coronary atherosclerotic heart disease
   a. NonSTMI 01/2010
   b. Coronary intervention 1/12/2010
2. Xience 3x23 drug eluting stent to RCA
3. Coronary intervention 2/17/2010
   a. Coronary intervention 4/6/2010
---

**Adverse and Allergic Drug Reactions:**

- penicillin (class) (rash)
- cephalexin (rash)

**Drug Genome Interactions:** (12/21/10 08:02)
- clopidogrel sensitivity: POOR METABOLIZER, REDUCED CYP2C19 - gene result: *2/*2

**Medications:** prepare to print

- prepare to print
- print and give pt.

**Drug/Herb Interactions**

- aspirin 325 mg orally once daily, in the morning
- prasugrel (effient) 10 mg orally once daily
- carvedilol 6.25 mg orally twice daily with meals
- lisinopril 10 mg orally once daily
- furosemide 40 mg or
PT3 Last Hospital Stay 07/19/2004 - 07/22/2004

DISCHARGE / OUTPT MED: OLANZAPINE 2.5 MG
DISCHARGE / OUTPT MED: THIAMINE TAB 100MG
DISCHARGE / OUTPT MED: MULTIVITAMINS 1 TAB
DISCHARGE / OUTPT MED: ENSURE SUPPLEMENTATION

DISCHARGE / OUTPT MED: ENSURE SUPPLEMENTATION

DISCHARGE MEDICATIONS: FROM DISCHARGE
SUMMARY NOTE 2004-04-09 13:01: She was to be discharged to the nursing home on ENSURE SUPPLEMENTATION QD PO

Therapeutic class: 402000 - Caloric Agents
Sat, 10 Apr 2004 03:59:00 UTC ~ Sun, 11 Jul 2004 01:04:00 UTC
Sun, 11 Jul 2004 01:05:00 UTC ~ Tue, 20 Jul 2004 00:00:00 UTC

Sources: DRMI
CAD/DM Smart Form: Patient View

Blood Pressure
On average, your blood pressure has been running high recently (average of 130/80 from your last two doctor visits). The recommended blood pressure goal is 130/80. You may want to discuss with your doctor about things you can do to help lower your blood pressure.

Immunizations
Most people older than 65 receive a shot to prevent pneumonia at least once. If you have not had a pneumonia shot, you may want to discuss with your doctor whether you should get a pneumonia shot. Most people with medical conditions such as yours receive a flu shot every year. If you have not had a flu shot this year, you may want to discuss with your doctor’s office whether you should get a flu shot.

Smoking
If you are currently a smoker, you may want to talk to your doctor about ways to help you quit.
Information about your hospital visit

Visiting hours: 1 pm to 9 pm
Call '43663' to order meals

Scheduled events

7:00-11:00 am  Speech, Blood draw,
11:00 am-3:00 pm  Physical therapy, Blood draw,
3:00-7:00 pm  Family meeting

Daily routine

7:00-8:00 am  Breakfast
7:00-9:30 am  Care team rounds
12:00-1:00 pm  Lunch
5:00-6:00 pm  Dinner

Patient and family notes

- Ask Dr. Boxer about discharge  Delete

Information about your health

Nutrition & Fluids  Care reminders  Test results  Medications  Education/Self management  Discharge Education
Re-Using EHR Data for Better Evidence

Clinical Decision Support

- Subjective
- Objective
- Assessment
- Plan

Analytics

Orders

Results

Billing

Alert
Re-Using EHR Data for Better Decision Support

Clinical Decision Support

Subjective
Objective
Assessment
Plan

Analytics

Orders
Results
Billing
Alert
Re-Using EHR Data for Better Decision Support

- Using a clinical data warehouse to improve alerts
- Risk-stratification with risk-specific plans of care
- Raising clinical alerts based unusual patient care
- Personalized medicine supported by genomic data
- Context-driven dynamic alerts that learn
- NLP to analyze notes in real-time
Clopidogrel Poor Metabolizer Rules

Genetic testing has been performed and indicates this patient is at risk for inadequate anti-platelet response to clopidogrel (Plavix) therapy.

This patient has been tested for CYP2C19 variants, and the presence of the *2/*2 genotype has identified this patient as a poor metabolizer of clopidogrel. Poor metabolizers treated with clopidogrel at normal doses exhibit higher rates of stent thrombosis/other cardiovascular events.

Treatment modification is recommended:
- Prescribe prasugrel (EFFIENT) 10mg daily and stop clopidogrel (PLAVIX) startdate, 10 AM

Due to increased risk of bleeding, prasugrel should not be given to patients:
- who have a history of stroke or transient ischemic attack *** Not known; please check StarPanel
- that are greater than 75 years of age
- whose body weight is less than 60 kg

Click here for more information

If prasugrel (EFFIENT) not selected, please choose desired action:
- Increase maintenance dose of clopidogrel (PLAVIX) 150 mg daily, start date, 10AM
- Maintain requested daily dose of clopidogrel (PLAVIX) 75 mg daily, start date, 10AM

If contraindicated
- Expected effects (e.g. nuisance bleeding)
- Patient preference
- Other

Click here for more information

NOTE: The Vanderbilt P&T Committee has recommended that prasugrel (if not contraindicated) should replace clopidogrel for poor metabolizers; if this is not possible consider doubling the standard dose of clopidogrel (or, use standard dose clopidogrel). However, there is not a national consensus on drug/dose guidance in this population.
Better Reuse For Research (and Workflow)
Better Reuse for Research (and Workflow)

- Data mining to detect adverse events
- Self-service hypothesis testing
- Alerts for subject recruitment
- Alerts for protocol violation
Allergies: No Known Allergies

Standing □ Future  Authorizing Provider: 

☐ ACCORD STUDY AGE 40 - 54 - SmartSet # 1410

☐ THE ACCORD STUDY: Your Patient may be eligible for this Study. PLEASE CLICK BELOW TO PROCEED. Thank You.

☐ Trigger diagnosis

☑ Diabetes Uncompl Adult-Type II [250.00]

☐ You do not need to explain the trial in detail or obtain consent from your patient.

☐ Simply consider the following criteria, and select the appropriate response below.

☐ YES below generates a consult to the study coordinator and Pt info in the After-Visit Summary.

☐ Does your patient meet the following criteria:

☐ 1.) Has documented Cardiovascular Disease: CHD, PVD, or Carotid disease

☐ 2.) Has ONE or BOTH of these diagnoses: HTN and/or Dyslipidemia

☐ 3.) Patient will allow limited chart review to determine eligibility

☐ 4.) Patient is willing to be contacted by a research coordinator if eligible.

☐ Please select one of the following, then click ACCEPT  (single)

☐ YES, patient meets above criteria (Study Coordinator Consult-Right Click for Details)

☐ NO, Patient Does Not currently meet study Criteria listed in 1.) and 2.) above.

☐ NO, Patient meets these criteria but is not interested

Courtesy: University of Cincinnati
Alert: PredniSONE Protocol Medication Restriction

Message: Dear prescriber, Under protocol 93-C-0133 concurrent corticosteroids are not allowed except for myasthenia gravis, other paraneoplastic syndromes, or other chronic conditions.
Welcome to BTRIS

The Biomedical Translational Research Information System (BTRIS) is a resource available to the NIH intramural community that brings together clinical research data from the Clinical Center and other NIH Institutes and Centers. BTRIS provides clinical investigators with access to identifiable data for the subjects on their own active protocols, while providing all NIH investigators with access to de-identified data across all protocols. BTRIS provides users with advanced search, filtering, and aggregation methods to create data sets to support ongoing studies and stimulate ideas for new research. BTRIS contains subject data from CRIS/MIS (the Clinical Center Medical Information Systems) and research data from NIAID (Crimson), NIAAA, and NCI. Data are available from 1976 to the present.

BTRIS comprises two distinct but interrelated Web-based applications, BTRIS Data Access and BTRIS Preferences. (Refer to the graphic below)

**BTRIS Data Access** is the data repository where principal investigators or their designees create reports on their active protocols with identified subject data. Multiple reports are available in BTRIS and can easily be run by researchers through a series of prompts. Reports include the IRB Inclusion Enrollment Report, demographics, patient lists, laboratory and microbiology results, vital signs, medication orders and administration, diagnoses, and radiology reports (with links to images in the CC PACS system).

**BTRIS Preferences** allows principal investigators or their designees to verify subject enrollment in their protocol(s). This ensures that reports created in BTRIS Data Access include all subjects. It also allows the principal investigator to designate associate investigators, and other members of the research team, to manage subject enrollment and create reports in BTRIS Data Access.

For questions or comment about BTRIS contact Dr. Jim Cimino, Chief, Laboratory for Informatics Development, NIH Clinical Center, National Institutes of Health, Bethesda, MD
| Data Type   | Subject | Event                          | Observation                       | Date             | Medication Admin D: Value | Unit of N Range | Comment Protocol | Protocol PI   | Protocol Email |
|------------|---------|--------------------------------|-----------------------------------|------------------|---------------------------|-----------------|------------------|----------------|----------------|----------------|
| Diagnosis  | Subject1| NIAID Problem                  | Chronic Granulomatous Disease (CGD) | 5/1/1984 12:00   | 829                       | -               |                  | 288.1          |                |                |
| Medications| Subject1| Bactrim DS                     |                                   | 5/15/1984 12:00  | No Admin Date Available  |                 |                  |                |                |                |
| Labs       | Subject1| ALKALINE PHOSPHATASE           | ALKALINE PHOSPHATASE              | 2/6/1985 10:30   | 124 U/L                   |                 |                  |                |                |                |
| Labs       | Subject1| BILIRUBIN TOTAL                | BILIRUBIN TOTAL                   | 2/6/1985 10:30   | 0.2 MG/DL                | N               |                  |                |                |                |
| Labs       | Subject1| ALT/GPT                        | ALT/GPT                          | 2/9/1985 12:42   | 18 U/L                    | N               |                  |                |                |                |
| Labs       | Subject1| AST/GOT                        | AST/GOT                          | 2/9/1985 12:42   | 18 U/L                    | N               |                  |                |                |                |
| Labs       | Subject1| ALBUMIN                        | ALBUMIN                          | 2/9/1985 12:42   | 4.1 G/DL                  | N               |                  |                |                |                |
| Labs       | Subject1| LDH                            | LDH                              | 2/9/1985 12:42   | 231 U/L                   | N               |                  |                |                |                |
| Labs       | Subject1| BILIRUBIN                      | BILIRUBIN                        | 2/10/1985 11:55  | NEG                       |                 |                  |                |                |                |
| Labs       | Subject1| BILIRUBIN                      | BILIRUBIN                        | 2/14/1985 12:16  | NEG                       |                 |                  |                |                |                |
| Diagnosis  | Subject1| Discharge Diagnosis            | Primary Tuberculous Infection, Unspecified | 2/27/1985 00:00 | 10.9                      |                  | PRIMARY TUBERCULOSIS |                |                |                |
| Diagnosis  | Subject1| NIAID Problem                  | Pulmonary tuberculosis           | 6/1/1985 12:00   | 314                       |                  |                  | 11.9           |                |                |
| Medications| Subject1| Streptomycin                    |                                   | 6/1/1985 12:00   | No Admin Date Available  |                 |                  |                |                |                |
| Medications| Subject1| Rifampin                        |                                   | 6/1/1985 12:00   | No Admin Date Available  |                 |                  |                |                |                |
| Medications| Subject1| INH                             |                                   | 6/1/1985 12:00   | No Admin Date Available  |                 |                  |                |                |                |
| Labs       | Subject1| ALBUMIN                        | ALBUMIN                          | 7/30/1985 11:44  | 4.1 G/DL                  | N               |                  |                |                |                |
| Labs       | Subject1| LDH                            | LDH                              | 7/30/1985 11:44  | 317 U/L                   |                 |                  |                |                |                |
| Diagnosis  | Subject1| Discharge Diagnosis            | Primary Tuberculous Infection, Unspecified | 8/4/1986 00:00 | 10.9                      |                  | PRIMARY PULMONARY TUBERCULOSIS |                |                |                |
| Labs       | Subject1| ALKALINE PHOSPHATASE           | ALKALINE PHOSPHATASE              | 8/4/1986 11:18   | 168 U/L                   |                 |                  |                |                |                |
| Medications| Subject1| INH                             |                                   | 9/1/1988 12:00   | No Admin Date Available  |                 |                  |                |                |                |
| Medications| Subject1| Pyrazinamide                    |                                   | 9/15/1988 12:00  | No Admin Date Available  |                 |                  |                |                |                |
| Labs       | Subject1| ALKALINE PHOSPHATASE           | ALKALINE PHOSPHATASE              | 9/16/1988 14:32  | 162 U/L                   |                 |                  |                |                |                |
| Diagnosis  | Subject1| Discharge Diagnosis            | Unspecified Pulmonary Tuberculosis, Unspecified | 9/20/1988 00:00 | 11.9                      |                  | R/O REACTIVATION TUBERCULOSIS |                |                |                |
| Labs       | Subject1| ALKALINE PHOSPHATASE           | ALKALINE PHOSPHATASE              | 2/2/1993 10:40   | 208 U/L                   |                 |                  |                |                |                |
| Labs       | Subject1| ALKALINE PHOSPHATASE           | ALKALINE PHOSPHATASE              | 6/22/1993 10:05  | 209 U/L                   |                 |                  |                |                |                |
| Medications| Subject1| RIFAMPIN 300MG CAPSULE          |                                   | 11/27/1998 12:00 | No Admin Date Available  |                 |                  |                |                |                |
| Medications| Subject1| LEVOFLOXACIN 500MG TAB         |                                   | 11/27/1998 12:00 | No Admin Date Available  |                 |                  |                |                |                |
| Medications| Subject1| SODIUM SULFACETAMIDE 10%, SULFUR 5% |                       | 11/27/1998 12:01 | No Admin Date Available  |                 |                  |                |                |                |
| Medications| Subject1| LEVOFLOXACIN 500MG CAPSULE      |                                   | 12/3/1998 17:33  | No Admin Date Available  |                 |                  |                |                |                |
| Medications| Subject1| RIFAMPIN 300MG CAPSULE          |                                   | 12/3/1998 17:33  | No Admin Date Available  |                 |                  |                |                |                |
| Labs       | Subject1| ALT/GPT (Alanine Trans.)       |                                   | 9/13/1998 5:59   | 19 U/L                    |                 |                  |                |                |                |
There Are Still Pieces Missing

Clinical Decision Support

- Subjective
- Objective
- Assessment
- Plan

Orders
Results
Billing
Alert
Research

Subjective
Objective
Assessment
Plan

?
Tactics versus Strategy
Larry Weed mentions computers 24 times

“If we accept the limits of discipline and form as we keep data in the medical records the physician's task will be better defined, the role of paramedical personnel and the computer will be clarified, and the art of medicine will gain freedom at the level of interpretation and be released from the constraints that disorder and confusion always impose.”
Cook #1: a terrible cook
Cook #2: a vegan
Cook #3: an informatician

CLOSED
THANKS FOR
THE MANY YEARS
We Need to Make the Computer a Full Partner

Clinical Decision Support

- Research
- Orders
- Results
- Billing
- Alert

Subjective
- Coded Symptoms

Objective
- Coded Signs

Assessment
- Relate Findings to Assessment
- What is the Strategy?

Plan
CAD/DM Smart Form

Smart View: Data Display

Smart Assessment, Orders, and Plan

Assessment and recommendations generated from rules engine

- Lipids
- Anti-platelet therapy
- Blood pressure
- Glucose control
- Microalbuminuria
- Immunizations
- Smoking
- Weight
- Eye and foot examinations

Assessment

- No recent LDL measurement
- Patient is on anti-platelet therapy
- Blood Pressure is above goal (avg. over last 2 visits 130/80, goal < 130/80)
- Patient is due for Pneumovax (older than 65, no record of prior vaccination)
- Patient is due for Influenza Vaccine (high risk medical condition)
- Patient may be Current Smoker, not thinking of quitting. Last counseled on 10/10/06.
- Patient is overweight or obese (BMI 27.1 on 10/31/06, goal < 25)
### Vital Signs

<table>
<thead>
<tr>
<th>Date</th>
<th>T (&lt;98.6)</th>
<th>BP (&lt;130/80)</th>
<th>HR (50-100)</th>
<th>RR</th>
<th>O2 Sat</th>
<th>W</th>
<th>H</th>
<th>BMI (&lt;25)</th>
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</thead>
<tbody>
<tr>
<td>10/31/06</td>
<td>✔ 98.5F</td>
<td>✔ 150/75!</td>
<td>✔ 70</td>
<td>14</td>
<td>✔</td>
<td>200lb</td>
<td>72in</td>
<td>✔ 27.1!</td>
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<tr>
<td>10/10/06</td>
<td>✔</td>
<td>✔ 110/85!</td>
<td>✔</td>
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<td>✔ 110.75</td>
<td>✔</td>
<td>✔</td>
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<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Rules
- If patient has DM then goal BP < 130/80
- If the average of the blood pressure at the last 2 visits (in the last year) is above goal then return..
CAD/DM Smart Form

- **Medication Orders**
  - 75 yo man with CAD, DM, and elevated CK. He is not taking any of his medications. I last saw him 3 months ago.

- **Lab Orders**
  - CAD-related
    - Diabetes mellitus type 1
    - Coronary artery disease
  - DM-related
    - Diabetes mellitus type 1

- **Referrals**
  - Onychomycosis
  - Elevated creatine phosphokinase

- **Handouts/Education**
  - Print "Control High Blood Pressure"
  - Print DASH diet instructions
  - Print exercise "prescription"
Easy inclusion of assessment and orders into note

Assessment and Plan

ASSESSMENT
- No recent LDL measurement
- Patient is on anti-platelet therapy
- Blood Pressure is above goal (avg. over last 2 visits 130/80, goal < 130/80)
- Patient is due for Pneumovax (older than 65, no record of prior vaccination)
- Patient is due for Influenza Vaccine (high risk medical condition)
- Patient may be Current Smoker, not thinking of quitting. Last counsel date is 10/10/06.
- Patient is overweight or obese (BMI 27.1 on 10/31/06, goal < 25)

PLAN

Blood Pressure:
- Adjust Lisinopril 40 MG (40MG TABLET take 1) PO QD
- Order Chem 7 in 1 weeks
- Referral to Nutritionist
- Print "Control High Blood Pressure"
**CAD/DM Smart Form: Workflow**

- **Importation of data elements**
- **Automatic inclusion of data (e.g., medications)**

### Problems

<table>
<thead>
<tr>
<th>Category</th>
<th>Condition</th>
<th>Date</th>
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<tbody>
<tr>
<td>CAD-related</td>
<td>Diabetes mellitus type 1</td>
<td>03/06/06</td>
</tr>
<tr>
<td>CAD-related</td>
<td>Coronary artery disease</td>
<td>10/10/06</td>
</tr>
<tr>
<td>DM-related</td>
<td>Diabetes mellitus type 1</td>
<td>03/06/06</td>
</tr>
<tr>
<td>DM-related</td>
<td>Coronary artery disease</td>
<td>10/10/06</td>
</tr>
<tr>
<td>Other</td>
<td>Onychomycosis</td>
<td>10/10/06</td>
</tr>
<tr>
<td>Other</td>
<td>Elevated creatinine</td>
<td>10/10/06</td>
</tr>
</tbody>
</table>

### Procedures

- **CAD-related**
  - Diabetes mellitus type 1
  - Coronary artery disease
- **DM-related**
  - Diabetes mellitus type 1
  - Coronary artery disease
- **Other**
  - Onychomycosis
  - Elevated creatinine

### Beta-Blockers

- **Acebutolol HCL 200 MG**
  - (200MG CAPSULE take 1) 10/10/06 PO QD

### Lipid Management

- **No recent LDL measurement**
- **Blood Pressure is above goal (avg. over last 2 visits 130/80, goal < 130/80)**
- **Patient is due for Pneumovax (older than 65, no record of prior vaccination)**
- **Patient is due for Influenza Vaccine (high risk medical condition)**
- **Patient may be Current Smoker, not thinking of quitting. Last counseled on 10/10/06.**
- **Patient is overweight or obese (BMI 27.1 on 10/31/06, goal < 25)**

### Blood Pressure Management

- **Blood Pressure is above goal (avg. over last 2 visits 130/80, goal < 130/80)**
- **Start an Other Anti-Hypertensives**
  - Adjust Cretin 25 MG (25MG TABLET take 1) PO QD
Automated Inclusion of Data in Notes

• Adverse effects:
  – Leads to note bloat
  – Discrepancies in the record

• Alternative therapy:
  – Annotate non-note data
  – Create relevant views while composing notes
  – Link observations to assessments - evidence
  – Link observations to plan – monitoring strategy
Future Partnerships

• Evidence-based care
• Quality care
• Cost containment
• Genomics: diagnosis, treatment, prognosis
• Pharmacogenomics: patient, tumor, microorganism
• Meaningful use of electronic health records
It has been said that preoccupation with the medical record and the computer leads to neglect of the "humanitarian" side and the "art" of medical practice.

The most humanitarian thing a physician can do is to precisely know what he is doing, and make the patient as comfortable as he can in the face of problems that he cannot yet solve.
Where Do We Go from Here?

- EHRs are less problem-oriented than paper ones
- Current EHRs are victims of their history
- Those who don’t study history are doomed to repeat it
- We need to stop thinking of the EHR as a diary
- We need to tell the EHR why we are doing things
Putting IBM Watson to Work in Healthcare

A New Class of Industry Specific Analytical Solutions.
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- We need to tell the EHR why we are doing things
- Then it can evolve to a solution-oriented health record
- Extinction is part of the evolutionary process
- IBM has tried to build EHRs before…
- Partners Healthcare purchased a commercial EHR
Acknowledgements

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- Bill Tierney: Regenstrief Institute