• 152

Dr. Karim Keshavjee

THE ONCE AND FUTURE EMR

This session will explore: 1) the history of electronic medical records --when and where they started, what the various visions for them were and how they evolved; 2) the current generation of electronic medical records and what led to their widespread use around the Western world; 3) the future of electronic medical records, the main drivers of change and how physicians can help drive that future.

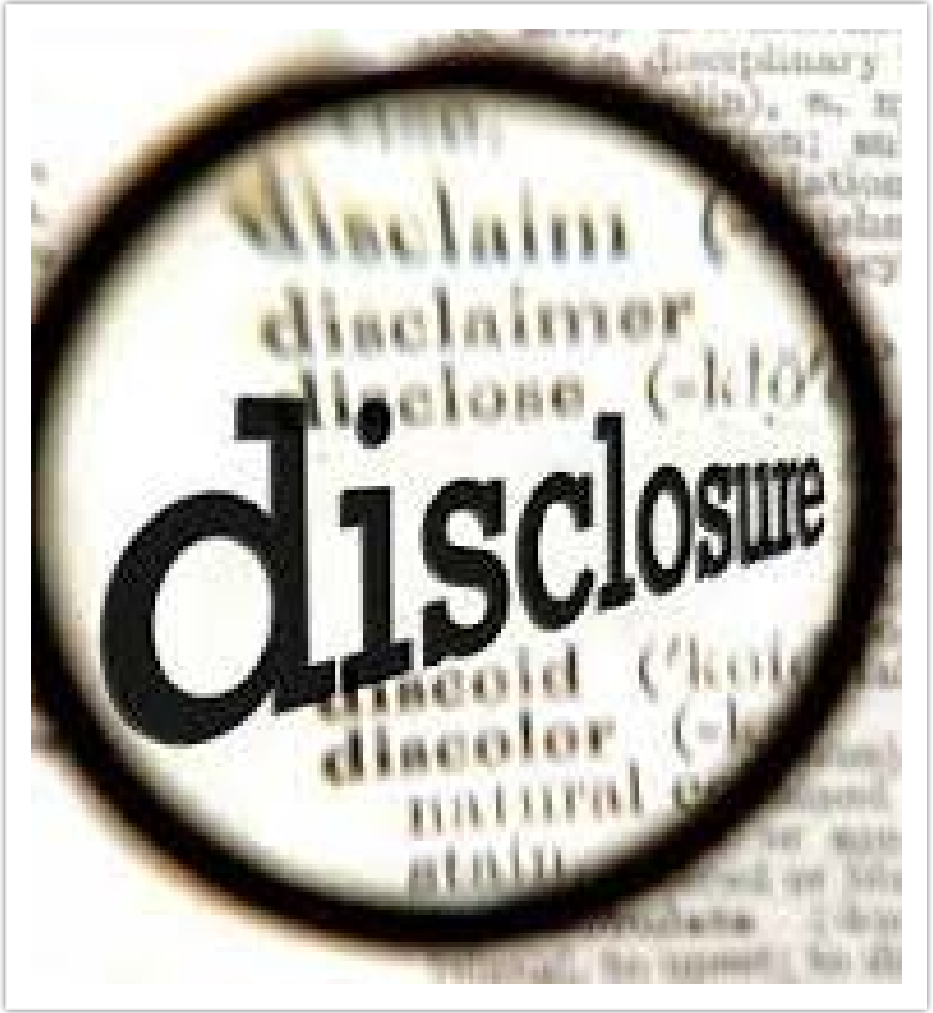
At the conclusion of this activity, participants will be able to: 1. List the key visions for electronic medical records when they were initially being developed. 2. List the key reasons for electronic medical record adoption in Canada 3. Explain why EMRs have been so widely adopted across Canada in the last 5 years 4. Explain why current EMRs are difficult to use and cause so many different types of issues 5. List features of future EMRs that may help solve current problem areas 6. Participate in and promote physician leadership in driving changes in future EMR development

THE ONCE AND FUTURE EMR

Karim Keshavjee, MD, MBA, CCFP, CPHIMS-CA

Outline

- The Past
- The Present
- The Future
- Next Steps



Faculty/Presenter Disclosure

- Faculty: **Karim Keshavjee**
- Relationships with commercial interests:
  - Grants/Research Support: **None**
  - Speakers Bureau/Honoraria: **None**
  - Consulting Fees: **University of Calgary, McMaster University, Mohawk College**
  - Other: **Shareholder in InfoClin and InfoClin Analytics**

Disclosure of Commercial Support

- **This program has received financial support from Society of Rural Physicians of Canada in the form of expense reimbursement.**
- **This program has received in-kind support from InfoClin in the form of Time to work on this project**
- **<u>Potential for conflict(s) of interest</u>:**
  - **None**
  - **I will NOT be speaking about off-label use of pharmaceutical products**
  - **I do not have shares in any EMR companies**

Mitigating Potential Bias

InfoClin provides IT architecture services to Clinical Researchers

InfoClin Analytics provides EMR data cleaning and analytics services to physicians

- At the conclusion of this activity, participants will be able to …

1. List the key visions for electronic medical records when they were initially being developed.

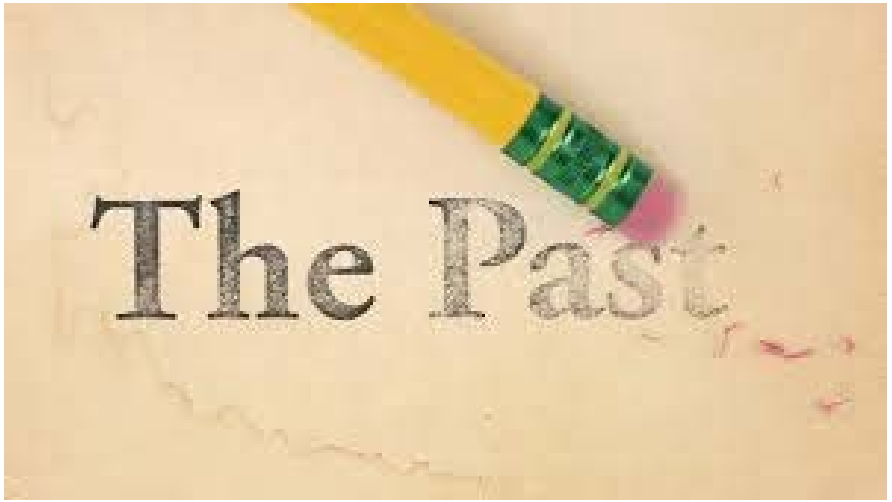
2. List the key reasons for initial electronic medical record adoption in Canada

3. Explain why EMRs have been so widely adopted across Canada in the last 5 years

4. Explain why current EMRs are difficult to use and cause so many different types of issues

5. List features of future EMRs that may help solve current problem areas

6. Participate in and promote physician leadership in driving changes in future EMR development

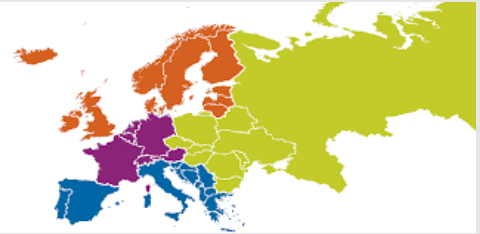


EMRS PAST

- First introduced at the Regenstreif Institute in the US in 1972
  - The Vision: Improve patient safety through clinical decision support
  - Prevent doctors from harming patients by prescribing medications that may be harmful to a patient
    - E.g., digoxin to a patient with hyperkalemia (at that time, an important issue!)
- Relatively poor uptake
- “Alert fatigue” first described
- Billing systems introduced at this time

EMRs –EUROPE

- EMRs have been around for a few decades
- Started out in Europe as stand-alone systems (’80s-’90s)
  - Gained widespread use because of subsidies
  - Lower cost of adoption because of small practices with single exam room
  - Subsidies came from sale of data to pharmaceutical companies
  - Data quality was important for pharma, so European systems have had higher quality data for a long time
  - The Read Codes were developed in the UK to standardize diagnosis information (doctors hate it, but forced to use it)



EMRs –PAST –US

- Started out in the US in the ’80s and ‘90s as integrated systems for large clinics (100-150 physicians)
  - Main driver was paper reduction
  - In large clinics, it costs a lot to manage paper
    - Pulling and filing charts for patient care, managing referrals, filing lab results
  - Charts are lost 11% of the time
  - No need for standardization of data –everyone just dictated their notes –no interruption of physician practice.
  - They learned a lot about implementation and integration of EMRs
    - Lots of failures along the way

EMRs –Canada

- Main driver for uptake:
- Large clinics (25-100 physicians)
- Paper management was becoming a problem
- No need for good data –just dictate notes and put them in
- Paper was the paradigm to emulate
- No thought for reports or analytics

Example of 1980's EMR

Text-based EMRs

(049950) C Dr's Desktop - fred 17Aug01

File Actions Tools Help

MEDACT - MEDICATIONS - ACTIVE

```
Active Medications                  (MEDACT)
--------------- Medication -------------- CA Issued   Dose Fq Rf Expires Dr
FERROUS GLUCONATE          TAB 300    MG   A  16Aug01     1  1  1 24Nov01 01
VASOTEC TAB 5MG            TAB 5      MG   C  16Aug01     1  1  1 04Mar02 01
VENTOLIN INHALER - AEM IN MET 100     MCG  C  16Aug01     0  0  0 16Aug01 01
```

al - ALLERGIES

```
SMITH ROBERT S (01)
  [penicillin          ][196305]  REACTION: rash
  [pollen              ][198708]  REACTION: sneezing; congestion
  [keflex              ][199805]  REACTION: rash
  [                    ][      ]  REACTION:
  [                    ][      ]  REACTION:
```

pl - PROBLEM LIST

```
SMITH ROBERT S (01)
  #[1 ]: Coronary Artery Disease
                    Diagnosed: 1986
                    Resolved:

  #[2 ]: Hepatitis "B"
                    Diagnosed: 1995
                    Resolved: 1996   ******  CARRIER  ******
  #[3 ]: Chronic Obstructive Pulmonary Disease
                    Diagnosed: 1996
                    Resolved: ongoing problem
  #[4 ]: Benign Prostatic Hypertrophy
                    Diagnosed: Sep 2000
                    Resolved:
```

Dr InBasket 01: Urgent (0) | Normal (1) | Sign Off (1) | Pending (2) | Lab (3/0) | Assistant (1) | Change Dr

CLINICARE

```
(049950) PATTERSON VICTOR B    AltID-                    LU 16Aug01
6420 LAW DRIVE S.W.            Male (66) 17Jul35         Home:(416)123-4567
Oakville ON  T2K 1X4           Ins: 5217 769 677         Work:(416)242-4715
Usual Dr: 01  SMITH ROBERT S   RST:25Jan2000              CT:ARC MD:A4  AD:60
```

al | MEDACT | PATHND | pl | ph | psh | lfh | sh | Date Table

```
August 16, 2001                Progress Notes
 SMITH ROBERT S (01)
    SUBJECTIVE:  Patient feeling listless.  Also wants meds renewed.
     OBJECTIVE:  ...
    ASSESSMENT:  Needs some iron.  Current meds working well, continue.

 SMITH ROBERT S (01)
 Rx0000239 ----- Medication -------------- CA Issued   Dose Fq Rf Expires Dr
 FERROUS GLUCONATE          TAB 300    MG   A  16Aug01     1  1  1 24Nov01 01
 VASOTEC TAB 5MG            TAB 5      MG   C  16Aug01     1  1  1 04Mar02 01
 VENTOLIN INHALER - AEM IN MET 100     MCG  C  16Aug01     0  0  0 16Aug01 01


July 8, 2001                   Progress Notes
 SMITH ROBERT S (01)
    SUBJECTIVE:  sore throat; started 4 days ago, with head congestion
     OBJECTIVE:  pharynx pyperemic, with white exodate
    ASSESSMENT:  pharyngitis
          PLAN:  ampicillin

 SMITH ROBERT S (01)
 Rx0000240 ----- Medication -------------- CA Issued   Dose Fq Rf Expires Dr
 AMPICILLIN ; 500 MG        CAP 500    MG   A  08Jul01     1  4  0 18Jul01 01


March 15, 2001                 Progress Notes
 SMITH ROBERT S (01)
    SUBJECTIVE:  Review of CVS status and recent gallbladder trouble.
    Denies all problems at this time.
     OBJECTIVE:  S1S2 normal.  B/P = 128/82. P = 72 and regular.  No edema,
    cyanosis or clubbing.  Chest is a bit emphysematous but nothing new.
    ASSESSMENT:  CAd, COPD, cholelithiasis, all quiesent at this time.
          PLAN:  Continue meds and diet as before.

February 24, 2001              Progress Notes
 SMITH ROBERT S (01)
```


Start | Your ... | CLIN... | MR3.... | MR.21... | (049... | MR3.... | Dr-InBas... | 4:33 PM

(049950) C Dr's Desktop - fred 21Aug01

File Actions Tools Help

MEDACT - MEDICATIONS - ACTIVE

Active Medications (MEDACT)

Medication			CR	Issued	Dose	Fq	Rf	Expires	Dr
FERROUS GLUCONATE	TAB 300	MG	A	16Aug01	1	1	1	24Aug01	01
VASOTEC TAB 5MG	TAB 5	MG	C	16Aug01	1	1	1	06Mar02	01
VENTOLIN INHALER - HEM IN MET	100	MCG	C	16Aug01	0	0	0	16Aug01	01

Dr InBasket 01

Urgent (0) | Normal (1) | Sign Off (1) | Pending (2) | Lab (3/6) | Assistant (1) | Change Dr

CLINI CARE

(049950) PATTERSON VICTOR B AltID- LV 16Aug01
6420 LAW DRIVE S.W. Male (66) 17Jul35 Home:(416)123-4567
Oakville ON T2K 1X4 Ins: 5217 769 677 Work:(416)242-4715
Usual Dr: 01 SMITH ROBERT S RST:25Jan2000 CT:ARC MD:A4 AD:60

HND | pl | ph | psh | fh | sh | Date Table

2001 Progress Notes
S (01)
E: Patient came in with acute epigastric and chest pain.
feels like being stabbed in the "wishbone". Worse after
t night and again today after lunch. No other episodes. No
nip to activity or position.
E: Heart sounds were normal, no sign of failure, no edema, no
rills. B/P = 140/90, P = 94, regular. Some tenderness in
guarding, no rebound, no rigidity. No masses. No jaundice.

T: ? cholelithiasis, ? PUD, ? angina
M: CXR, KUB, U/S of gallbladder as well as some bloodwork.
s given strict advice on diet and activity and what to do if
oms do not relent while we are waiting for the results. I
him when the results are available.
.....I reviewed patient's workup late in the afternoon of the
that patient was in and it shows patient has gallstones.
lso appears to have a signifigant infection and he confirmed
llow-up by telephone when he reported a fever.

DIAGNOSTIC IMAGING REPORT (di)
S (01)

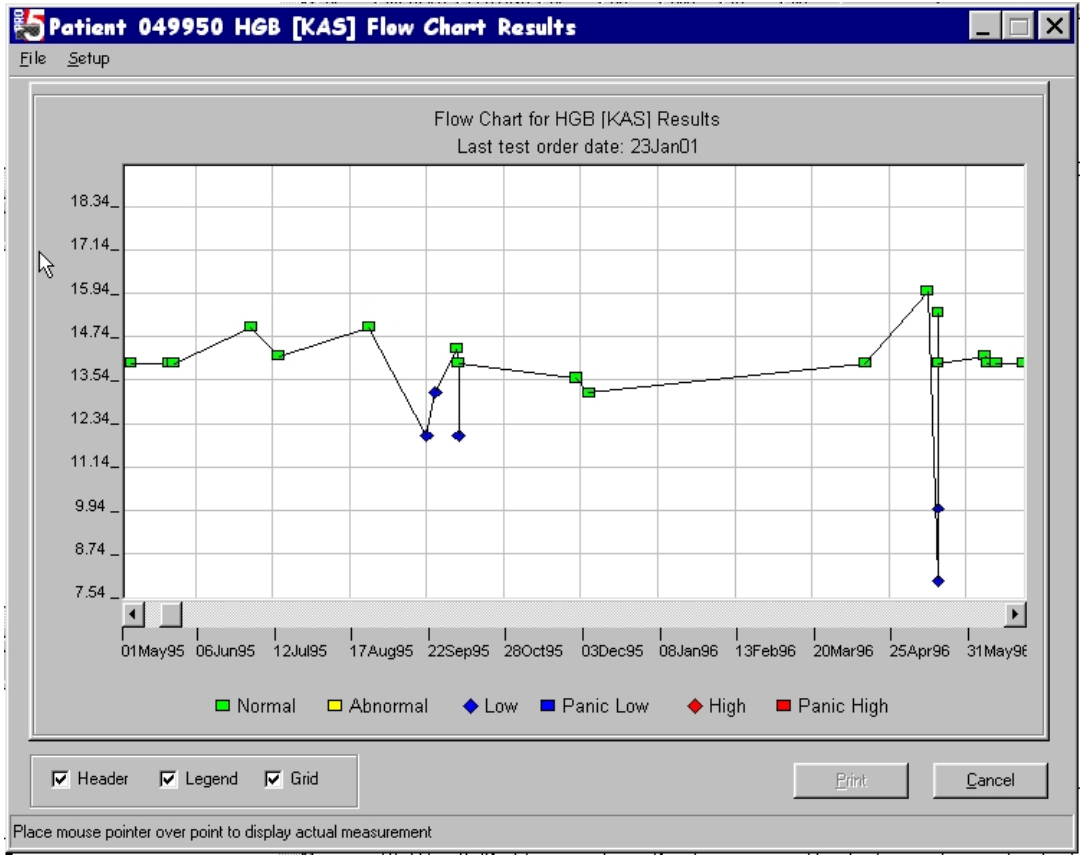
XAMINATION: CXR, KUB, U/S of upper abdomen.
CXR unchanged from last report of 15/01/01.
KUB shows only some increased bowel gas accumulation, no other
t findings.
of the abdomen showed multiple gallstones as well as
of the wall of the gallbladder. Collecting ducts all appear
d free of obstruction.

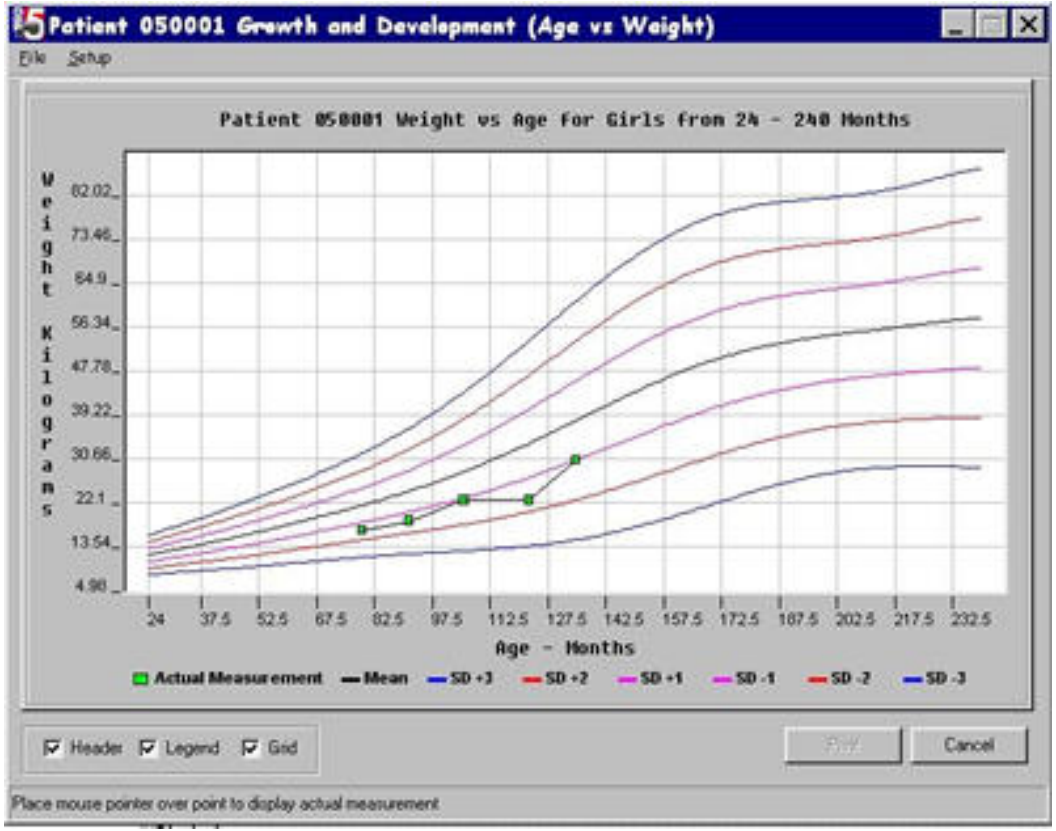
file://c:/bbxbt/df/images 49950 20000310 0.jpg

January 17, 2001 Progress Notes
SMITH ROBERT S (01)
SUBJECTIVE: Recheck of chest. States he feels fine now.

al - ALLERGI
SMITH ROBE
[pollen
[kefler

pl - PROBLEM
SMITH ROBE
#|1]: C
#|2]: H
#|3]: C
Resolved: ongoing problem
#|4]: Benign Prostatic Hypertrophy
Diagnosed: Sep 2000
Resolved:


Patient 049950 HGB [KAS] Flow Chart Results
File
Setup
Flow Chart for HGB [KAS] Results
Last test order date: 23Jan01
18.34
17.14
15.94
14.74
13.54
12.34
11.14
9.94
8.74
7.54
01May95
06Jun95
12Jul95
17Aug95
22Sep95
28Oct95
03Dec95
08Jan96
13Feb96
20Mar96
25Apr96
31May96
Normal
Abnormal
Low
Panic Low
High
Panic High
Header
Legend
Grid
Print
Cancel
Place mouse pointer over point to display actual measurement


Patient 050001 Growth and Development (Age vs Weight)
File
Setup
Patient 050001 Weight vs Age for Girls from 24 - 240 Months
Weight Kilograms
82.02
73.46
64.9
56.34
47.78
39.22
30.66
22.1
13.54
4.98
24
37.5
52.5
67.5
82.5
97.5
112.5
127.5
142.5
157.5
172.5
187.5
202.5
217.5
232.5
Age - Months
Actual Measurement
Mean
SD +3
SD +2
SD +1
SD -1
SD -2
SD -3
Header
Legend
Grid
Print
Cancel
Place mouse pointer over point to display actual measurement

Macintosh, Kathleen age 39 #2417

320 Pinebush Road
Cambridge, Ontario N3C 2V3
888-1113 (H) 888-1111 (B)

Birthdate: Jan 14, 1959 Sex: F
Health #: ON 9876512345
Last Seen: Nov 18, 1998
MD: Schaefer, Jordan

FH
M HPT, died Breast CA 1981
M's & F's side DM

PROB
Metastatic adenocarcinoma
Unknown primary (? breast)
Hypothyroidism
Asthma

HOH
Hypothyroidism
P3G2
Appendectomy 1976
Cholecystectomy 1994
Coccygeal excision following minor injury 1980
T&A age 5

RX
Palafer 1 OD
Synthroid .15 mg OD
Ventolin Inhaler PRN
Amoxil (day 3 of 10)

ALG
Duragesic -> Local skin irritation with excoriated rash.
Dyazide > rash

IMM
flushot (3) latest: Oct 27, 1997
Pneumovax Oct 15, 1998
Td Nov 11, 1998

PERS
Married
Nonsmoker
Social Drinker
1 Twin daughter died in MVA 1980

REM
Recommend Flu Shot
Order Mammogram
Needs Pap Smear

RISK

Nov 11, 1998 JJS

Immunized: Td

lot #29384

Nov 12, 1998 BG/JJS

House Call

S: 1. No further vomiting since discharge from hospital but getting lower abd and back pains. VON has suggested Duragesic patches as she is not getting adequate pain control w Dilaudid.

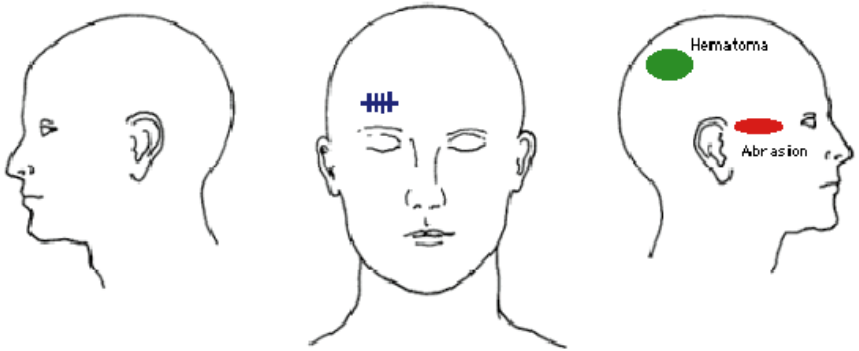
2. Fell in her bathroom, hurting her head. No LUC. Stitched in Emerg.

O: BP 130/80 R supine. Resting w legs elevated. Still has massive oedema of both lower limbs but tissues less tense. Abd soft w no localized tenderness. Pelvic exam not done but she cts to complain of perineal irritation and burning. Head injuries as diagrammed.

A: Metastatic adenocarcinoma. ? 1° breast. Perineal dermatitis. Minor head injuries.

P: Start Duragesic patches 25 µg 1-2 q72h. Use Dilaudid prn only. Try compresses to perineal area. Due to go to Hamilton for chemo tomorrow. Stitches out in 5 days.

Nov 12, 1998 JJS



Nov 12, 1998 JJS

Start: Duragesic patches 25 µg 1-2 q72h M: 25

Nov 18, 1998 JMK

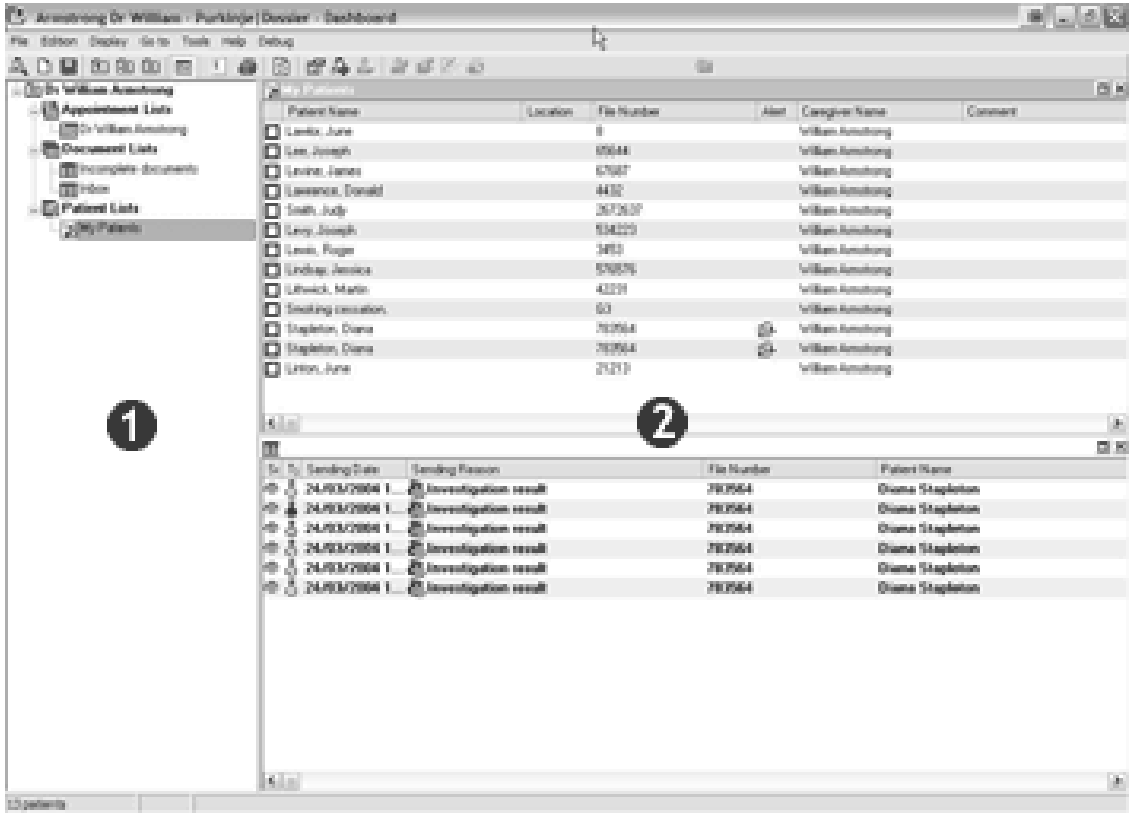
Discontinue: Duragesic patches 25 µg 1-2 q72h

Partial Success: Good pain control

Local skin irritation with excoriated rash

Renewal: Amoxil for 10 days

8.5 x 11 in


Dr William Armstrong
Appointment Lists
Dr William Armstrong
Document Lists
Incomplete documents
Inbox
Patient Lists
My Patients
Patient Name
Location
File Number
Alert
Caregiver Name
Comment
Sending Date
Sending Reason
File Number
Patient Name
Investigation result
Diana Stapleton
1
2

CONTEXT

Patient referred by : name :

CHIEF COMPLAINT

As reported by patient :

Type of visit : Initial evaluation Follow-up Consultation

HISTORY OF PRESENT ILLNESS

Symptom(s)

PAST MEDICAL HISTORY

MEDICATION

Medication - Profile (current)

SOCIAL HISTORY

FAMILY HISTORY

2003/05/21 - - Dr François Martin

2003/05/21 12:38

PHx

MED

PRESC

PAST MEDICAL HISTORY

ALLERGY : none

Allergy - Profile

MEDICATION

Medication - Profile (current)

PRESCRIPTION

MEDICATION

Medication - Profile (current)

BIAXIN (Tabs 500MG)

Sig

dose: 1 tab(s)

freq: once daily bid tid qid HS every 12 hr(s)

directions: PRN :

duration 10 day(s) end of medication: stopped

complex prescription

quantity: tab(s) for: month(s)

renew: time(s) non renewable

Stapleton Diana, 37 years old (F), #783564 - Purkinje | Dossier

File Edit Display Go to Tools Help

All

- PATIENT RECORD
  - Demographic Data
  - Alerts
  - Summary
    - Allergies
    - Immunizations
    - Medications
    - Past Medical History
    - Family History
    - Obstetrical History
    - Diseases
    - Procedures
    - Orders
    - Results Table
    - Monitoring Tables
  - Episodes
  - Problems
  - Notes
  - Exam Reports
  - Scanned Documents
  - Other Documents

Results Table

Element	Selec	11/9/2003 9:00 AM	12/9/2003 9:00 AM	2/2
BIOCHEMIST...				
blood				
glucose...	☑	5.2 mmol/L		
HEMATOLOGY				
general h...				
glycosyl...	☑	5 %	5.2 %	
coagulation				
internati...	☑	2.4		

Logician - Lynn J. Marks LPN @ Southside Clinic (LOCAL) - 2/2/99 11:22 AM - [Chart]

Go Actions Options Help

Desktop | Chart | Appts | Reg | Reports | LinkLogic | New | View | Print | Help | EXIT

Judy S. Pullman

39 Year Old Female (DOB: **06/29/1959**) Patient ID: **121-TEST011**

Home: **503-299-7222** Work: **503-531-7036**

Insurance: **CHC (Gold Plan)** Group: **CHC3497**

Find Pt. | Protocols | Graph | Handouts | Probs | Meds | Refills | Allergies | Directives | Flowsheet | Orders | End Update

Summary | Problems | Medications | Alerts | Flowsheet | Orders | Documents | Update

Doc ID: **34** Properties: **Office Visit at SOUTH on 02/02/1999 10:56 AM by Harry S. Winston MD**

Summary: f/u Asthma management

Change Properties...

- HPI - General
- Histories
- Risk Factors
- ROS complete-no visibility
- Vital Signs
- Exam General Multi-system
- Assessment/Plan

Arial 10

Past, Family, and Social History

Past History (reviewed - no changes required):
Usual Childhood Illnesses? Yes, including chicken pox
Hospital/Accident/Injury/Surgery - emergency appendectomy age 16
Pregnancies/Live Births/Abortions - G2P2 Asthma: childhood asthma from age 5 to 11, which then resolved until age 17. She only used inhalers as a child and as never seen in the emergency room. As an adult she has gradually had worsening symptoms in an episodic manner with prolonged wheezing and coughing after URIs.

Family History (reviewed - no changes required): Mother 62 A&W ex steroid-dependent asthma GMa dec 66 MVA GFa dec 85 "old age" Father 63 A&W GMa dec 79 lung cancer GFa 83 "senile" No other Cancer, HTN, heart disease, asthma, DM or CVA.

Social History (reviewed - no changes required): Where Grew up? Northern California, moved to Oregon 5 years ago Years education/degrees? BA/MBA Occupation: Manager small business, office work, no occupational experience. Marital Status/Children: Married/2 children Sexually Active? Yes, single partner x 13 years - vasectomy Patient states she is an organ donor.

For Help, press F1 NUM

Mental Status Exam

MSE-cc/aff | MSE-thought

MENTAL STATUS EXAM

Date of Onset:

CC: mood changes

Affect:

- [ ] Sad
- [ ] Flat
- [ ] Tearful
- [ ] Elated
- [ ] Consistent
- [ ] Hostile
- [ ] Labile
- [ ] Neutral
- [ ] Appropriate to thought
- [ ] Blunt
- [ ] Inappropriate to thought

Attitude:

- [ ] Cooperative
- [ ] Guarded
- [ ] Hostile
- [ ] Suspicious
- [ ] Negative

Speech:

- [ ] WNL
- [ ] Loud
- [ ] Delayed
- [ ] Rapid
- [ ] Soft
- [ ] Slurred
- [ ] Pressured
- [ ] Slow
- [ ] Excessive

Appearance:

- [ ] Appropriate
- [ ] Bizarre
- [ ] Disheveled
- [ ] Physical Impairment
- [ ] Inappropriate

Mood:

- [ ] Depressed
- [ ] Elevated
- [ ] Angry
- [ ] Consistent
- [ ] Empty
- [ ] Labile
- [ ] Neutral
- [ ] Irritable

Prev Form (Ctrl+PgUp) | Next Form (Ctrl+PgDn) | Close

ROS complete-no visibility

Review of Systems

Negative unless otherwise specified

General:		Negative
Eyes:		Negative
Ears/Nose/Throat:		Negative
Cardiovascular:		Negative
Respiratory:		Negative
Gastrointestinal:		Negative
Genitourinary:		Negative
Musculoskeletal:		Negative
Skin:		Negative
Neurologic:		Negative
Psychiatric:		Negative
Endocrine:		Negative
Heme/lymphatic:		Negative
Allergic/Immunologic:		Negative

Prev Form (Ctrl+PgUp) Next Form (Ctrl+PgDn) Close

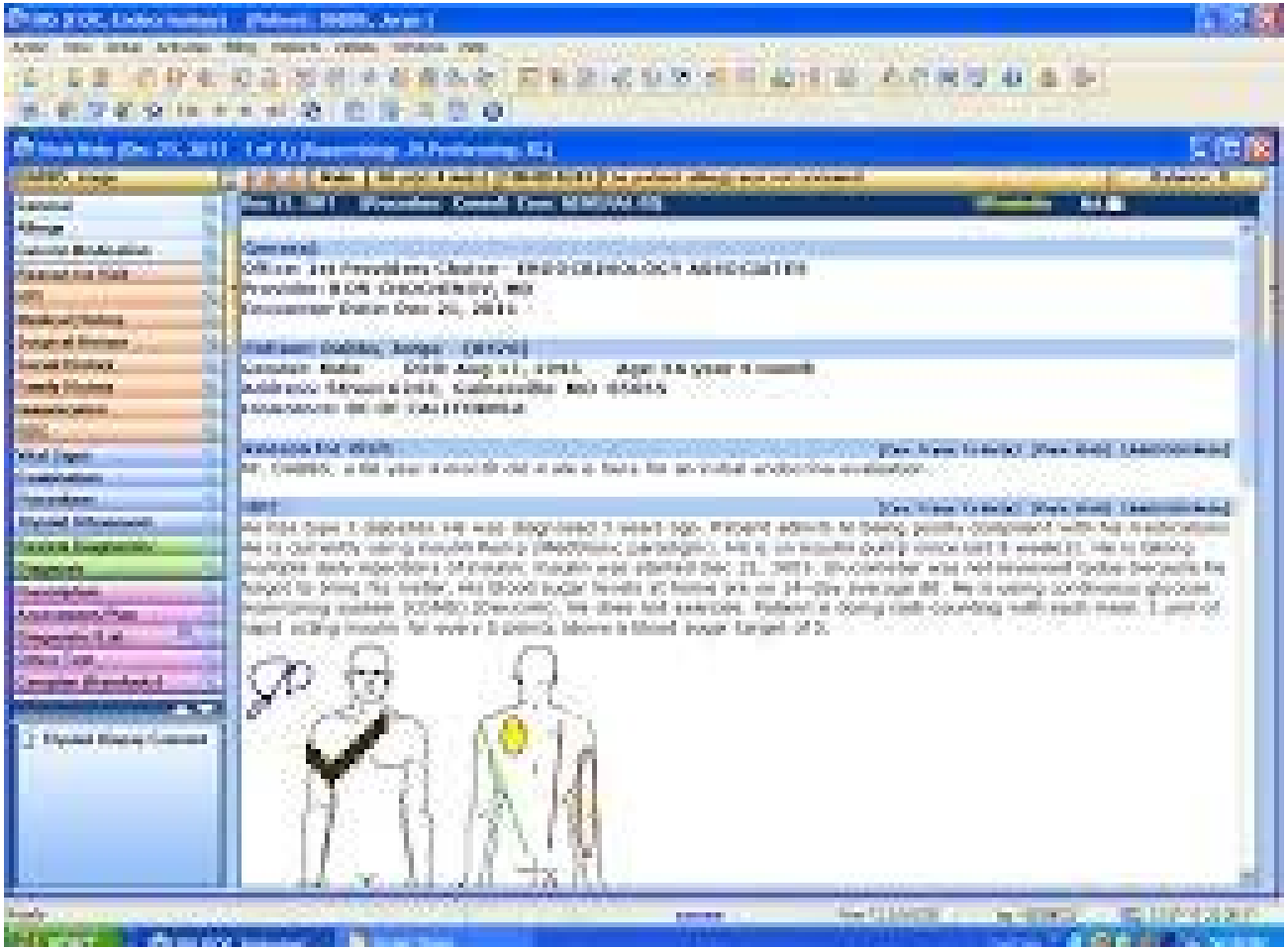
EMRs -Past

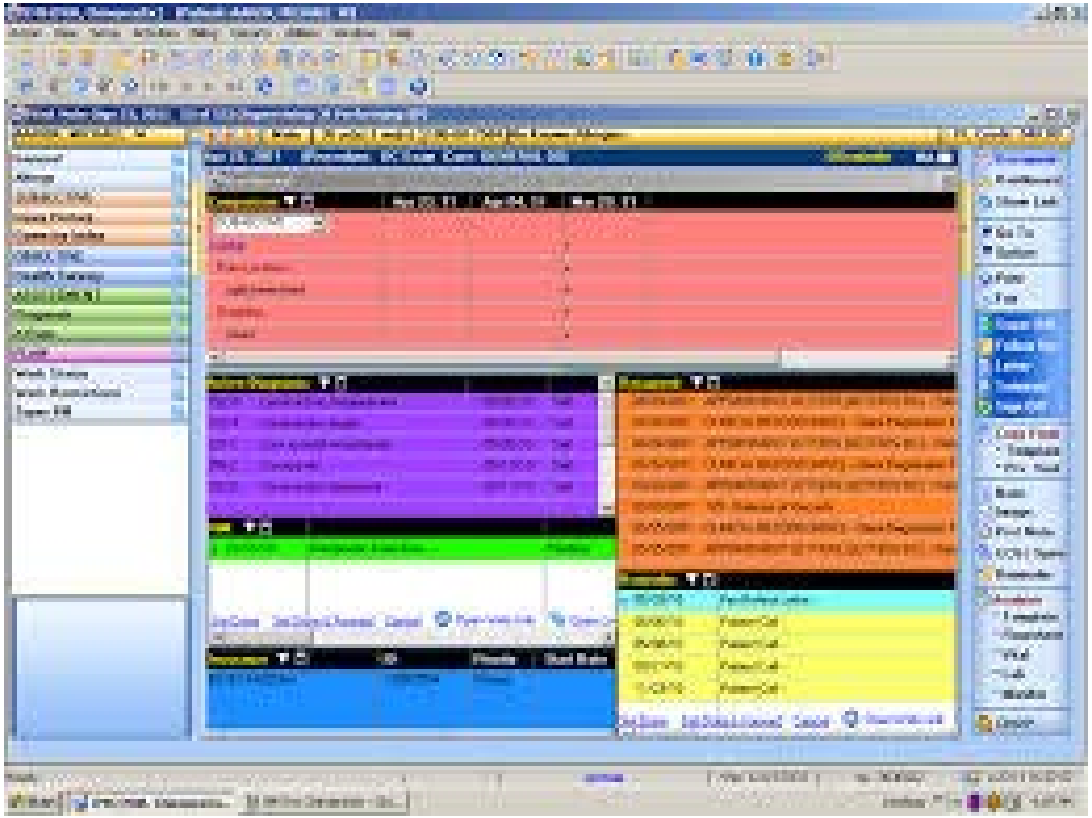
- Major driver was paper management and storage expense
- Little concern about quality of data
  - Physicians dictated notes and it was transcribed into EMR
- Key to physician adoption was integration of information
  - Labs, radiology, discharge summaries, etc.
  - Removal of paper copies after a few months

EMRS PRESENT

EMRs – Present

- In the US, driven by HITECH Act and Meaningful Use program
  - Part of President Obama's stimulus package for the US economy
- In Canada, driven by Provincial Subsidy programs and Canada Health Infoway Investments
- In Canada, regulation and specifications administered by the provinces ensured uniformity and standardization of functionality
  - There was some informal cross-fertilization across Provinces
- In the US, HL7 Functional Specifications of EMR drove the standardization of functionality





Westside Medical Office | Watson RN, Jennifer

Correctional Health Patient: Patient Test Age: 39 Years DOB: 19710211
ID #: ABCD-1234 Current Provider: Jennifer Watson RN Gender: Female Encounter: 08/23/2010

Navigation
HOME
Demographics
Record Vital Signs
Nurse Doc
Chart Summary
Order Management
Allergies
Immunizations
Past Medical Hx
Family History
Social History
Health Maintenance
HPI
Problem List
Review of System
Physical Exam
Procedures
Assessment
Disease Mgmt
Orders
Plan
Document Library
EM Coding
Comments
Intake
Health Assessment
Nurse Visit
Provider Visit
Consult Request
Other Templates

Specialty Template Set: CHM
Visit Type:

Classification

Medical (or combined)	WA	07/15/2010
BH	MS	07/15/2010
Other		/ /

Reason(s) for visit

	F/U
	F/U
	F/U
	F/U
	F/U
	F/U

Chronic Problem List Add New Problem

Chronic Problem	Code
Cerebrally, spine, congenital	754.2
Diabetes insipidus	253.5

Add to Today's Assessments
Advance Directives

Vitals Alerts Patient Service info Expand Vital Signs

Date / Time	Temp	BP	Pulse	Respirations	Height (in)	Weight	BMI	Pulse Ox	Peak Flow
07/15/2010 11:17 AM	98.9	122/71			71.0	150.0	20.92		
07/15/2010 11:17 AM	99.0	120/70			71.0	160.0	22.31		

Medications No Medications Medications reviewed Comment

Medication	Dose	Sig Description	Start Date
ACETAMINOPHEN	325MG	take 1 tablet (325MG) by ORAL route every 4 hours as needed	07/15/2010
WARFARIN SODIUM	1 MG	take 1 tablet (1MG) by	07/15/2010 11

Allergies No Known Allergies Comment
Allergies reviewed, no change
New allergies added this encounter

Ingredient/Allergen	Brand Name
CAT'S CLAW	
QUINAPRIL HCL	ACCUPRIL
MAGNESIUM CARBONATE	ACCUPRIL

Date	Visit Type
08/23/2010	Intake
08/23/2010	Intake
08/23/2010	Intake

Chronic Care Clinic	Condition	Code	Last Visit
Endocrine	Improving		07/09/2010

Health Monitor Set Health Maintenance Protocols

TST

Placed	Read	Result	Side
07/15/2010	/ /		

Due: 08/23/2010

TST

	Due:
Health Assessment	08/23/2010
Lipid Panel	/ /
Colonoscopy	/ /
Sigmoidoscopy	/ /
FOBT x3	/ /

	Due:
Breast Exam	/ /
Mammogram	/ /
PAP Test	08/23/2010
GYN Exam	07/15/2011
DEXA Scan	/ /

My Practic
Custom


History of Presenting Illness

Plan - Diabetic Clinic

File | Home | Create | External Data | Database Tools | My controls

Plan of Action

RecordID 2805 PIN 642 FirstName post ablative SecondName Score: 67 Patient Current Plan: Thyroxine Plan

Diagnoses

Functional Status: Hyper-Thyroidism
Etiological Diagnosis: Post Ablative Myxedema
Known for: Patient was previously on Ablation Therapy Treatmen

Stable Diagnosis 1
Stable Diagnosis 2
Clinician's Diagnosis

Re-Run Diagnostic Algorithm

Do you want to Refer this patient to Consultant ?

Instructions
Instructions2:

Prescription (Tablets) and Treatment

Thyroid-related Drugs

Thyroxine 50ug:
Neomercazole 50mg
Steroid(s):

Other Drugs

Medicine 1	Tab. Folic Ac	1 + 0 + 0
Medicine 2	Tab. Inderal	1 + 1 + 1
Medicine 3	Tab. Pentoxi	0 + 0 + 1

Investigations Advised :

Investigation 1	ESR
Investigation 2	CBC
Investigation 3	FLP
Investigation 4	TT3
Investigation 5	TT4
Investigation 6	TSH
Investigation 7	
Investigation 8	
Investigation 9	
Investigation 10	

Follow Up Visit Schedule

Next Visit 8/1/2012 (mm/dd/yyyy)

Referrals

Cardiologist	None
Ophthalmologist	None
Surgery	None
Gynaecologist	None
Nuclear Medicine	None
Inmol for	None

Planned By

Generate Printable Patient Record

Switchboard

Back

View Trends

Trend in Weight

DateOfVis	Weigt
7/25/2012	66
7/25/2012	58

Navigation Pane

EMRs – Present

- Focused on generating a note
- Little focus on improving care within the workflow
- Data capture is divorced from analytics
  - Doctor has to pull a report to know the status of their practice
- Difficult and time-consuming to enter data
- Difficult to know what's going on with the patient
- Difficult to tell what treatments are current
- Difficult to tell the status of your patient
- Documentation for the sake of documentation or billing

EMRS – THE FUTURE

- “Don’t work the way I do”
- Poor information management capabilities
- Too faithful to the paper paradigm
- Driven by regulation of features
- Not driven by patient safety or physician productivity requirements
- They don’t have clinical common sense

What we know

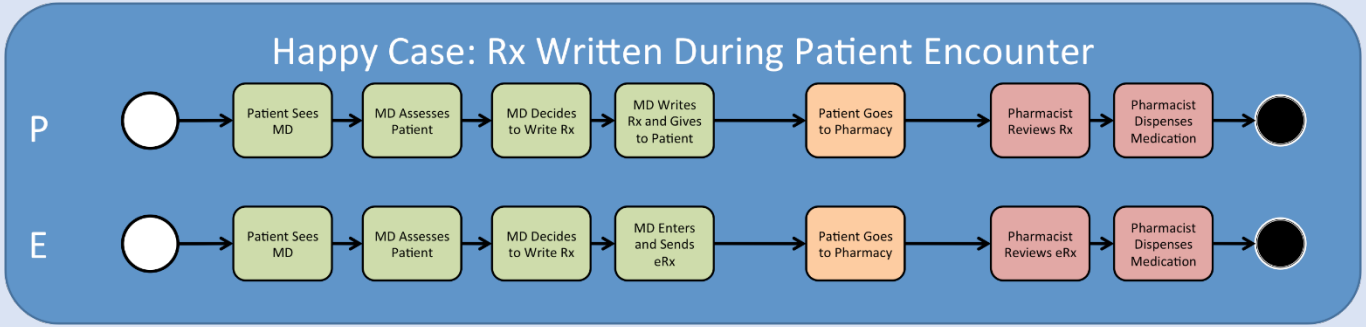
- There is lots of dirty data in the EMR
- EMRs are driven by an encounter/visit based data model
  - Doctors find it difficult to use EMR for chronic disease management
- Meta data poorly handled –easy to put data in 'wrong place'
- Poor integration of databases and knowledge bases
  - Drug-drug interactions checking software forces me to indicate allergy to an instance of a medication instead of a class of medication
- Overall, EMRs are poor at information management

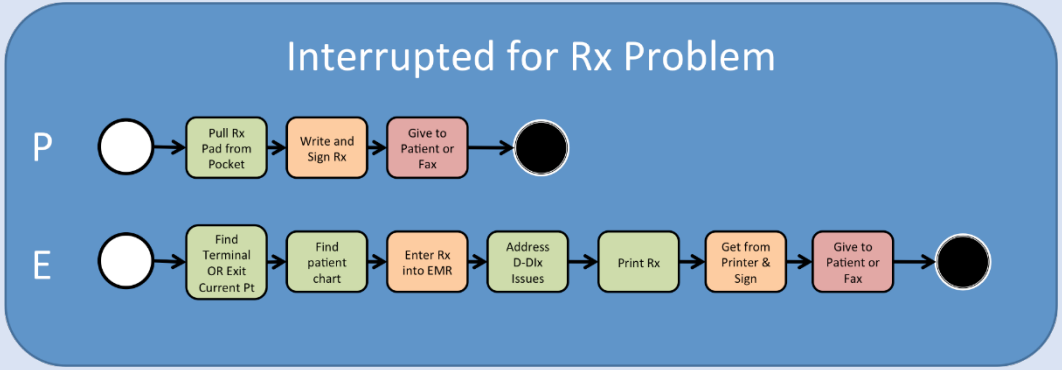
Other issues

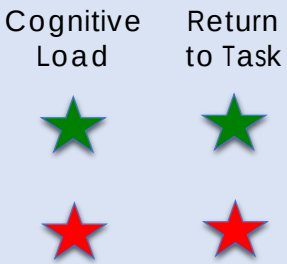
- Informatics places too much emphasis on content semantics (e.g., SNOMED)
  - Diabetes is an endocrine disease –so what?
- Too little emphasis on ‘eye-ball’ semantics
  - Can I transfer data to another provider quickly and easily?
- Too little emphasis on semantics inherent in structure and ‘syntax’
  - A risk factor has a structure distinct from a prescription
  - How can we use this to our advantage in EMR design?
- A narrow focus on content semantics slows us down, as we are trying to solve the most difficult problems in knowledge representation and ontology

Kuziemsky, C. E., & Keshavjee, K. (2015, February). A Framework of'p'-Benefits in Health Information Technology Implementation. In ITCH (pp. 232-236).

Workflow Impacts

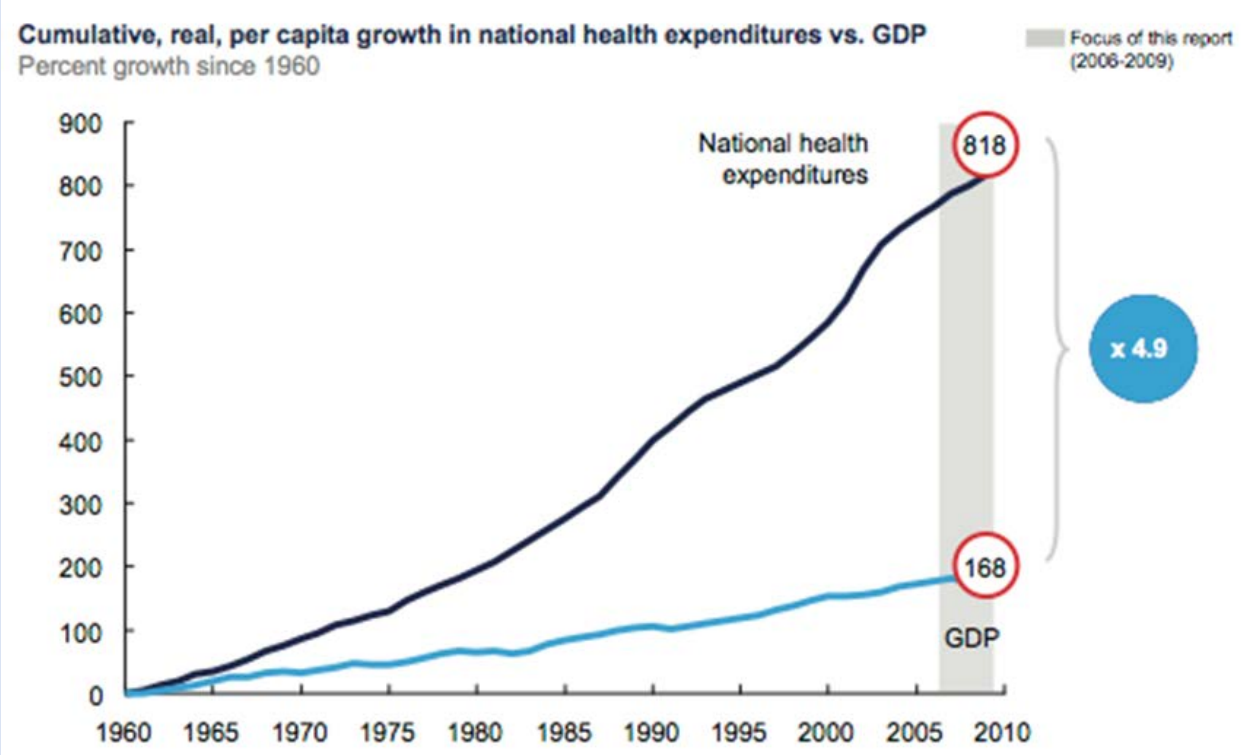


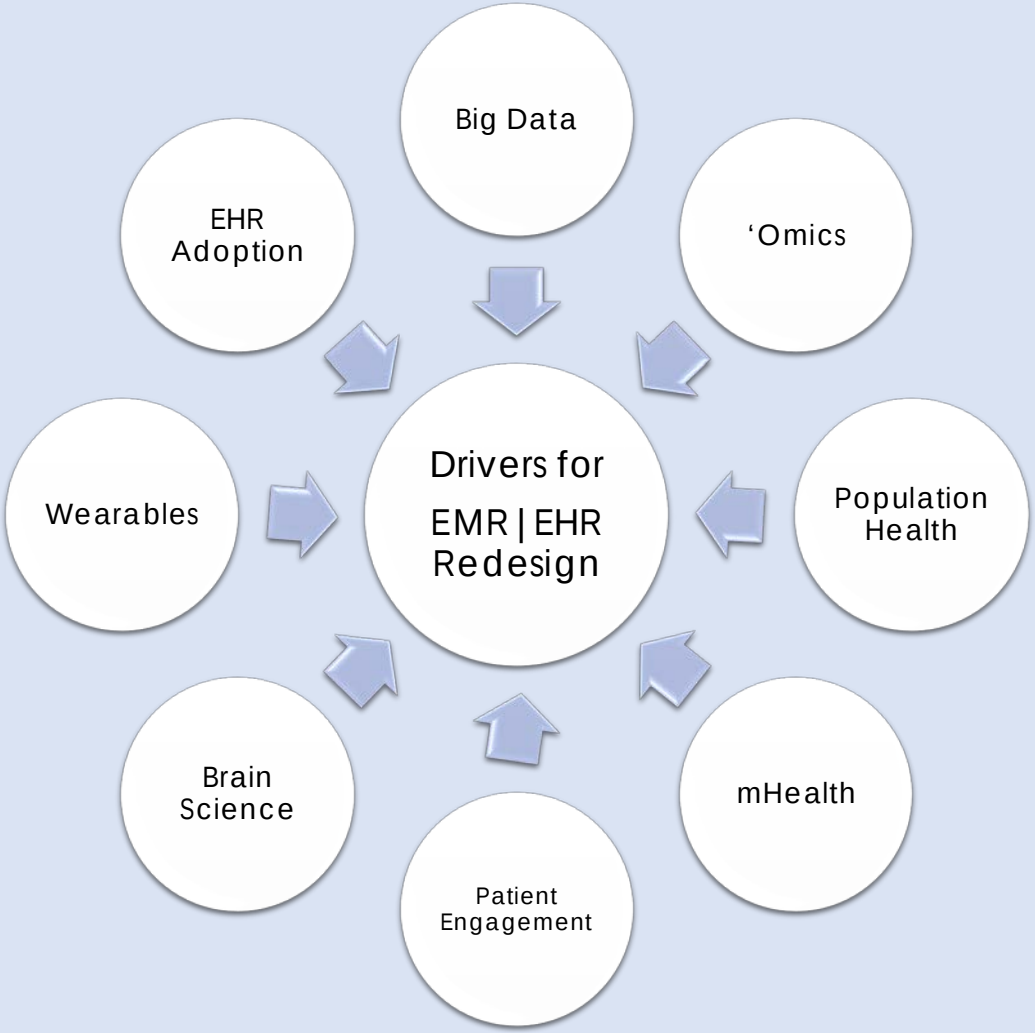




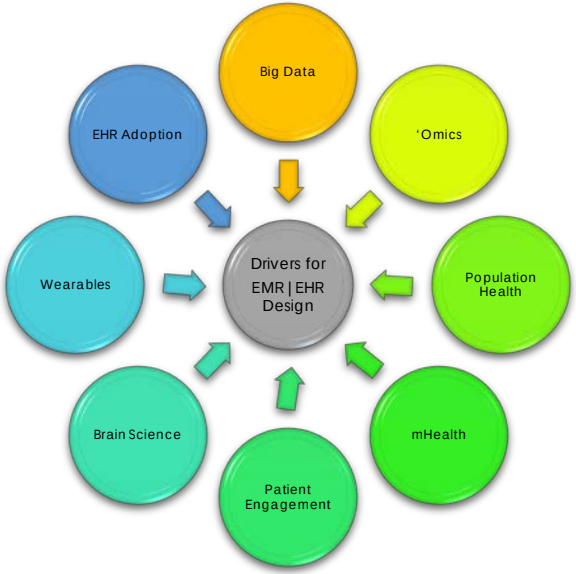
http://blog.evicore.com/category/healthcare-news/

Drivers for change




Big Data
'Omics
Population Health
mHealth
Patient Engagement
Brain Science
Wearables
EHR Adoption
Drivers for EMR | EHR Redesign

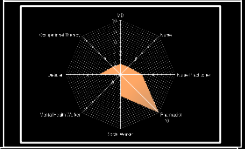
Drivers of change

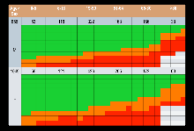


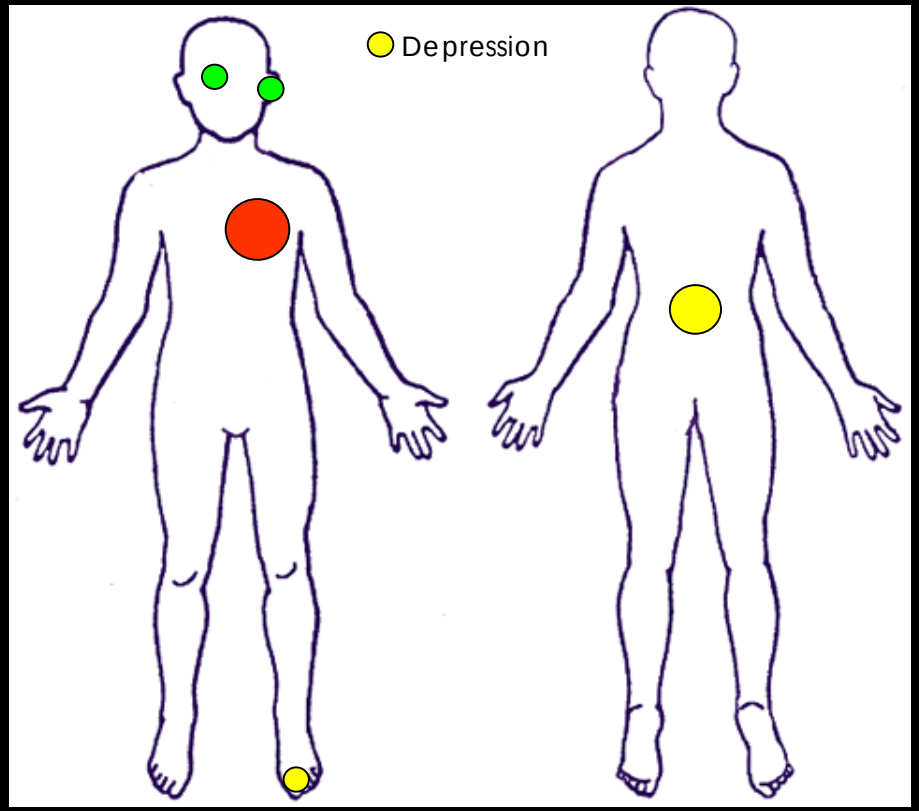
- Continuous, rapid changes in evidence
- Explosion of new technologies (Big Data, Genomics, Proteomics, mHealth apps, Diagnostics, Tablets)
- Consumer movement amongst patients
- Payers are looking for more value
- Pay for performance and outcomes
- Chronic disease explosion
- 1% and 5% driving 50-80% of expenditures

Joe Schmoe M 50 (Jan-25-1966) (2 Joe Schmoe's in database)

Research | Care Coordination | Refer Specialist | Circle of Care | Refer Telehealth | CDSS







+ Problem List

- CAD
- Hypertension
- Gout
- Back pain

+ Medication List

- Ramipril
- Propranolol
- Diltiazem
- ASA
- Indocid
- Garamycin
- Penicillin

+ Family History

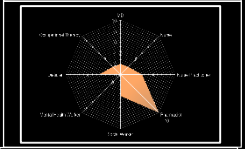
- CAD –Father d. 58
- HTN–Mother
- DM –Mother

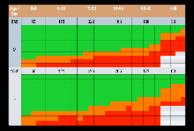
+ Risk Factors

- Smoker

(2 Joe Schmoe's in database)

Research | Care Coordination | Refer Specialist | Refer Telehealth | CDSS





Red Eye
Date: Aug 2002
S: red eye, sticky
O: No abrasion
A:Bact Conjuntivitis
P: Garamycin optic

Chest pain

Angina

CAD
Date: Jan 1993
S: Chest pain
O: ECG abnormal
A:CAD
P: Propranolol

Problem List
- CAD
- Hypertension
- Gout
- Back pain

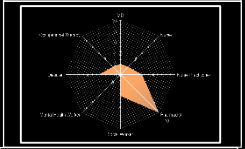
Medication List
- Ramipril
- Propranolol
- Diltiazem
- ASA
- Indocid
- Garamycin
- Penicillin

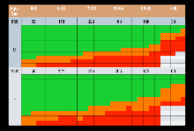
Family History
- CAD –Father d. 58
- HTN–Mother
- DM –Mother

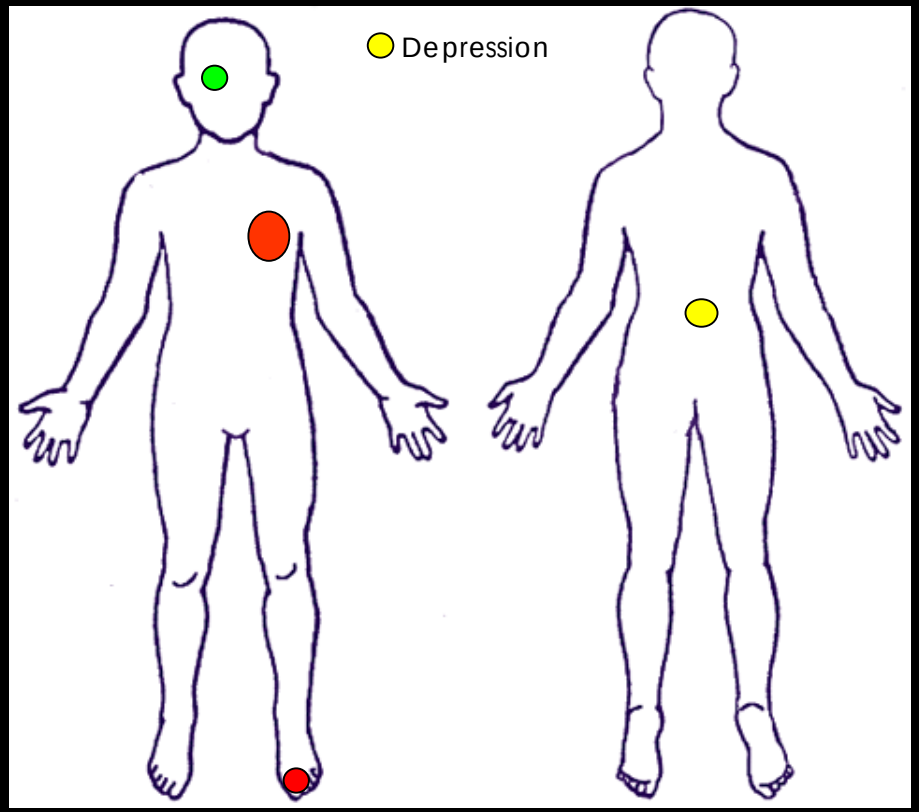
Risk Factors
- Smoker

(2 Joe Schmoe's in database)

Research | Care Coordination | Refer Specialist | Circle of Care | Refer Telehealth | CDSS







Problem List

- CAD
- Hypertension
- Gout
- Back pain

Medication List

- Ramipril
- Propranolol
- Diltiazem
- ASA
- Indocid
- Garamycin
- Penicillin

Family History

- CAD –Father d. 58
- HTN–Mother
- DM –Mother

Risk Factors

- Smoker

Future Medical History

Brain

Eye | H&N | Ear

Lung | Heart | Breast

Liver | Stomach | Spleen

Intestine | Colon

Kidney | Bladder

Ovary | Uterus

Prostate

U Limbs | L Limbs

Depression

Schizophrenia | Anxiety

PTSD

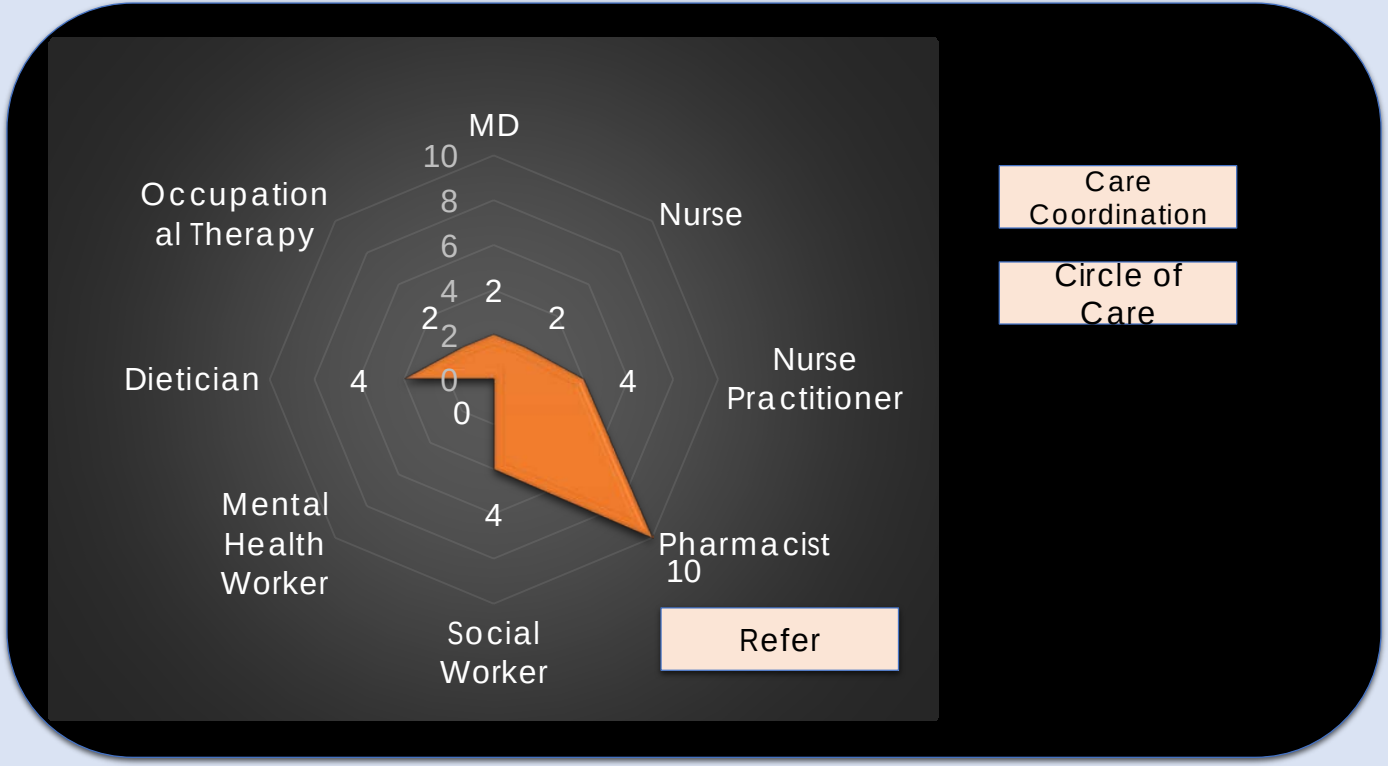
Personality

Pituitary

Thyroid | Diabetes

Adrenal | PCO

Team-based care – Care Coordination – Circle of Care



Circle of Care

Dr. Alex

He lives alone. Anything we should be worried about?

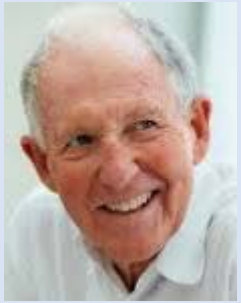
Dr. Cardy

I'd dial back his BP control. 120 systolic may be too aggressive for him. Probably keeping it around 150 would be best.

Samantha

I'll arrange Meals on Wheels and transport to his local church on Sundays. He didn't get his license renewed this year

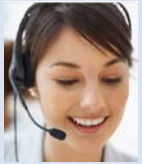
Dr. Alex - FP



Joe Schmoe

Dr. Cardy- Cardio

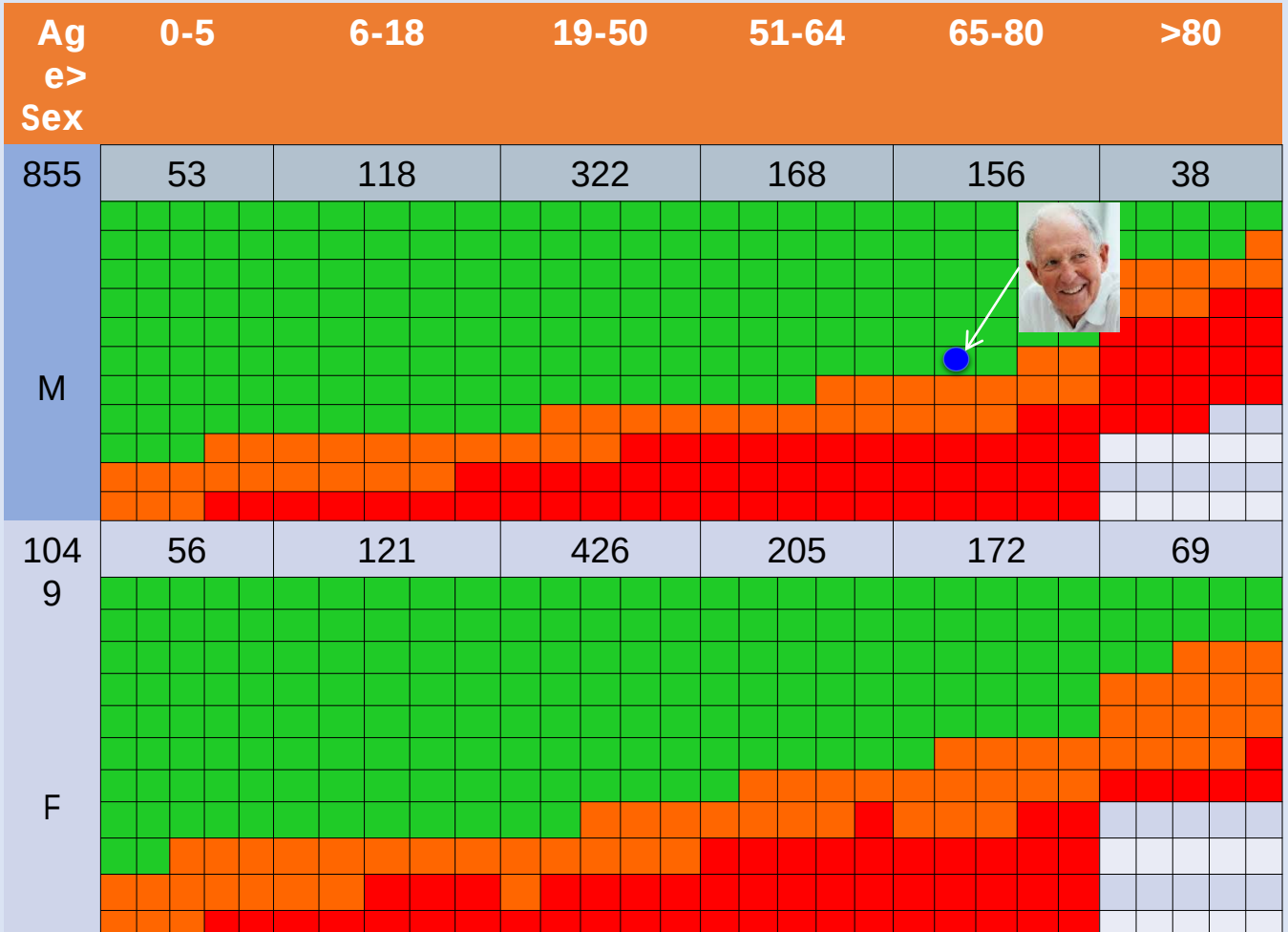
Nurse - Judy



Remote Nurse Nancy

SW - Samantha

Population Based Care



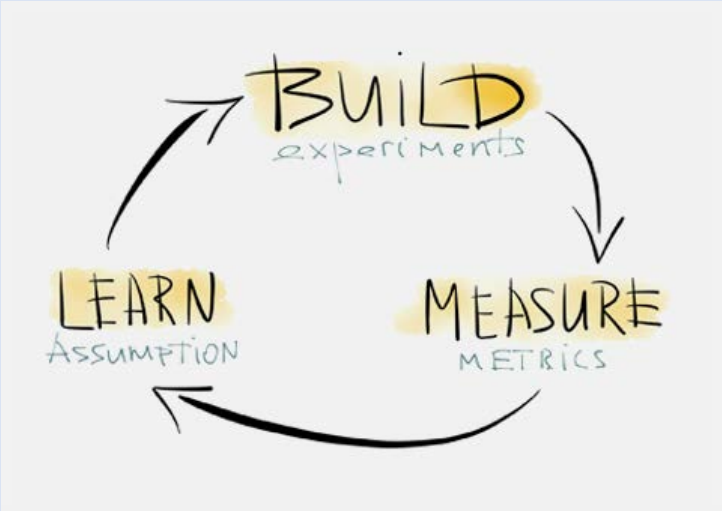
Patient engagement

Area of Risk	Readiness for Change	Importance	Comment	Current Goal
Lung			Smoking Counseling	
Heart			On Statin	
Prostate			Regular PSAs	
Colon			Hx Fam Polyps Refuses colonoscopy	
Depression			In denial of Fam Hx	
Thyroid			On Rx	
Diabetes			Uncontrolled DM Risk	

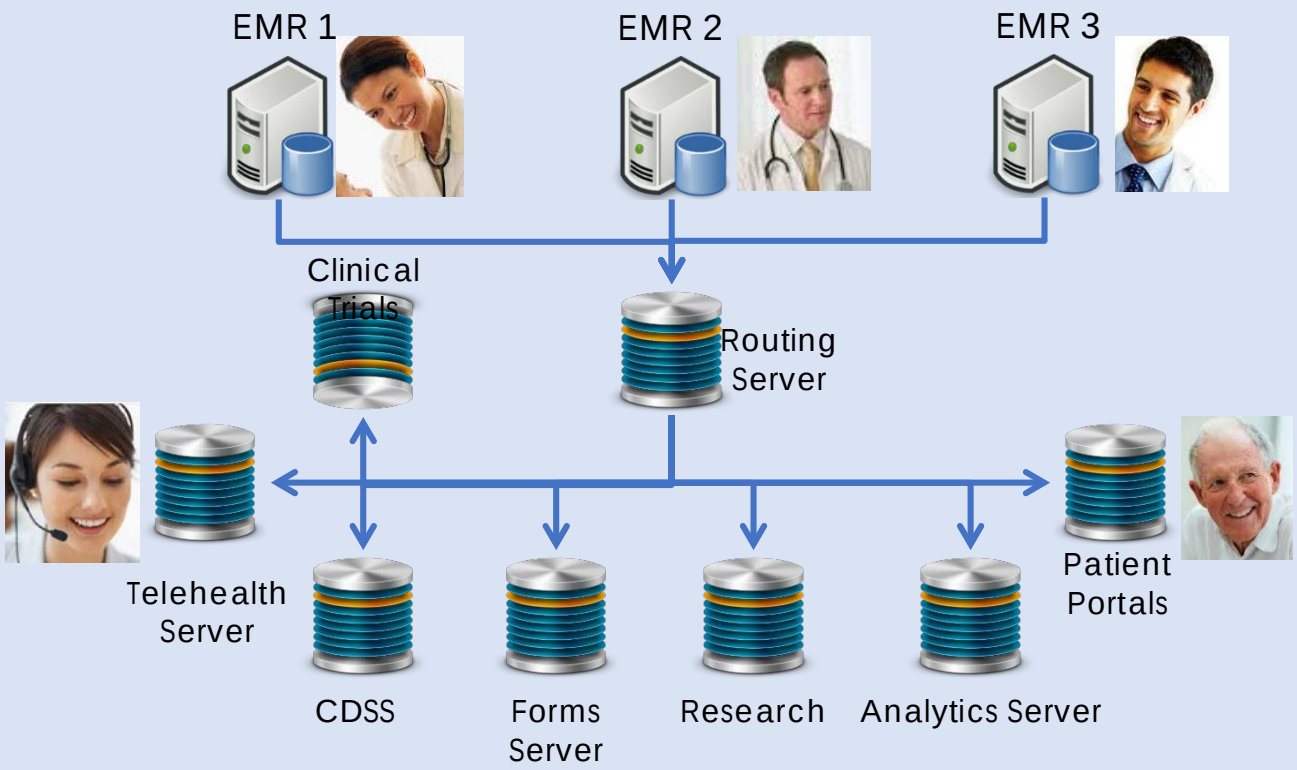
View Patient Portal

Advanced Research

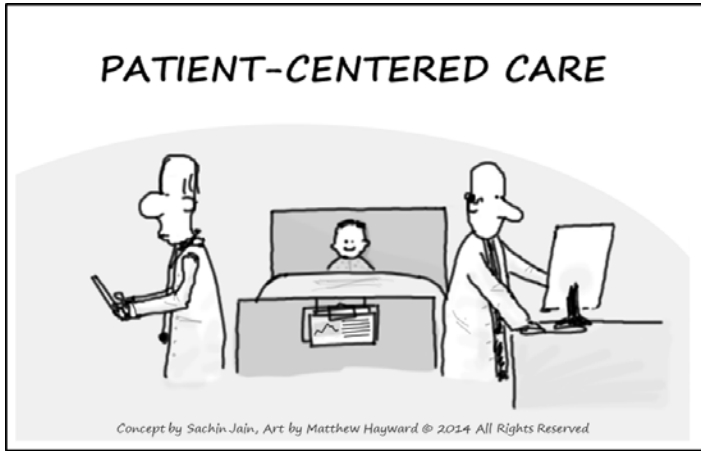
- Research should allow for A/B testing
- Which version of a form works better? Don't just guess or pretend you know.
- Test the new against the old – that's what Google, Amazon and Facebook do. Not possible with our current EMRs.



Solution architecture



The New Paradigm



- Patient-centric data model, not a document-centric data model
  - Manipulate a model of the patient – it's how I practice medicine
  - Don't try to 'construct a good encounter note' –that's a business requirement, not a strategic imperative
- Capture structured information in a good balance with narrative data
  - Need structured data for information management
  - Need narrative for richness and the human touch
- Exploit the potential of information technology for information management

The New Paradigm

- Use the semantics inherent in the structure of the data
- Enter data about patient complaints in small ‘chunks’ which contain related information
  - Chronological fragmentation is better than anatomic and physiological fragmentation –computers are better at reconstructing information using dates than reconstructing information based on complex semantics.

- Encounter notes should be generated by the system as a by-product of capturing information about the patient
- System should be aware that un-coded allergies in the allergy field cannot be found in the medication list

Features of New Paradigm

- System should be able to manipulate records in the system based on their structure (metadata)
  - Smoking records should be concatenated for a history
  - Prescription records should be graphed to show potential non-compliance
  - Prescription records should easily generate a current/active meds list
  - Diagnoses should be ‘superceded’ as greater certainty is achieved –implies that diagnoses should be linkable
  - Diagnoses should be ‘deletable’ in the Problem list as differential diagnostic possibilities are eliminated
  - Similar documents should be able to be grouped even though they are ‘stored’ within a particular encounter.

Benefits of the new Paradigm

- Can ‘slice-and-dice’ patient data in real-time
  - See an encounter view, by clicking on an encounter ‘arrow’
  - See a disease view, by clicking on the disease ‘dot’
  - See the history of a disease by moving the time slider across the timeline
- Can represent data visually in new and exciting ways
- Can conduct queries much more efficiently
  - Data is captured with meta data more efficiently and as a by-product of documentation
  - EMR utilizes the semantics inherent in the structure of the data
    - risk factors automatically go to the risk field,
    - meds automatically go to the medication list

How you can help

- Encourage research and development in EMR by your local academics
- Encourage EMR vendors to adopt new ideas from academics
- Get involved locally or nationally in EMR governance

- EMR adoption has peaked in North America, significant penetration in primary care
  - Current EMRs are unlikely to help transform health care
- EMR vendors are unable & can't afford to do necessary R&D
- We need new governance structures that integrate multiple stakeholders
  - Learning Health Systems may be the right structures?
- Physicians, governments, EMR vendors and researchers and academics need to consider new models of partnership that can accelerate R&D in the EMR space
- Physicians need to take a leadership role in coordinating efforts with appropriate clinical goals in mind